

Descriptions of Ecological Systems for Modeling of LANDFIRE Biophysical Settings

**Ecological Systems of
location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA,
ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE,
NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN,
TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates**

06 February 2009

Descriptions provided to TNC and LANDFIRE by NatureServe

About this document

This document contains brief definitions of the NatureServe terrestrial ecological systems currently identified as occurring in location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates. Terrestrial ecological systems concepts form the basis for three map products from the inter-agency Landfire effort. First, they define the map legend for mapping Existing Vegetation Type (EVT); i.e., the current location of vegetative components of each terrestrial ecological system are mapped in that layer. Second, Environmental Site Potential (ESP) is a spatial model of environments that constrain the possible locations where a given ecological system could occur, without including natural disturbance regime as a factor. Third, Biophysical Settings (BpS) provide another spatial model depicting the probable location of each ecological system type, assuming the inclusion of natural disturbance regimes as a factor.

This ecological systems classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Most of the following types will be further described, quantitatively modeled, and mapped for LANDFIRE. Comments and suggestions regarding the contents of this subset may be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC, <mary_russo@natureserve.org>.





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TABLE OF CONTENTS

FOREST AND WOODLAND.....	12
1373 Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565)	12
1374 Acadian-Appalachian Montane Spruce-Fir Forest (CES201.566)	14
1317 Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)	16
1370 Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)	18
1340 Appalachian Shale Barrens (CES202.598)	21
1346 Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)	23
1347 Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)	26
1301 Boreal Aspen-Birch Forest (CES103.020)	29
1344 Boreal Jack Pine-Black Spruce Forest (CES103.022)	30
1365 Boreal White Spruce-Fir-Hardwood Forest (CES103.021)	32
1177 California Coastal Closed-Cone Conifer Forest and Woodland (CES206.922)	33
1015 California Coastal Redwood Forest (CES206.921)	35
1031 California Montane Jeffrey Pine-(Ponderosa Pine) Woodland (CES206.918)	37
1338 Central and South Texas Coastal Fringe Forest and Woodland (CES203.464)	39
1320 Central and Southern Appalachian Montane Oak Forest (CES202.596)	41
1350 Central and Southern Appalachian Spruce-Fir Forest (CES202.028)	43
1014 Central and Southern California Mixed Evergreen Woodland (CES206.920)	45
1369 Central Appalachian Dry Oak-Pine Forest (CES202.591)	46
1377 Central Appalachian Pine-Oak Rocky Woodland (CES202.600)	48
1361 Central Atlantic Coastal Plain Maritime Forest (CES203.261)	50
1363 Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692)	52
1016 Colorado Plateau Pinyon-Juniper Woodland (CES304.767)	54
1017 Columbia Plateau Western Juniper Woodland and Savanna (CES304.082)	57
1308 Crosstimbers Oak Forest and Woodland (CES205.682)	59
1322 Crowley's Ridge Mesic Loess Slope Forest (CES203.079)	61
1510 Crowley's Ridge Sand Forest (CES203.072)	63
1018 East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)	65
1060 East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085)	67
1372 East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)	69
1349 East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)	72
1380 East Gulf Coastal Plain Maritime Forest (CES203.503)	74
1307 East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)	76
1327 East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)	78
1306 East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)	80
1325 East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)	82
1329 East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)	84
1358 East-Central Texas Plains Pine Forest and Woodland (CES205.896)	86
1519 East-Central Texas Plains Post Oak Savanna and Woodland (CES205.679)	87
1331 Eastern Great Plains Tallgrass Aspen Parkland (CES205.688)	89
1375 Eastern Serpentine Woodland (CES202.347)	91
1523 Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)	93
Edwards Plateau Floodplain (CES303.651)	95
1383 Edwards Plateau Limestone Savanna and Woodland (CES303.660)	97
1524 Edwards Plateau Mesic Canyon (CES303.038)	99
1356 Florida Longleaf Pine Sandhill (CES203.284)	101
1387 Florida Peninsula Inland Scrub (CES203.057)	103
1019 Great Basin Pinyon-Juniper Woodland (CES304.773)	105
1061 Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)	107
1062 Inter-Mountain Basins Curl-leaf Mountain-mahogany Woodland and Shrubland (CES304.772)	110
1020 Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (CES304.790)	112
1021 Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland (CES206.917)	114
1022 Klamath-Siskiyou Upper Montane Serpentine Mixed Conifer Woodland (CES206.914)	116
1302 Laurentian-Acadian Northern Hardwoods Forest (CES201.564)	117
1362 Laurentian-Acadian Northern Pine-(Oak) Forest (CES201.719)	119
1366 Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563)	121
Lower Mississippi River Dune Pond (CES203.189)	123

1381 Lower Mississippi River Dune Woodland and Forest (CES203.531)	124
1023 Madrean Encinal (CES305.795)	126
1024 Madrean Lower Montane Pine-Oak Forest and Woodland (CES305.796)	128
1025 Madrean Pinyon-Juniper Woodland (CES305.797)	130
1026 Madrean Upper Montane Conifer-Oak Forest and Woodland (CES305.798)	132
1027 Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916)	133
1030 Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923)	135
1028 Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915)	137
1034 Mediterranean California Mesic Serpentine Woodland and Chaparral (CES206.928)	139
1043 Mediterranean California Mixed Evergreen Forest (CES206.919)	140
1029 Mediterranean California Mixed Oak Woodland (CES206.909)	142
1032 Mediterranean California Red Fir Forest (CES206.913)	144
1033 Mediterranean California Subalpine Woodland (CES206.910)	146
1166 Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959)	148
1384 Mississippi Delta Maritime Forest (CES203.513)	150
1509 Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest (CES203.071)	151
1063 North Pacific Broadleaf Landslide Forest and Shrubland (CES204.846)	153
1035 North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845)	154
1174 North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)	156
1036 North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841)	158
1178 North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest (CES204.842)	161
North Pacific Lowland Mixed Hardwood-Conifer Forest (CES204.073)	163
1037 North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)	165
1038 North Pacific Maritime Mesic Subalpine Parkland (CES204.837)	168
1039 North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)	170
1042 North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)	173
1041 North Pacific Mountain Hemlock Forest (CES204.838)	175
1008 North Pacific Oak Woodland (CES204.852)	178
1173 North Pacific Wooded Volcanic Flowage (CES204.883)	180
1313 North-Central Interior Beech-Maple Forest (CES202.693)	181
1311 North-Central Interior Dry Oak Forest and Woodland (CES202.047)	183
1310 North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046)	185
1314 North-Central Interior Maple-Basswood Forest (CES202.696)	187
1303 Northeastern Interior Dry-Mesic Oak Forest (CES202.592)	189
1354 Northeastern Interior Pine Barrens (CES202.590)	191
1324 Northern Atlantic Coastal Plain Hardwood Forest (CES203.475)	193
1379 Northern Atlantic Coastal Plain Maritime Forest (CES203.302)	195
1355 Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)	197
1044 Northern California Mesic Subalpine Woodland (CES206.911)	199
1045 Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)	200
1047 Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)	203
1053 Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)	205
1046 Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)	208
1010 Northern Rocky Mountain Western Larch Savanna (CES306.837)	210
1179 Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650)	212
1048 Northwestern Great Plains Highland White Spruce Woodland (CES303.957)	214
1312 Ouachita Montane Oak Forest (CES202.306)	215
1364 Ozark-Ouachita Dry Oak Woodland (CES202.707)	216
1304 Ozark-Ouachita Dry-Mesic Oak Forest (CES202.708)	218
1334 Ozark-Ouachita Mesic Hardwood Forest (CES202.043)	220
1507 Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)	221
1367 Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)	223
1342 Piedmont Hardpan Woodland and Forest (CES202.268)	225
1011 Rocky Mountain Aspen Forest and Woodland (CES306.813)	227
1012 Rocky Mountain Bigtooth Maple Ravine Woodland (CES306.814)	230
1049 Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)	232
1050 Rocky Mountain Lodgepole Pine Forest (CES306.820)	234
1167 Rocky Mountain Poor-Site Lodgepole Pine Forest (CES306.960)	236
1055 Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)	238
1056 Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)	241
1057 Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819)	244
1058 Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland (CES206.912)	246

1172 Sierran-Intermontane Desert Western White Pine-White Fir Woodland (CES204.101)	248
1333 South Florida Hardwood Hammock (CES411.287)	250
1360 South Florida Pine Rockland (CES411.367)	252
1326 South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)	254
1321 South-Central Interior Mesophytic Forest (CES202.887)	256
1337 Southeast Florida Coastal Strand and Maritime Hammock (CES411.369)	258
1351 Southeastern Interior Longleaf Pine Woodland (CES202.319)	260
1318 Southern and Central Appalachian Cove Forest (CES202.373)	262
1353 Southern Appalachian Low-Elevation Pine Forest (CES202.332)	265
1352 Southern Appalachian Montane Pine Forest and Woodland (CES202.331)	268
1309 Southern Appalachian Northern Hardwood Forest (CES202.029)	270
1315 Southern Appalachian Oak Forest (CES202.886)	273
1335 Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241)	276
1382 Southern Atlantic Coastal Plain Maritime Forest (CES203.537)	278
1343 Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)	280
1330 Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560)	283
1328 Southern Coastal Plain Limestone Forest (CES203.502)	285
1357 Southern Coastal Plain Mesic Slope Forest (CES203.476)	287
Southern Coastal Plain Oak Dome and Hammock (CES203.494)	290
1305 Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)	292
1368 Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)	295
1316 Southern Piedmont Mesic Forest (CES202.342)	298
1376 Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)	300
1051 Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)	302
1052 Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)	306
1059 Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835)	308
1054 Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)	310
1336 Southwest Florida Coastal Strand and Maritime Hammock (CES411.368)	313
1339 West Gulf Coastal Plain Chenier and Upper Texas Coastal Fringe Forest and Woodland (CES203.466)	315
1323 West Gulf Coastal Plain Mesic Hardwood Forest (CES203.280)	317
1371 West Gulf Coastal Plain Pine-Hardwood Forest (CES203.378)	319
1378 West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland (CES203.056)	321
1521 West Gulf Coastal Plain Stream Terrace Sandyland Longleaf Pine Woodland (CES203.891)	323
1348 West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293)	326
1013 Western Great Plains Dry Bur Oak Forest and Woodland (CES303.667)	328
UPLAND SHRUBLAND.....	330
1386 Acadian-Appalachian Alpine Tundra (CES201.567)	330
1389 Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (CES201.568)	332
1095 Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733)	334
1073 Baja Semi-Desert Coastal Succulent Scrub (CES206.934)	336
1096 California Maritime Chaparral (CES206.929)	337
1097 California Mesic Chaparral (CES206.926)	338
1098 California Montane Woodland and Chaparral (CES206.925)	339
1099 California Xeric Serpentine Chaparral (CES206.927)	341
1074 Chihuahuan Creosotebush Desert Scrub (CES302.731)	342
1100 Chihuahuan Mixed Desert and Thorn Scrub (CES302.734)	344
1075 Chihuahuan Mixed Salt Desert Scrub (CES302.017)	347
1076 Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub (CES302.737)	349
1077 Chihuahuan Succulent Desert Scrub (CES302.738)	351
1078 Colorado Plateau Blackbrush-Mormon-tea Shrubland (CES304.763)	352
1064 Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762)	354
1102 Colorado Plateau Pinyon-Juniper Shrubland (CES304.766)	356
1065 Columbia Plateau Scabland Shrubland (CES304.770)	358
1393 Edwards Plateau Limestone Shrubland (CES303.041)	360
1103 Great Basin Semi-Desert Chaparral (CES304.001)	362
1079 Great Basin Xeric Mixed Sagebrush Shrubland (CES304.774)	364
1080 Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)	366
1066 Inter-Mountain Basins Mat Saltbush Shrubland (CES304.783)	369
1081 Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)	371
1101 Madrean Oriental Chaparral (CES302.031)	375
1067 Mediterranean California Alpine Fell-Field (CES206.900)	377
1104 Mogollon Chaparral (CES302.741)	378

1082 Mojave Mid-Elevation Mixed Desert Scrub (CES302.742)	380
1083 North Pacific Avalanche Chute Shrubland (CES204.854)	382
1068 North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-Field and Meadow (CES204.862)	384
1084 North Pacific Montane Shrubland (CES204.087)	386
1105 Northern and Central California Dry-Mesic Chaparral (CES206.931)	387
1522 Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895)	389
1128 Northern California Coastal Scrub (CES206.932)	391
1106 Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994)	393
1169 Northern Rocky Mountain Subalpine Deciduous Shrubland (CES306.961)	395
1085 Northwestern Great Plains Shrubland (CES303.662)	396
1070 Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)	398
1107 Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)	400
1086 Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)	403
1071 Sierra Nevada Alpine Dwarf-Shrubland (CES206.924)	405
1087 Sonora-Mojave Creosotebush-White Bursage Desert Scrub (CES302.756)	406
1088 Sonora-Mojave Mixed Salt Desert Scrub (CES302.749)	408
1108 Sonora-Mojave Semi-Desert Chaparral (CES302.757)	410
1089 Sonoran Brittlebush-Ironwood Desert Scrub (CES302.758)	411
1090 Sonoran Granite Outcrop Desert Scrub (CES302.760)	412
1091 Sonoran Mid-Elevation Desert Scrub (CES302.035)	413
1109 Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761)	414
1092 Southern California Coastal Scrub (CES206.933)	416
1110 Southern California Dry-Mesic Chaparral (CES206.930)	418
1093 Southern Colorado Plateau Sand Shrubland (CES304.793)	419
1392 Tamaulipan Calcareous Thornscrub (CES301.986)	421
1391 Tamaulipan Mesquite Upland Scrub (CES301.984)	422
1390 Tamaulipan Mixed Deciduous Thornscrub (CES301.983)	423
1111 Western Great Plains Mesquite Woodland and Shrubland (CES303.668)	424
1094 Western Great Plains Sandhill Steppe (CES303.671)	426
1072 Wyoming Basins Dwarf Sagebrush Shrubland and Steppe (CES304.794)	428
SAVANNA AND SHRUB-STEPPE.....	430
1408 Alabama Ketona Glade and Woodland (CES202.338)	430
1121 Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735)	432
1112 California Central Valley Mixed Oak Savanna (CES206.935)	435
1113 California Coastal Live Oak Woodland and Savanna (CES206.937)	436
1114 California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna (CES206.936)	437
1400 Central Appalachian Alkaline Glade and Woodland (CES202.602)	439
1401 Central Interior Highlands Calcareous Glade and Barrens (CES202.691)	441
1122 Chihuahuan Gypsophilous Grassland and Steppe (CES302.732)	444
1124 Columbia Plateau Low Sagebrush Steppe (CES304.080)	446
1123 Columbia Plateau Steppe and Grassland (CES304.083)	448
1398 Cumberland Sandstone Glade and Barrens (CES202.337)	449
Eastern Great Plains Quartzite Rocky Outcrop (CES205.697)	451
1409 Great Lakes Alvar (CES201.721)	452
1125 Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)	454
1115 Inter-Mountain Basins Juniper Savanna (CES304.782)	457
1126 Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)	459
1127 Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)	462
1170 Klamath-Siskiyou Xeromorphic Serpentine Savanna and Chaparral (CES206.150)	465
Laurentian Acidic Rocky Outcrop (CES201.019)	467
1407 Laurentian Pine-Oak Barrens (CES201.718)	469
Laurentian-Acadian Calcareous Rocky Outcrop (CES201.572)	471
1116 Madrean Juniper Savanna (CES301.730)	472
1397 Nashville Basin Limestone Glade and Woodland (CES202.334)	473
1394 North-Central Interior Oak Savanna (CES202.698)	475
North-Central Interior Quartzite Glade (CES202.699)	477
1395 North-Central Oak Barrens (CES202.727)	479
Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571)	481
1165 Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958)	483
1505 Ouachita Novaculite Glade and Woodland (CES202.314)	485
1517 Paleozoic Plateau Bluff and Talus (CES202.704)	487
Panhandle Florida Limestone Glade (CES203.534)	489

South-Central Saline Glade (CES203.291)	490
Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)	492
1118 Southern California Oak Woodland and Savanna (CES206.938)	494
Southern Piedmont Glade and Barrens (CES202.328)	495
Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)	497
1119 Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834)	499
1117 Southern Rocky Mountain Ponderosa Pine Savanna (CES306.649)	501
1403 West Gulf Coastal Plain Catahoula Barrens (CES203.364)	503
1405 West Gulf Coastal Plain Nepheline Syenite Glade (CES203.371)	504
1404 West Gulf Coastal Plain Weches Glade (CES203.277)	505
1120 Willamette Valley Upland Prairie and Savanna (CES204.858)	506
UPLAND GRASSLAND AND HERBACEOUS.....	507
1415 Arkansas Valley Prairie and Woodland (CES202.312)	507
1413 Bluegrass Savanna and Woodland (CES202.888)	509
1129 California Central Valley and Southern Coastal Grassland (CES206.942)	511
1130 California Mesic Serpentine Grassland (CES206.943)	512
1131 California Northern Coastal Grassland (CES206.941)	513
1132 Central Mixedgrass Prairie (CES303.659)	514
1421 Central Tallgrass Prairie (CES205.683)	517
1503 Chihuahuan Loamy Plains Desert Grassland (CES302.061)	519
1133 Chihuahuan Sandy Plains Semi-Desert Grassland (CES302.736)	521
1134 Columbia Basin Foothill and Canyon Dry Grassland (CES304.993)	522
1142 Columbia Basin Palouse Prairie (CES304.792)	524
Cumberland Wet-Mesic Meadow and Savanna (CES202.053)	526
1427 East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353)	528
1424 East-Central Texas Plains Xeric Sandyland (CES205.897)	530
1417 Eastern Highland Rim Prairie and Barrens (CES202.354)	531
1425 Florida Dry Prairie (CES203.380)	533
1135 Inter-Mountain Basins Semi-Desert Grassland (CES304.787)	535
1410 Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)	539
1432 Lower Mississippi Alluvial Plain Grand Prairie (CES203.549)	542
1136 Mediterranean California Alpine Dry Tundra (CES206.939)	544
1137 Mediterranean California Subalpine Meadow (CES206.940)	545
1171 North Pacific Alpine and Subalpine Dry Grassland (CES204.099)	546
North Pacific Herbaceous Bald and Bluff (CES204.089)	547
North Pacific Hypermaritime Shrub and Herbaceous Headland (CES204.088)	549
1138 North Pacific Montane Grassland (CES204.100)	550
1412 North-Central Interior Sand and Gravel Tallgrass Prairie (CES202.695)	551
1139 Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)	553
1140 Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)	556
1420 Northern Tallgrass Prairie (CES205.686)	558
1141 Northwestern Great Plains Mixedgrass Prairie (CES303.674)	559
1508 Ozark Prairie and Woodland (CES202.326)	563
1418 Pennyroyal Karst Plain Prairie and Barrens (CES202.355)	565
1143 Rocky Mountain Alpine Fell-Field (CES306.811)	567
1144 Rocky Mountain Alpine Turf (CES306.816)	569
1145 Rocky Mountain Subalpine-Montane Mesic Meadow (CES306.829)	572
1439 South Texas Lomas (CES301.462)	574
1442 South Texas Sand Sheet Grassland (CES301.538)	575
1423 Southeastern Great Plains Tallgrass Prairie (CES205.685)	577
1414 Southern Appalachian Grass and Shrub Bald (CES202.294)	579
1426 Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)	581
1430 Southern Coastal Plain Blackland Prairie and Woodland (CES203.478)	583
1419 Southern Ridge and Valley Patch Prairie (CES202.453)	586
1146 Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)	588
1431 Southwest Florida Dune and Coastal Grassland (CES203.539)	590
1440 Tamaulipan Clay Grassland (CES301.987)	592
1438 Tamaulipan Savanna Grassland (CES301.985)	593
1441 Tamaulipan Tallgrass Grassland (CES301.988)	594
1422 Texas Blackland Tallgrass Prairie (CES205.684)	595
1428 West Gulf Coastal Plain Northern Calcareous Prairie (CES203.377)	597
1429 West Gulf Coastal Plain Southern Calcareous Prairie (CES203.379)	599

1147 Western Great Plains Foothill and Piedmont Grassland (CES303.817)	601
1148 Western Great Plains Sand Prairie (CES303.670)	603
1149 Western Great Plains Shortgrass Prairie (CES303.672)	606
1150 Western Great Plains Tallgrass Prairie (CES303.673)	609
1416 Western Highland Rim Prairie and Barrens (CES202.352)	611
WOODY WETLANDS AND RIPARIAN.....	613
Acadian Maritime Bog (CES201.580)	613
Acadian-Appalachian Conifer Seepage Forest (CES201.576)	614
Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)	615
Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)	618
1459 Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)	620
Atlantic Coastal Plain Northern Bog (CES203.893)	622
1452 Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)	623
Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)	626
Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)	629
1468 Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)	632
Boreal Depressional Bog (CES103.871)	634
Boreal-Laurentian Bog (CES103.581)	636
Boreal-Laurentian Conifer Acidic Swamp (CES103.724)	638
Boreal-Laurentian-Acadian Acidic Basin Fen (CES201.583)	640
California Central Valley Alkali Sink (CES206.954)	642
1449 Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)	643
Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)	646
Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768)	649
Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub-Steppe (CES304.084)	651
Cumberland Riverscour (CES202.036)	653
Cumberland Seepage Forest (CES202.361)	655
East Gulf Coastal Plain Interior Shrub Bog (CES203.385)	656
East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)	658
East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)	661
East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)	663
1455 East Gulf Coastal Plain Southern Loblolly-Hardwood Flatwoods (CES203.557)	666
East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)	668
1525 Edwards Plateau Riparian (CES303.652)	670
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045)	672
High Allegheny Wetland (CES202.069)	674
Interior Highlands Forested Acidic Seep (CES202.321)	677
1481 Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575)	679
Laurentian-Acadian Alkaline Fen (CES201.585)	681
1513 Lower Mississippi River Flatwoods (CES203.193)	683
Mediterranean California Alkali Marsh (CES206.947)	685
Mississippi River Bottomland Depression (CES203.490)	686
Mississippi River High Floodplain (Bottomland) Forest (CES203.196)	688
Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)	690
Mississippi River Riparian Forest (CES203.190)	692
North American Warm Desert Lower Montane Riparian Woodland and Shrubland (CES302.748)	694
North American Warm Desert Riparian Mesquite Bosque (CES302.752)	696
North American Warm Desert Riparian Woodland and Shrubland (CES302.753)	698
North American Warm Desert Wash (CES302.755)	700
North Pacific Bog and Fen (CES204.063)	703
North Pacific Hardwood-Conifer Swamp (CES204.090)	706
1156 North Pacific Lowland Riparian Forest and Shrubland (CES204.869)	708
1158 North Pacific Montane Riparian Woodland and Shrubland (CES204.866)	711
1663 North Pacific Shrub Swamp (CES204.865)	714
North-Central Appalachian Acidic Swamp (CES202.604)	716
North-Central Interior and Appalachian Acidic Peatland (CES202.606)	718
North-Central Interior and Appalachian Rich Swamp (CES202.605)	720
North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702)	721
1518 North-Central Interior Wet Flatwoods (CES202.700)	723
North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)	725
Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574)	727
Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)	729

Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest (CES203.520)	731
1456 Northern Atlantic Coastal Plain Pitch Pine Lowland (CES203.374)	733
Northern Atlantic Coastal Plain Tidal Swamp (CES203.282)	735
1161 Northern Rocky Mountain Conifer Swamp (CES306.803)	736
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)	738
Northern Rocky Mountain Wooded Vernal Pool (CES304.060)	741
Northwestern Great Plains Floodplain (CES303.676)	742
Piedmont Seepage Wetland (CES202.298)	744
Piedmont Upland Depression Swamp (CES202.336)	746
Red River Large Floodplain Forest (CES203.065)	748
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)	750
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)	754
Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)	758
South Florida Bayhead Swamp (CES411.366)	761
1447 South Florida Cypress Dome (CES411.365)	763
1445 South Florida Dwarf Cypress Savanna (CES411.290)	764
South Florida Hydric Hammock (CES411.273)	765
South Florida Mangrove Swamp (CES411.289)	766
South Florida Pond-apple/Popash Slough (CES411.486)	768
1457 South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480)	769
Southeastern Coastal Plain Natural Lakeshore (CES203.044)	771
Southeastern Great Plains Floodplain (CES205.710)	773
Southeastern Great Plains Riparian (CES205.709)	775
Southern and Central Appalachian Bog and Fen (CES202.300)	777
Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)	780
Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)	783
1501 Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)	786
Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)	789
1450 Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)	791
Southern Coastal Plain Blackwater River Floodplain Forest (CES203.493)	793
Southern Coastal Plain Hydric Hammock (CES203.501)	795
Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)	797
1460 Southern Coastal Plain Nonriverine Cypress Dome (CES203.251)	799
1461 Southern Coastal Plain Seepage Swamp and Baygall (CES203.505)	801
Southern Piedmont Large Floodplain Forest (CES202.324)	803
Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)	806
Southwest Florida Perched Barriers Tidal Swamp and Lagoon (CES203.540)	809
Tamaulipan Arroyo Shrubland (CES301.992)	810
1467 Tamaulipan Floodplain (CES301.990)	811
Tamaulipan Palm Grove Riparian Forest (CES301.991)	813
Texas-Louisiana Coastal Prairie Slough (CES203.542)	814
West Gulf Coastal Plain Flatwoods Pond (CES203.547)	815
West Gulf Coastal Plain Large River Floodplain Forest (CES203.488)	817
West Gulf Coastal Plain Near-Coast Large River Swamp (CES203.459)	820
1506 West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)	821
1462 West Gulf Coastal Plain Seepage Swamp and Baygall (CES203.372)	823
West Gulf Coastal Plain Small Stream and River Forest (CES203.487)	825
1451 West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191)	827
Western Great Plains Floodplain (CES303.678)	829

HERBACEOUS WETLAND..... 831

Acadian Coastal Salt Marsh (CES201.578)	831
Acadian Estuary Marsh (CES201.579)	832
Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243)	833
Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)	835
Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)	837
Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)	839
Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)	841
Atlantic Coastal Plain Northern Salt Pond Marsh (CES203.892)	843
1516 Atlantic Coastal Plain Sandhill Seep (CES203.253)	844
Central and Upper Texas Coast Fresh and Oligohaline Tidal Marsh (CES203.472)	846
Central and Upper Texas Coast Salt and Brackish Tidal Marsh (CES203.473)	847
1514 Central Florida Herbaceous Pondshore (CES203.890)	849

Central Florida Wet Prairie and Herbaceous Seep (CES203.491)	851
Colorado Plateau Hanging Garden (CES304.764)	852
Columbia Plateau Vernal Pool (CES304.057)	854
East Gulf Coastal Plain Depression Pondshore (CES203.558)	856
East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)	859
East Gulf Coastal Plain Sandhill Lakeshore Depression (CES203.292)	861
1485 East Gulf Coastal Plain Savanna and Wet Prairie (CES203.192)	863
1488 Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687)	865
Edwards Plateau Upland Depression (CES303.654)	867
Florida Big Bend Fresh and Oligohaline Tidal Marsh (CES203.507)	868
Florida Big Bend Salt and Brackish Tidal Marsh (CES203.508)	869
Florida Keys Seagrass Bed (CES411.285)	870
Florida River Floodplain Marsh (CES203.055)	871
1489 Floridian Highlands Freshwater Marsh (CES203.077)	873
Great Lakes Freshwater Estuary and Delta (CES202.033)	875
Gulf Coast Chenier Plain Fresh and Oligohaline Tidal Marsh (CES203.467)	877
Gulf Coast Chenier Plain Salt and Brackish Tidal Marsh (CES203.468)	879
Inter-Mountain Basins Alkaline Closed Depression (CES304.998)	881
Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)	883
Interior Low Plateau Seepage Fen (CES202.346)	885
Laurentian-Acadian Freshwater Marsh (CES201.594)	887
Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)	889
Mediterranean California Coastal Interdunal Wetland (CES206.951)	891
Mediterranean California Eelgrass Bed (CES206.999)	892
Mediterranean California Serpentine Fen (CES206.953)	893
Mediterranean California Subalpine-Montane Fen (CES206.952)	894
Mississippi Delta Fresh and Oligohaline Tidal Marsh (CES203.470)	895
Mississippi Delta Salt and Brackish Tidal Marsh (CES203.471)	897
Mississippi Sound Fresh and Oligohaline Tidal Marsh (CES203.067)	898
Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303)	900
Modoc Basalt Flow Vernal Pool (CES204.996)	902
North American Arid West Emergent Marsh (CES300.729)	903
North American Warm Desert Cienega (CES302.747)	906
North American Warm Desert Interdunal Swale Wetland (CES302.039)	907
North Pacific Coastal Interdunal Wetland (CES204.062)	909
North Pacific Hardpan Vernal Pool (CES204.859)	911
North Pacific Intertidal Freshwater Wetland (CES204.875)	912
1670 North Pacific Maritime Eelgrass Bed (CES200.882)	913
North-Central Appalachian Seepage Fen (CES202.607)	914
North-Central Interior Freshwater Marsh (CES202.899)	916
Northern Atlantic Coastal Plain Brackish Tidal Marsh (CES203.894)	918
Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.516)	919
Northern Atlantic Coastal Plain Pond (CES203.518)	921
Northern Atlantic Coastal Plain Seagrass Bed (CES203.246)	923
Northern Atlantic Coastal Plain Subtidal Aquatic Bed (CES203.521)	924
Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)	925
Northern California Claypan Vernal Pool (CES206.948)	927
Northern California Volcanic Vernal Pool (CES206.949)	928
Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)	929
Northern Great Lakes Coastal Marsh (CES201.722)	931
Northern Great Lakes Interdunal Wetland (CES201.034)	933
Northern Gulf of Mexico Seagrass Bed (CES203.263)	934
Ozark-Ouachita Fen (CES202.052)	936
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)	937
Rocky Mountain Subalpine-Montane Fen (CES306.831)	941
South Coastal California Vernal Pool (CES206.950)	943
South Florida Depression Pondshore (CES411.054)	944
1483 South Florida Everglades Sawgrass Marsh (CES411.286)	946
South Florida Slough, Gator Hole, and Willow Head (CES411.485)	948
1484 South Florida Wet Marl Prairie (CES411.370)	950
Southeastern Coastal Plain Interdunal Wetland (CES203.258)	951
Southern Appalachian Seepage Wetland (CES202.317)	953

Southern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376)	955
Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)	957
1515 Southern Coastal Plain Herbaceous Seep and Bog (CES203.078)	959
Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275)	961
Southwest Florida Seagrass Bed (CES203.274)	962
1664 Temperate Pacific Freshwater Aquatic Bed (CES200.876)	964
1662 Temperate Pacific Freshwater Emergent Marsh (CES200.877)	966
Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)	968
1668 Temperate Pacific Tidal Salt and Brackish Marsh (CES200.091)	971
Texas Coastal Bend Seagrass Bed (CES203.474)	973
1486 Texas Saline Coastal Prairie (CES203.543)	974
1487 Texas-Louisiana Coastal Prairie Pondshore (CES203.541)	975
Texas-Louisiana Fresh-Oligohaline Subtidal Aquatic Vegetation (CES203.511)	977
Upper Texas Coast Seagrass Bed (CES203.545)	978
West Gulf Coastal Plain Herbaceous Seep and Bog (CES203.194)	979
Western Great Plains Closed Depression Wetland (CES303.666)	981
Western Great Plains Open Freshwater Depression Wetland (CES303.675)	983
Western Great Plains Saline Depression Wetland (CES303.669)	986
Willamette Valley Wet Prairie (CES204.874)	988
MIXED UPLAND AND WETLAND.....	989
1464 Acadian Sub-boreal Spruce Barrens (CES201.561)	989
1465 Acadian Sub-boreal Spruce Flat (CES201.562)	990
Boreal Ice-Scour Rivershore (CES103.589)	991
1151 California Central Valley Riparian Woodland and Shrubland (CES206.946)	993
1437 Central and Upper Texas Coast Dune and Coastal Grassland (CES203.465)	994
Central Appalachian River Floodplain (CES202.608)	995
Central Appalachian Stream and Riparian (CES202.609)	998
1453 Central Florida Pine Flatwoods (CES203.382)	1000
1504 Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (CES302.746)	1002
1435 East Gulf Coastal Plain Dune and Coastal Grassland (CES203.500)	1004
1454 East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)	1006
1444 Eastern Boreal Floodplain (CES103.588)	1008
1411 Great Lakes Wet-Mesic Lakeplain Prairie (CES202.027)	1009
1466 Great Lakes Wooded Dune and Swale (CES201.726)	1010
1482 Great Plains Prairie Pothole (CES303.661)	1013
1153 Inter-Mountain Basins Greasewood Flat (CES304.780)	1015
Laurentian-Acadian Floodplain Forest (CES201.587)	1017
Mediterranean California Foothill and Lower Montane Riparian Woodland (CES206.944)	1019
Mediterranean California Serpentine Foothill and Lower Montane Riparian Woodland and Seep (CES206.945)	1020
North-Central Interior Floodplain (CES202.694)	1021
Northern Atlantic Coastal Plain Calcareous Ravine (CES203.069)	1024
1436 Northern Atlantic Coastal Plain Dune and Swale (CES203.264)	1026
Northern Atlantic Coastal Plain Stream and River (CES203.070)	1029
1168 Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)	1031
1009 Northwestern Great Plains Aspen Forest and Parkland (CES303.681)	1033
Northwestern Great Plains Riparian (CES303.677)	1035
Ozark-Ouachita Riparian (CES202.703)	1037
Sonoran Fan Palm Oasis (CES302.759)	1039
1446 South Florida Pine Flatwoods (CES411.381)	1040
1443 South Texas Dune and Coastal Grassland (CES301.460)	1041
South-Central Interior Large Floodplain (CES202.705)	1042
South-Central Interior Small Stream and Riparian (CES202.706)	1045
Tamaulipan Caliche Grassland (CES301.989)	1048
1434 Texas-Louisiana Coastal Prairie (CES203.550)	1049
1458 West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278)	1051
Western Great Plains Riparian (CES303.956)	1053
1385 Western Great Plains Wooded Draw and Ravine (CES303.680)	1055
SPARSELY VEGETATED.....	1057
Acadian-North Atlantic Rocky Coast (CES201.573)	1057
Central Atlantic Coastal Plain Sandy Beach (CES203.064)	1058
Central California Coast Ranges Cliff and Canyon (CES206.903)	1059

Central Interior Acidic Cliff and Talus (CES202.689)	1060
Central Interior Calcareous Cliff and Talus (CES202.690)	1062
Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765)	1064
Columbia Plateau Ash and Tuff Badland (CES304.081)	1067
Cumberland Acidic Cliff and Rockhouse (CES202.309)	1068
East Gulf Coastal Plain Dry Chalk Bluff (CES203.492)	1070
Edwards Plateau Carbonate Glade and Barrens (CES303.655)	1071
Edwards Plateau Cliff (CES303.653)	1073
Florida Panhandle Beach Vegetation (CES203.266)	1075
Great Lakes Acidic Rocky Shore and Cliff (CES201.025)	1076
Great Lakes Alkaline Rocky Shore and Cliff (CES201.995)	1077
Great Lakes Dune (CES201.026)	1078
Inter-Mountain Basins Active and Stabilized Dune (CES304.775)	1080
Inter-Mountain Basins Cliff and Canyon (CES304.779)	1083
Inter-Mountain Basins Playa (CES304.786)	1085
Inter-Mountain Basins Shale Badland (CES304.789)	1087
Inter-Mountain Basins Volcanic Rock and Cinder Land (CES304.791)	1089
Inter-Mountain Basins Wash (CES304.781)	1091
Klamath-Siskiyou Cliff and Outcrop (CES206.902)	1093
Laurentian-Acadian Acidic Cliff and Talus (CES201.569)	1094
Laurentian-Acadian Calcareous Cliff and Talus (CES201.570)	1096
Laurentian-Acadian Lakeshore Beach (CES201.586)	1097
Louisiana Beach (CES203.469)	1098
Mediterranean California Alpine Bedrock and Scree (CES206.899)	1099
Mediterranean California Coastal Bluff (CES206.906)	1100
Mediterranean California Northern Coastal Dune (CES206.907)	1101
Mediterranean California Serpentine Barrens (CES206.905)	1102
Mediterranean California Southern Coastal Dune (CES206.908)	1103
1735 North American Glacier and Ice Field (CES100.728)	1104
North American Warm Desert Active and Stabilized Dune (CES302.744)	1105
North American Warm Desert Badland (CES302.743)	1107
North American Warm Desert Bedrock Cliff and Outcrop (CES302.745)	1108
North American Warm Desert Pavement (CES302.750)	1109
North American Warm Desert Playa (CES302.751)	1110
North American Warm Desert Volcanic Rockland (CES302.754)	1112
North Atlantic Cobble Shore (CES201.051)	1113
North Atlantic Intertidal Mudflat (CES201.050)	1114
North Atlantic Rocky Intertidal (CES201.048)	1115
North Atlantic Tidal Sand Flat (CES201.049)	1116
North Pacific Active Inland Dune (CES204.861)	1117
North Pacific Active Volcanic Rock and Cinder Land (CES204.092)	1118
1734 North Pacific Alpine and Subalpine Bedrock and Scree (CES204.853)	1119
North Pacific Coastal Cliff and Bluff (CES204.094)	1120
North Pacific Maritime Coastal Sand Dune and Strand (CES200.881)	1121
1733 North Pacific Montane Massive Bedrock, Cliff and Talus (CES204.093)	1123
North Pacific Serpentine Barren (CES204.095)	1124
North-Central Appalachian Acidic Cliff and Talus (CES202.601)	1125
North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)	1127
Northeastern Erosional Bluff (CES203.498)	1129
Northern Atlantic Coastal Plain Sandy Beach (CES203.301)	1130
1341 Northwestern Great Plains Canyon (CES303.658)	1131
Rocky Mountain Alpine Bedrock and Scree (CES306.809)	1133
Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)	1135
Sierra Nevada Cliff and Canyon (CES206.901)	1137
South Florida Shell Hash Beach (CES411.271)	1138
1500 South Texas Salt and Brackish Tidal Flat (CES301.461)	1139
Southeast Florida Beach (CES411.272)	1141
Southern Appalachian Granitic Dome (CES202.297)	1142
Southern Appalachian Montane Cliff and Talus (CES202.330)	1144
Southern Appalachian Rocky Summit (CES202.327)	1146
Southern Appalachian Spray Cliff (CES202.288)	1148
Southern Atlantic Coastal Plain Florida Beach (CES203.535)	1150

Southern Atlantic Coastal Plain Sea Island Beach (CES203.383)	1151
1388 Southern Atlantic Coastal Plain Xeric River Dune (CES203.497)	1152
Southern California Coast Ranges Cliff and Canyon (CES206.904)	1153
Southern Coastal Plain Sinkhole (CES203.495)	1154
Southern Interior Calcareous Cliff (CES202.356)	1155
Southern Interior Sinkhole Wall (CES202.357)	1157
Southern Piedmont Cliff (CES202.386)	1158
Southern Piedmont Granite Flatrock and Outcrop (CES202.329)	1160
Southwest Florida Beach (CES411.276)	1162
Southwestern Great Plains Canyon (CES303.664)	1163
Temperate Pacific Freshwater Mudflat (CES200.878)	1165
1669 Temperate Pacific Intertidal Flat (CES204.879)	1166
Texas Coastal Bend Beach (CES203.463)	1167
Upper Texas Coast Beach (CES203.544)	1168
Western Great Plains Badlands (CES303.663)	1169
Western Great Plains Cliff and Outcrop (CES303.665)	1171

FOREST AND WOODLAND

1373 ACADIAN LOW-ELEVATION SPRUCE-FIR-HARDWOOD FOREST (CES201.565)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Mesotrophic Soil; Oligotrophic Soil; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Sideslope; Toeslope/Valley Bottom; Glaciated; Acidic Soil; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Sand Soil Texture; Udic; Long Disturbance Interval; W-Patch/Medium Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2373; ESLF 4316; ESP 1373

CONCEPT

Summary: This system represents the Acadian and northern Appalachian red spruce-fir forest that extends to the southern boreal region of southeastern Canada. The low- to mid-elevation forests are dominated by *Picea rubens* and *Abies balsamea*. *Picea mariana* and *Picea glauca* may be present. *Betula alleghaniensis* is the most common codominant, and *Acer rubrum*, *Acer saccharum*, and *Fagus grandifolia* are sometimes present. The upland soils are acidic and usually rocky, mostly well- to moderately well-drained but with some somewhat poorly drained patches at the slope bottoms. This is the matrix forest type in the lower-elevation northern portions of this division. This system may include earlier successional patches in which *Populus* spp. and *Betula* spp. are dominant or mixed with *Picea* and *Abies* that will develop into spruce-fir forests. Blowdowns with subsequent gap regeneration are the most frequent form of natural disturbance, with large-scale fires important at longer return intervals.

Similar Ecological Systems:

- Acadian Sub-boreal Spruce Flat (CES201.562)--more poorly drained and with a very well-developed bryoid layer, although the two systems can grade into one another.
- Boreal Aspen-Birch Forest (CES103.020)
- Laurentian-Acadian Northern Hardwoods Forest (CES201.564)

MEMBERSHIP

Associations:

- *Picea mariana* - *Picea rubens* / *Pleurozium schreberi* Forest (CEGL006361, GNR)
- *Picea mariana* / *Kalmia angustifolia* Woodland (CEGL006292, G4?)
- *Picea rubens* - *Abies balsamea* - *Betula papyrifera* Forest (CEGL006273, GNR)
- *Picea rubens* - *Abies balsamea* - *Betula* spp. - *Acer rubrum* Forest (CEGL006505, GNR)
- *Picea rubens* - *Picea glauca* Forest (CEGL006151, G4G5)

Alliances:

- *Picea mariana* Forest Alliance (A.149)
- *Picea mariana* Woodland Alliance (A.3504)
- *Picea rubens* - *Abies balsamea* Forest Alliance (A.150)
- *Picea rubens* - *Betula alleghaniensis* Forest Alliance (A.384)

SPATIAL CHARACTERISTICS

Spatial Summary: More southerly occurrences of this system can be large patch (or even small patch) rather than matrix systems.

Adjacent Ecological Systems:

- Acadian-Appalachian Montane Spruce-Fir Forest (CES201.566)

DISTRIBUTION

Range: This system is found in northern New England, northern New York and adjacent Canada and is occasional southwards.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: ME, NB, NH, NY, PA, QC?, VT

Map Zones: 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 211F:CC, 211I:CC, 221A:CC, M211D:CC, M221B:CC, M221C:CC

TNC Ecoregions: 60:C, 61:C, 63:C

SOURCES

References: Comer et al. 2003, Lorimer 1977

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723039#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: East

1374 ACADIAN-APPALACHIAN MONTANE SPRUCE-FIR FOREST (CES201.566)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Glaciated; Mesotrophic Soil; Oligotrophic Soil; Acidic Soil; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Udic; Long Disturbance Interval; W-Patch/Medium Intensity; Needle-Leaved Tree; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2374; ESLF 4317; ESP 1374

CONCEPT

Summary: This is the matrix forest system in the montane spruce-fir region of the northern Appalachian Mountains, extending east through the Canadian Maritimes. It occurs mostly upwards of 457 m (1500 feet) elevation and is restricted to progressively higher elevations southward. Northward, it is often contiguous with Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565). This system often forms a mosaic of strongly coniferous patches and mixed patches, with occasional smaller inclusions of northern hardwoods, but is overall more than 50% coniferous. *Picea rubens* and *Abies balsamea* are the dominant conifers. Gaps formed by wind, snow, ice, and harvesting are the major replacement agents; fires may be important but only over a long return interval.

Classification Comments: This system can occupy an intermediate elevation position between Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565) and Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (CES201.568), and it could arguably be combined with one of those, probably the former. However, in the southern part of its range, it often occurs without either of these other systems. It is distinguished, in concept, from Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565) by the presence or greater abundance of montane species such as *Sorbus americana* or *Sorbus decora*, *Dryopteris campyloptera*, *Oxalis montana*, etc., and by occurring at higher positions in the toposequence. It is generally above northern hardwood forests, while Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565) is generally below (or at similar elevations to) northern hardwood forests. More careful review is needed to determine if it should remain a separate system.

Similar Ecological Systems:

- Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (CES201.568)
- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)

MEMBERSHIP

Associations:

- *Abies balsamea* - (*Betula papyrifera* var. *cordifolia*) Forest (CEGL006112, GNR)
- *Picea rubens* - *Abies balsamea* - *Betula* spp. - *Acer rubrum* Forest (CEGL006505, GNR)
- *Picea rubens* - *Abies balsamea* / *Sorbus americana* Forest (CEGL006128, G3G5)
- *Picea rubens* - *Betula alleghaniensis* / *Dryopteris campyloptera* Forest (CEGL006267, GNR)

Alliances:

- *Picea rubens* - *Abies balsamea* Forest Alliance (A.150)
- *Picea rubens* - *Betula alleghaniensis* Forest Alliance (A.384)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565)
- Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (CES201.568)

Adjacent Ecological System Comments: Northward, it is often contiguous with Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565). At higher elevations it can transition to Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (CES201.568).

DISTRIBUTION

Range: This system is found at higher elevations of northern New England and the Adirondacks, extending north along the mountains and higher hills into Canada and occurring southward in the Catskills.

Divisions: 201:C; 202:C

Nations: US

Subnations: MA, ME, NH, NY, VT

Map Zones: 64:C, 65:C, 66:C

USFS Ecomap Regions: 211Ia:CCC, 221A:CC, M211A:CC, M211Df:CCC, M221B:CC, M221C:CC

TNC Ecoregions: 60:C, 61:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723038#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: East

ClassifResp: East

1317 ALLEGHENY-CUMBERLAND DRY OAK FOREST AND WOODLAND (CES202.359)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Acidic Soil; Broad-Leaved Tree

Non-Diagnostic Classifiers: Lowland; Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2317; ESLF 4123; ESP 1317

CONCEPT

Summary: This system encompasses dry hardwood forests on predominately acidic substrates in the Allegheny and Cumberland plateaus, and ridges in the southern Ridge and Valley. Its range is more or less consistent with the "Mixed Mesophytic Forest Region" of Braun (1950) and Greller (1988), although it is not a mesic forest type. These forests are typically dominated by *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus coccinea*, with lesser amounts of *Acer rubrum*, *Carya glabra*, and *Carya alba*. Small inclusions of *Pinus echinata* and/or *Pinus virginiana* may occur, particularly adjacent to escarpments or following fire. In addition, *Pinus strobus* may be prominent in some stands in the absence of fire. It occurs in a variety of situations, including on nutrient-poor or acidic soils. Sprouts of *Castanea dentata* can often be found where it was formerly a common tree.

Classification Comments: Related forests on more base-rich substrates may be classified as examples of Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457), where this distinction may be made.

Similar Ecological Systems:

- Central Appalachian Dry Oak-Pine Forest (CES202.591)--occurs to the east of this system's range.
- Northeastern Interior Dry-Mesic Oak Forest (CES202.592)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Oak Forest (CES202.886)--is a related broader and overlapping concept (conceptually and geographically).
- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--is found in some similar landscapes but on more base-rich substrates, which usually correspond to different landform positions.

Related Concepts:

- Xeric Acidic Forest (Evans 1991) Broader

DESCRIPTION

Environment: This system is most likely found on predominantly nutrient-poor or acidic substrates in the Allegheny and Cumberland plateaus, and ridges in the southern Ridge and Valley.

Vegetation: These forests are typically dominated by *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus coccinea*, *Acer rubrum*, *Carya glabra*, and *Carya alba*. These occur in a variety of situations, most likely on nutrient-poor or acidic soils and, to a much lesser extent, on circumneutral soils. Sprouts of *Castanea dentata* can often be found where it was formerly a common tree. Small inclusions of *Pinus echinata* and/or *Pinus virginiana* may occur, particularly adjacent to escarpments or following fire. In addition, *Pinus strobus* may be prominent in some stands in the absence of fire.

MEMBERSHIP

Associations:

- *Pinus rigida* - *Quercus coccinea* / *Vaccinium angustifolium* Woodland (CEGL006557, GNR)
- *Pinus strobus* - *Quercus (coccinea, prinus)* / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest (CEGL007519, G4)
- *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest (CEGL007517, G3G4)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Quercus alba* - (*Quercus prinus*) / (*Hydrangea quercifolia*) - *Viburnum acerifolium* / *Carex picta* - *Piptochaetium avenaceum* Forest (CEGL008430, G3G4)
- *Quercus alba* - *Carya alba* - (*Quercus velutina*) / *Desmodium nudiflorum* - (*Carex picta*) Forest (CEGL007795, G4)
- *Quercus alba* - *Quercus (coccinea, velutina, prinus)* / *Gaylussacia baccata* Forest (CEGL008521, G5)
- *Quercus alba* - *Quercus falcata* / *Vaccinium (arboreum, hirsutum, pallidum)* Forest (CEGL008567, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240, G4)
- *Quercus alba* - *Quercus stellata* / *Ostrya virginiana* - *Acer barbatum* / *Chasmanthium sessiliflorum* Forest (CEGL008443, G3G4)
- *Quercus alba* - *Quercus velutina* - *Carya (ovata, alba, glabra)* - *Pinus* sp. Forest (CEGL007231, G4G5)
- *Quercus falcata* - *Quercus (coccinea, stellata)* / *Vaccinium (pallidum, stamineum)* Forest (CEGL007247, G4)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus prinus* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431, G4G5)
- *Quercus prinus* - *Carya (alba, glabra, ovata)* / *Juniperus virginiana* var. *virginiana* Forest (CEGL004786, G2G3)
- *Quercus prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261, G3G4)

- *Quercus prinus* - *Quercus* (*alba*, *coccinea*, *velutina*) / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023, G4?)
- *Quercus prinus* - *Quercus rubra* - *Carya* (*ovata*, *glabra*) - *Pinus virginiana* Forest (CEGL007269, G4?)
- *Quercus prinus* - *Quercus* spp. / *Vaccinium arboreum* - (*Kalmia latifolia*, *Styrax grandifolius*) Forest (CEGL007700, G4)
- *Quercus stellata* - *Pinus virginiana* / (*Schizachyrium scoparium*, *Piptochaetium avenaceum*) Woodland (CEGL008406, G2?)

Alliances:

- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus strobus* - *Quercus* (*alba*, *rubra*, *velutina*) Forest Alliance (A.401)
- *Pinus strobus* - *Quercus* (*coccinea*, *prinus*) Forest Alliance (A.402)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus* (*alba*, *falcata*, *rubra*, *velutina*) Forest Alliance (A.249)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South-Central Interior Mesophytic Forest (CES202.887)

Adjacent Ecological System Comments: The somewhat more mesic and/or more base-rich forests of the lower slopes of the Cumberlands and the lower slopes and valleys in the Ridge and Valley are covered by South-Central Interior Mesophytic Forest (CES202.887).

DISTRIBUTION

Range: This system is centered on the Allegheny and Cumberland plateaus from northern Alabama north to Ohio, West Virginia, and possibly western Pennsylvania.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, OH, PA?, TN, VA, WV

Map Zones: 48:C, 53:C, 57:C, 61:C, 62:C

USFS Ecomap Regions: 221E:CC, 221H:CC, 221J:CC, 231C:CC, 231D:CC, M221A:CC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Be:CCC, M221C:CC

TNC Ecoregions: 49:C, 50:C

SOURCES

References: Braun 1950, Comer et al. 2003, Greller 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723154#references

Description Author: R. Evans, M. Pyne, C. Nordman, mod. J. Teague and S. Gawler

Version: 05 May 2008

Concept Author: R. Evans, M. Pyne, C. Nordman

Stakeholders: East, Midwest, Southeast
ClassifResp: Southeast

1370 APPALACHIAN (HEMLOCK)-NORTHERN HARDWOOD FOREST (CES202.593)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Mesotrophic Soil; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; *Pinus* spp. - *Tsuga canadensis*

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Lowland; Forest and Woodland (Treed); Sideslope;

Toeslope/Valley Bottom; Temperate; Acidic Soil; Shallow Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Ustic; Long Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2370; ESLF 4313; ESP 1370

CONCEPT

Summary: This forested system of the northeastern U.S. ranges from central New England west to Lake Erie and south to the higher elevations of Virginia and West Virginia. It is one of the matrix forest types in the northern part of the Central Interior and Appalachian Division. Northern hardwoods such as *Acer saccharum*, *Betula alleghaniensis*, and *Fagus grandifolia* are characteristic, either forming a deciduous canopy or mixed with *Tsuga canadensis* (or in some cases *Pinus strobus*). Other common and sometimes dominant trees include *Quercus* spp. (most commonly *Quercus rubra*), *Liriodendron tulipifera*, *Prunus serotina*, and *Betula lenta*. It is of more limited extent and more ecologically constrained in the southern part of its range, in northern parts of Virginia and West Virginia.

Classification Comments: Northward this system is replaced by Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563) and Laurentian-Acadian Northern Hardwoods Forest (CES201.564), but the limits of both are not yet clear in western New York (Allegheny Plateau) and central New England. USFS ecological province lines provide an apparently appropriate delimiter, with areas in Provinces 211 and M211 (as well as the Great Lakes part of 221 in NY and OH) falling into the Laurentian-Acadian systems, and areas in Provinces 221 and M221 falling into this Appalachian system.

Similar Ecological Systems:

- Laurentian-Acadian Northern Hardwoods Forest (CES201.564)
- Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563)--found to the north and northeast of this system.
- North-Central Interior Beech-Maple Forest (CES202.693)
- South-Central Interior Mesophytic Forest (CES202.887)
- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Related Concepts:

- Acidic Cove Forests (Fleming et al. 2005) Intersecting
- Central Appalachian Northern Hardwood Forests (Fleming et al. 2005) Intersecting
- Eastern Hemlock - Hardwood Forests (Fleming et al. 2005) Intersecting

DESCRIPTION

Environment: This system occurs on somewhat protected low and midslopes and valley bottoms. In the central Appalachian center of its range, its ecological amplitude is somewhat broader, and it approaches matrix forest in some areas. It is considered a system of intermediate moisture regime.

Vegetation: The canopy is characterized and often usually dominated by northern hardwoods (e.g., *Fagus grandifolia* and *Acer saccharum*), often with *Tsuga canadensis*, but may also contain large amounts of *Pinus strobus* and *Quercus* spp. The understory varies quite a bit, in some places dominated by evergreen shrubs and in others by herbs.

Dynamics: This system is currently being devastated in large parts of its range by the hemlock woolly adelgid (*Adelges tsugae*). This sucking insect is continuing to cause close to 100% mortality as it spreads from the north into the southern United States. The insect will most likely cause canopy hemlocks to be replaced by other canopy trees. Historically, this system was probably only subject to occasional fires. Fires that did occur may have been catastrophic and may have led to even-aged stands of pine and hemlock. Fire suppression appears to have increased the extent of this system at the expense of oak-pine systems.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* Forest (CEGL006252, G5)
- *Acer saccharum* - *Betula alleghaniensis* - *Prunus serotina* Forest (CEGL006045, G4)
- *Acer saccharum* - *Fraxinus americana* - *Juglans cinerea* / *Staphylea trifolia* / *Adlumia fungosa* Forest (CEGL006577, GNR)
- *Acer saccharum* - *Pinus strobus* / *Acer pensylvanicum* Forest (CEGL005005, GNR)
- *Acer saccharum* - *Quercus rubra* / *Hepatica nobilis* var. *obtusata* Forest (CEGL006046, GNR)
- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861, G3G4Q)
- *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Herbaceous Vegetation (CEGL006597, G3)

- *Chrysosplenium americanum* Herbaceous Vegetation (CEGL006193, G3G5)
- *Fagus grandifolia* - *Betula lenta* - *Liriodendron tulipifera* - *Acer saccharum* Forest (CEGL006296, GNR)
- *Liriodendron tulipifera* - *Quercus rubra* - *Fraxinus americana* / *Asimina triloba* / *Actaea racemosa* - *Uvularia perfoliata* Forest (CEGL006186, G4?)
- *Picea rubens* - *Betula alleghaniensis* - *Prunus serotina* Forest (CEGL006029, GNR)
- *Pinus strobus* - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest (CEGL006019, G4?)
- *Pinus strobus* - *Tsuga canadensis* Lower New England / Northern Piedmont Forest (CEGL006328, G5)
- *Quercus* (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest (CEGL006454, G4G5)
- *Quercus bicolor* / *Vaccinium corymbosum* / *Carex stipata* Forest (CEGL006241, GNR)
- *Quercus rubra* - *Acer saccharum* - *Fagus grandifolia* / *Viburnum acerifolium* Forest (CEGL006173, G4G5)
- *Quercus rubra* - *Acer saccharum* - *Liriodendron tulipifera* Forest (CEGL006125, G4?)
- *Quercus rubra* - *Tsuga canadensis* - *Liriodendron tulipifera* / *Hamamelis virginiana* Forest (CEGL006566, G4?)
- *Rhododendron maximum* Upland Shrubland (CEGL003819, G3?Q)
- *Thuja occidentalis* - *Pinus strobus* - *Tsuga canadensis* / *Carex eburnea* Woodland (CEGL008426, G1G2)
- *Tsuga canadensis* - (*Betula alleghaniensis*, *Quercus rubra*) / *Ilex montana* / *Rhododendron catawbiense* Forest (CEGL008513, G1?)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum* / *Dryopteris intermedia* Forest (CEGL006109, G4?)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest (CEGL006206, G4?)
- *Tsuga canadensis* - *Betula alleghaniensis* / *Veratrum viride* - *Carex scabrata* - *Oclemena acuminata* Forest (CEGL008533, G2)
- *Tsuga canadensis* - *Fagus grandifolia* - *Acer saccharum* / (*Hamamelis virginiana*, *Kalmia latifolia*) Forest (CEGL005043, G3?)
- *Tsuga canadensis* - *Fagus grandifolia* - *Quercus* (*prinus*, *alba*) Forest (CEGL006474, G2G3)
- *Tsuga canadensis* - *Fagus grandifolia* - *Quercus rubra* Forest (CEGL006088, G4G5)

Alliances:

- *Acer saccharum* - *Betula alleghaniensis* - (*Fagus grandifolia*) Forest Alliance (A.216)
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Chrysosplenium americanum* Saturated Herbaceous Alliance (A.1685)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Picea rubens* - *Betula alleghaniensis* Forest Alliance (A.384)
- *Pinus strobus* - *Acer saccharum* Forest Alliance (A.3012)
- *Pinus strobus* - *Quercus* (*alba*, *rubra*, *velutina*) Forest Alliance (A.401)
- *Pinus strobus* - *Tsuga canadensis* Forest Alliance (A.127)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Rhododendron maximum* Shrubland Alliance (A.745)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)
- *Tsuga canadensis* - *Betula alleghaniensis* Forest Alliance (A.412)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Spatial Summary: Matrix in the northern portion of its range to large patch on the southern end of its range in Virginia and West Virginia.

Size: Some examples may be more than 1000 acres, but smaller in the southern part of the range.

Adjacent Ecological Systems:

- High Allegheny Wetland (CES202.069)

Adjacent Ecological System Comments: The concept of this system was revised in April 2007 to remove areas south and west of Virginia and West Virginia from its range; hemlock and mixed coves in that southern range are now within Southern and Central Appalachian Cove Forest (CES202.373), and small areas of non-cove hemlock are to be considered patches within the surrounding forest matrix system. The Region 8 National Forests and other Federal lands, as well as ecoregions and mapzones related to this area were also removed.

DISTRIBUTION

Range: This system is found from central New England south to Virginia and West Virginia, and probably in adjacent Kentucky.

Divisions: 202:C

Nations: US

Subnations: CT, KY?, MA, MD, ME?, NH, NJ, NY, OH?, PA, VA, VT, WV

Map Zones: 53:C, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 211Fc:CCC, 211Fd:CCC, 211G:CC, 221Aa:CCC, 221B:CC, 221D:CC, 221E:CC, 221F:CC, 222I:CC, M221A:CC, M221B:CC, M221C:CC, M221D:CC

TNC Ecoregions: 48:C, 49:C, 52:?, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2005, Yahn pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723013#references

Description Author: S.C. Gawler, R. White, R. Evans, M. Pyne

Version: 05 May 2008

Concept Author: S.C. Gawler, R. White, R. Evans, M. Pyne

Stakeholders: East, Midwest, Southeast

ClassifResp: East

1340 APPALACHIAN SHALE BARRENS (CES202.598)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Sideslope; Talus (Substrate); Unglaciaded; Unconsolidated

Non-Diagnostic Classifiers: Lowland; Ridge/Summit/Upper Slope; Temperate; Acidic Soil; Very Shallow Soil; Ustic; Landslide

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2340; ESLF 4147; ESP 1340

CONCEPT

Summary: This system encompasses the distinctive shale barrens of the central and southern Appalachians at low to mid elevations. The exposure and lack of soil create extreme conditions for plant growth. Vegetation is mostly classified as woodland, overall, but may include large open areas of sparse vegetation. Dominant trees are primarily *Quercus prinus* and *Pinus virginiana*, although on higher-pH substrates the common trees include *Juniperus virginiana* and *Fraxinus americana*. Shale barren endemics are diagnostic in the herb layer. The substrate includes areas of solid rock as well as unstable areas of shale scree, usually steeply sloped. The fully exposed areas are extremely dry. These barrens are high in endemic species.

Classification Comments: Examples of related barrens in the "Knobs" region of Kentucky are included in Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692), not here. The southern range limit is not completely clear. "Central Appalachian Shale Barrens" (sensu VDNH) are the "core" concept. The bluestone shale barrens of West Virginia are placed in this system even though many of the endemics are not present there; the same is true at the northern periphery of this system in Pennsylvania.

Similar Ecological Systems:

- Central Appalachian Pine-Oak Rocky Woodland (CES202.600)
- Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Montane Cliff and Talus (CES202.330)

Related Concepts:

- Central Appalachian Shale Barrens (Fleming et al. 2004) Finer

DESCRIPTION

Environment: This system is found at low to mid elevations in the central and southern Appalachians. Most shale barrens occur between 305 and 610 m (1000-2000 feet) elevation and have a generally southern exposure. Slopes are steep and often undercut by a stream at the base. Soils are thin, with a layer weathered rock fragments covering the surface. The exposure and lack of soil create extreme conditions for plant growth. The chemistry and pH vary somewhat from site to site, and this variability may be reflected in the vegetation. The substrate includes areas of solid rock as well as unstable areas of shale scree, usually steeply sloped.

Vegetation: Although stunted trees of several species such as *Quercus prinus*, *Pinus virginiana*, and *Carya glabra* are common, Central Appalachian Shale Barrens are strongly characterized by their open physiognomy and by a suite of uncommon and rare plants found almost exclusively in these habitats (Fleming et al. 2004). Endemic or near-endemic shale barren species include shale-barren rock-cress (*Arabis serotina*), white-haired leatherflower (*Clematis albicoma*), Millboro leatherflower (*Clematis viticaulis*; also endemic to Virginia), shale-barren wild buckwheat (*Eriogonum allenii*), shale-barren evening-primrose (*Oenothera argillicola*), shale-barren ragwort (*Packera antennariifolia*), and Kate's Mountain clover (*Trifolium virginicum*). Other more-or-less widespread and characteristic herbaceous species of Virginia shale barrens include Pennsylvania sedge (*Carex pennsylvanica*), little bluestem (*Schizachyrium scoparium*), poverty oatgrass (*Danthonia spicata*), wavy hairgrass (*Deschampsia flexuosa* var. *flexuosa*), moss phlox (*Phlox subulata*), mountain nailwort (*Paronychia montana*), rock spike-moss (*Selaginella rupestris*), shale-barren pussytoes (*Antennaria virginica*), Canada cinquefoil (*Potentilla canadensis*), smooth sunflower (*Helianthus laevigatus*), false boneset (*Brickellia eupatorioides* var. *eupatorioides*), hairy woodmint (*Blephilia ciliata*), and western wallflower (*Erysimum capitatum* var. *capitatum*; Bath and Alleghany counties).

MEMBERSHIP

Associations:

- (*Pinus virginiana*, *Juniperus virginiana*) / *Schizachyrium scoparium* - *Eriogonum allenii* Wooded Herbaceous Vegetation (CEGL008530, G2)
- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (CEGL004995, G2)
- *Juniperus virginiana* - *Fraxinus americana* / *Carex pennsylvanica* - *Cheilanthes lanosa* Wooded Herbaceous Vegetation (CEGL006037, G2)
- *Pinus virginiana* - *Juniperus virginiana* - *Quercus rubra* / *Solidago arguta* var. *harrisii* - *Opuntia humifusa* Woodland (CEGL006288, G3)
- *Pinus virginiana* - *Quercus prinus* / *Packera antennariifolia* - *Phlox subulata* Woodland (CEGL006562, G3G4)
- *Pinus virginiana* - *Quercus prinus* / *Quercus ilicifolia* / (*Hieracium greenii*, *Viola pedata*) Woodland (CEGL008525, G3)

- *Pinus virginiana* / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland (CEGL003624, G2)
- *Quercus prinus* - *Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus* - *Celtis occidentalis* Woodland (CEGL007720, G2)
- *Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland [Provisional] (CEGL008526, G3?)

Alliances:

- (*Fraxinus americana*, *Juniperus virginiana*) / *Carex pensylvanica* - *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.3014)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Pinus (rigida, pungens, virginiana)* - *Quercus prinus* Woodland Alliance (A.677)
- *Quercus prinus* - *Quercus coccinea* Woodland Alliance (A.622)

DISTRIBUTION

Range: This system is found from southern Pennsylvania south to Virginia and extreme eastern Tennessee. Application of the concept south of Virginia is uncertain. It is not attributed to Kentucky.

Divisions: 202:C

Nations: US

Subnations: MD, NC?, PA, TN, VA, WV

Map Zones: 57:C, 61:C

USFS Ecomap Regions: M221Ac:CCC, M221Be:CCC

TNC Ecoregions: 50:P, 51:P, 59:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2004, Keener 1970, Platt 1951

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723010#references

Description Author: S.C. Gawler, mod. M. Pyne

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: East

1346 ATLANTIC COASTAL PLAIN FALL-LINE SANDHILLS LONGLEAF PINE WOODLAND (CES203.254)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2346; ESLF 4249; ESP 1346

CONCEPT

Summary: This system occurs in the Fall-line Sandhills region of central North Carolina extending into central Georgia. It is the predominant system in its range, covering most of the natural landscape of the region. It occurs on upland sites ranging from gently rolling, broad ridgetops to steeper sideslopes, as well as locally in mesic swales and terraces. Most soils are well- to excessively drained. The vegetation is naturally dominated by *Pinus palustris*. Most associations have an understory of scrub oaks (*Quercus laevis*, *Quercus marilandica*, *Quercus incana*, and *Quercus margarettiae*). The herb layer is generally well-developed and dominated by grasses. Wiregrasses (*Aristida stricta* in the north, *Aristida beyrichiana* in the south) dominates in most of the range, but other grasses dominate where it is absent. Forbs, including many legumes, are also abundant. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system is distinguished from Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) based on differences in landscape patterns, prevailing associations, and some floristic differences. Dissected topography with much higher relief, predominance of interbedded sands and clays, and interspersed with seepage wetlands all characterize the Fall-line Sandhills, in contrast to the low relief, pure sands or loams, and mosaics containing other wetland types in the rest of the Coastal Plain. Some matrix associations in the Fall-line Sandhills, such as *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595) are nearly absent in the rest of the Coastal Plain. The abundance of legumes in most Sandhills region associations and their scarcity in most Outer Coastal Plain associations is striking, and is probably related to the differences in prevailing soil texture. This system does not have a biogeographic break in southern South Carolina, as the Outer Coastal Plain systems do. It includes areas with both *Aristida stricta* and *Aristida beyrichiana*. Gopher tortoises (*Gopherus polyphemus*), used as a break in the Outer Coastal Plain systems because of their keystone species role, are not present in the Fall-line Sandhills. This system is distinguished from Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) because of the ecological role of saturated wetland conditions in the latter.

Similar Ecological Systems:

- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Related Concepts:

- Pine / Scrub Oak Sandhill (Schafale and Weakley 1990) Finer. in major part.
- Xeric Sandhill Scrub (Schafale and Weakley 1990) Finer

DESCRIPTION

Environment: This system occurs on upland sites in the Fall-line Sandhills region (Ecoregion 65c of EPA (2004); 232Bq of Keys et al. (1995)). It covers the gently rolling, ancient eolian sands and the steeper side slopes in older formations that make up most of the dissected landscape in this region. Shallow swales, drier stream terraces, and rock outcrops also may support this system. Substrates include interbedded sands and clays, deep sands, and occasional loamy sediments. Soils are generally well- to excessively drained and infertile, though local richer, mesic sites occur. Non-wetland conditions and frequent fire unify this system within the Fall-line Sandhills region. Soil texture appears to be the most important driver of differences among associations within the system, with biogeography also important.

Vegetation: Vegetation is a set of associations naturally dominated by longleaf pine (*Pinus palustris*). Scrub oaks (*Quercus laevis*, *Quercus marilandica*, *Quercus incana*, and *Quercus margarettiae*) form an understory in most associations, all but the mesic ones. Low shrubs, most ericaceous, may be abundant. In most of the range, wiregrass (*Aristida stricta* or in the south *Aristida beyrichiana*) is the dominant herb. In central South Carolina both species are absent and various other grass species dominate. Most associations have abundant legumes, as well as composites and other forbs. The abundance of legumes distinguishes this system from Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281), where most associations have few legumes. Many associations have moderate to high species richness, with most of the species in the herb layer. Some mesic associations have among the highest species richness values measured at the 1/10-hectare scale. Associations on deep, coarse sands may have low species richness but have a distinct set of xerophytic herbs and dwarf-shrubs.

Dynamics: Frequent fire is the predominant natural force in this system. Component communities naturally burned every few years, many averaging as often as every 3 years. Fires are naturally low to moderate in intensity. They burn above-ground parts of herbs and shrubs, but have little effect on the fire-tolerant trees. Vegetation recovers very quickly from fires, with live herbaceous biomass often restored in just a few weeks. Many plants have their flowering triggered by burning. Fire is important in creating the structure of the

vegetation. In the absence of fire, less fire-tolerant species increase and others invade the system. The scrub oaks and shrubs, kept to low density and mostly reduced to shrub size, become tall and dense and can suppress tree regeneration. Herb layer density and diversity decline. Only on the most excessively drained coarse sands does the vegetation not undergo substantial structural alteration and reduction in species richness after just a few years without burning.

Canopies are believed to naturally be many-aged, consisting of a fine mosaic of small even-aged groves driven by gap-phase regeneration. Longleaf pine is shade-intolerant and slow to reach reproductive age, but is very long-lived. Most plants in these systems appear to be conservative, living a long time and only rarely sexually reproducing or colonizing new sites. Similar conservatism is shown by some of the vertebrates, such as *Picoides borealis*. Different dynamics occur in insect populations, whose individuals are not resilient to fire. Insect populations must recolonize burned areas from nearby unburned patches.

MEMBERSHIP

Associations:

- *Pinus palustris* - (*Pinus taeda*) / *Schizachyrium scoparium* - *Rhynchosia reniformis* Woodland (CEGL007738, G1)
- *Pinus palustris* - *Pinus (echinata, taeda)* - *Quercus (incana, margarettiae, falcata, laevis)* Woodland (CEGL007511, G4)
- *Pinus palustris* / *Aristida stricta* - *Sorghastrum nutans* - *Anthraenantia villosa* Woodland (CEGL003570, G2G3)
- *Pinus palustris* / *Quercus incana* - *Quercus marilandica* / *Aristida beyrichiana* - *Nolina georgiana* Woodland (CEGL007842, G2G3)
- *Pinus palustris* / *Quercus incana* / *Aristida stricta* - *Sorghastrum nutans* - *Anthraenantia villosa* Woodland (CEGL003578, G2G3)
- *Pinus palustris* / *Quercus laevis* - (*Quercus incana*) / *Vaccinium tenellum* / *Schizachyrium scoparium* - *Eriogonum tomentosum* Woodland (CEGL003593, G2)
- *Pinus palustris* / *Quercus laevis* - *Quercus (incana, margarettiae)* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003591, G3?)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* / *Aristida beyrichiana* - *Baptisia perfoliata* Woodland (CEGL007844, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Aristida purpurascens* - *Stipulicida setacea* - (*Rhynchospora megalocarpa*, *Selaginella acanthonota*) Woodland (CEGL003590, G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida stricta* / *Cladonia* spp. Woodland (CEGL003584, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida beyrichiana* - *Helianthus atrorubens* Woodland (CEGL004488, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003586, G3?)
- *Pinus palustris* / *Quercus laevis* / *Leiophyllum buxifolium* - *Cyrilla racemiflora* - *Clethra alnifolia* Woodland (CEGL007767, G1)
- *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595, G2G3)
- *Pinus palustris* / *Quercus marilandica* / *Vaccinium crassifolium* / *Aristida stricta* Woodland (CEGL003599, G2?)
- *Pinus palustris* / *Vaccinium elliotii* - *Clethra alnifolia* / *Aristida stricta* - *Panicum virgatum* Woodland (CEGL003573, G1)

Alliances:

- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Woodland Alliance (A.520)

SPATIAL CHARACTERISTICS

Spatial Summary: This system is naturally a matrix system, covering most of the landscape in its range. Most occurrences now are artificially bounded remnants or naturally small islands. Extensive occurrences usually have embedded wetland systems, especially Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252).

Size: Natural patches once would have been contiguous over hundreds of square miles, covering most of the landscape in the region and broken only by river systems. Most occurrences are now artificially bounded remnants of small to fairly large size. A few landscape matrix areas of thousands of acres remain.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)

Adjacent Ecological System Comments: Streamhead pocosins are the most frequently associated system, with Sandhill seeps and Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249) also frequent associates.

DISTRIBUTION

Range: This system ranges from central North Carolina to central Georgia, in the Fall-line Sandhills region (Ecoregion 65c of EPA (2004); 232Bq of Keys et al. (1995)).

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, EPA 2004, Keys et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723231#references

Description Author: M. Schafale and R. Evans

Version: 17 Jan 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1347 ATLANTIC COASTAL PLAIN UPLAND LONGLEAF PINE WOODLAND (CES203.281)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2347; ESLF 4250; ESP 1347

CONCEPT

Summary: This system of upland *Pinus palustris*-dominated vegetation ranges from southern Virginia (beginning approximately at the James River) to northeastern Florida (excluding longleaf pine of the Fall-Line Sandhills, accommodated by another ecological system), where it was once perhaps the most extensive system in the Outer Coastal Plain within its range. Examples and associations share the common feature of upland (non-wetland) moisture regimes and natural exposure to frequent fire. They occur on a variety of well- to excessively drained soils, and on the higher parts of upland-wetland mosaics. The vegetation is naturally dominated by *Pinus palustris*. Most associations have an understory of scrub oaks. The herb layer is generally well-developed and dominated by grasses. *Aristida stricta* primarily dominates in the northern part of its range, and *Aristida beyrichiana* in the southern part. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system is distinguished from Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) because of the ecological role of saturated wetland conditions in the latter. The two systems have much in common, including frequent fire and the same primary dominant tree and herb species. They often occur in the same landscapes. However, floristic differences are well marked, and no associations are shared. This system is distinguished from the Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254) based on the differences in landscape patterns and prevailing associations in the two regions. Dissected topography with much higher relief, predominance of interbedded sands and clays, and interspersed with seepage wetlands all characterize the Fall-line Sandhills, in contrast to the low relief, pure sands or loams, and mosaics containing other wetland types in the rest of the Coastal Plain. Some matrix associations in the Fall-line Sandhills, such as *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595) are nearly absent in the rest of the Coastal Plain, and there are systematic floristic differences. If this were to be split into a northern and southern component, the distinction would be justified based on differences in climate, flora, and some differences in ecological dynamics. Gopher tortoises (*Gopherus polyphemus*) are an important keystone species in the southern portion of the range. The dominant grass also changes at this approximate point, with *Aristida beyrichiana* dominating herb layers to the south.

Similar Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Related Concepts:

- Coastal Fringe Sandhill (Schafale and Weakley 1990) Finer
- Mesic Pine Flatwoods (Schafale and Weakley 1990) Finer
- Pine / Scrub Oak Sandhill (Schafale and Weakley 1990) Finer. in minor part.
- Sandhill (FNAI 1990) Intersecting
- Xeric Sandhill Scrub (Bennett and Nelson 1991) Finer
- Xeric Sandhill Scrub (Schafale and Weakley 1990) Finer

DESCRIPTION

Environment: This system occurs on upland sites of the Middle to Outer Atlantic Coastal Plain, on landforms that include loamy to sandy flats, relict beach system deposits, eolian sand deposits, Carolina bay rims (Bennett and Nelson 1991), and occasional low rolling hills. Soils range from mesic to xeric and from sandy to loamy or occasionally clayey. Most natural remnants are on coarse sands, but most examples probably once occurred on loamy soils. Soils are largely acidic and infertile, and the coarsest sands are excessively drained and sterile. The unifying feature of this system is non-wetland sites that naturally supported frequent fire. As such, it once covered much of the landscape of the Coastal Plain. Variations in soil texture and drainage appear to be a primary driver of differences between associations within the system, with biogeography also important.

Vegetation: Vegetation is a set of associations that are most naturally woodlands or savannas dominated by *Pinus palustris* and having a well-developed grassy herb layer. A few associations have sparse herb layers due to excessively drained soils, and a few are dominated by scrub oaks. Other pine species may sometimes be present. Scrub oaks (*Quercus laevis*, *Quercus incana*, *Quercus margarettiae*, *Quercus hemisphaerica*, and others) form an understory in most associations, all but the mesic ones. Low shrubs, most ericaceous, are often an important component. In most of the range, *Aristida stricta* is the dominant herb. In the southern and northern parts of the range, it is absent, and various other grass species dominate. Forbs, especially composites, are usually also an important herb component, and lichens are abundant in some associations. Many associations have moderate species richness, with most of the species in the herb layer. Some mesic associations have very high species richness, among the highest values ever measured at the

1/10-hectare scale. Associations on deep, coarse sands may have low species richness but have a distinct set of xerophytic herbs and dwarf-shrubs.

Dynamics: Frequent fire is the predominant natural force in this system. Component communities naturally burned every few years, many averaging as often as every 3 years. Fires are naturally low to moderate in intensity. They burn above-ground parts of herbs and shrubs but have little effect on the fire-tolerant trees. Vegetation recovers very quickly from fire, with live herbaceous biomass often restored in just a few weeks. Many plants have their flowering triggered by burning. In the absence of fire, less fire-tolerant species increase and others invade the system. The scrub oaks and shrubs, kept to low density and mostly reduced to shrub size by fire, become tall and dense and can suppress tree regeneration. Herb layer density and diversity decline. Only on the most excessively drained coarse sands does the vegetation not undergo substantial structural alteration and reduction in species richness after just a few years without burning.

Canopies are believed to naturally be many-aged, consisting of a fine mosaic of small even-aged groves driven by gap-phase regeneration. Longleaf pine is shade-intolerant and slow to reach reproductive age but is very long-lived. Most plants in these systems appear to be conservative, living a long time and only rarely sexually reproducing or colonizing new sites. Similar conservatism is shown by some of the vertebrates, such as *Picoides borealis* (red-cockaded woodpecker). Different dynamics occur in insect populations, whose individuals are not resilient to fire. Insect populations must recolonize burned areas from nearby unburned patches.

MEMBERSHIP

Associations:

- (*Pinus palustris*) / *Bigelowia nuttallii* - *Talinum teretifolium* - *Allium cuthbertii* - *Penstemon dissectus* Altamaha Grit Herbaceous Vegetation (CEGL004783, G1G2)
- *Pinus palustris* - (*Pinus taeda*) / *Schizachyrium scoparium* - *Rhynchosia reniformis* Woodland (CEGL007738, G1)
- *Pinus palustris* - *Pinus (echinata, taeda)* - *Quercus (incana, margarettiae, falcata, laevis)* Woodland (CEGL007511, G4)
- *Pinus palustris* - *Pinus taeda* - *Pinus serotina* / *Quercus marilandica* / (*Quercus pumila*) / *Aristida stricta* Woodland (CEGL003664, G1)
- *Pinus palustris* - *Pinus taeda* / *Quercus geminata* - *Quercus hemisphaerica* - *Osmanthus americanus var. americanus* / *Aristida stricta* Woodland (CEGL003577, G2)
- *Pinus palustris* / *Amorpha herbacea var. herbacea* / *Aristida stricta* - *Sorghastrum nutans* Woodland (CEGL003569, G2G3)
- *Pinus palustris* / *Aristida stricta* - *Sorghastrum nutans* - *Anthaenantia villosa* Woodland (CEGL003570, G2G3)
- *Pinus palustris* / *Quercus incana* - *Quercus marilandica* / *Aristida beyrichiana* - *Nolina georgiana* Woodland (CEGL007842, G2G3)
- *Pinus palustris* / *Quercus incana* - *Quercus stellata* / *Aristida beyrichiana* - *Sporobolus junceus* - *Nolina georgiana* Woodland (CEGL004487, G2G3)
- *Pinus palustris* / *Quercus incana* / *Aristida stricta* - *Sorghastrum nutans* - *Anthaenantia villosa* Woodland (CEGL003578, G2G3)
- *Pinus palustris* / *Quercus laevis* - (*Quercus incana*) / *Vaccinium tenellum* / *Schizachyrium scoparium* - *Eriogonum tomentosum* Woodland (CEGL003593, G2)
- *Pinus palustris* / *Quercus laevis* - *Quercus (incana, margarettiae)* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003591, G3?)
- *Pinus palustris* / *Quercus laevis* - *Quercus geminata* / *Vaccinium tenellum* / *Aristida stricta* Woodland (CEGL003589, G2?)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* - *Quercus margarettiae* / *Licania michauxii* / *Aristida beyrichiana* Woodland (CEGL004492, G3)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* / *Aristida beyrichiana* - *Baptisia perfoliata* Woodland (CEGL007844, G2G3)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* / *Gaylussacia dumosa* - *Gaylussacia (baccata, frondosa)* Woodland (CEGL003592, G1)
- *Pinus palustris* / *Quercus laevis* / *Aristida purpurascens* - *Stipulicida setacea* - (*Rhynchospora megalocarpa*, *Selaginella acanthonota*) Woodland (CEGL003590, G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida stricta* / *Cladonia* spp. Woodland (CEGL003584, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida beyrichiana* - *Helianthus atrorubens* Woodland (CEGL004488, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003586, G3?)
- *Pinus palustris* / *Quercus laevis* / *Serenoa repens* - *Vaccinium stamineum* / *Aristida beyrichiana* Woodland (CEGL004490, G2G3)
- *Pinus palustris* / *Quercus margarettiae* - *Quercus incana* / *Schizachyrium scoparium* Atlantic Woodland (CEGL004083, G2?)
- *Pinus palustris* / *Quercus marilandica* - *Quercus laevis* / *Aristida beyrichiana* - *Nolina georgiana* Woodland (CEGL004489, G2)
- *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595, G2G3)

Alliances:

- *Bigelowia nuttallii* Herbaceous Alliance (A.1617)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Woodland Alliance (A.520)

SPATIAL CHARACTERISTICS

Spatial Summary: This system is naturally a matrix system, probably once the most extensive system in its range. Most occurrences now are artificially bounded remnants or naturally small islands. Occurrences often form mosaics with Atlantic Coastal Plain Northern Wet Longleaf Pine Savanna and Flatwoods (CES203.265) or Atlantic Coastal Plain Peatland Pocosin (CES203.267) and may have

small-patch systems embedded in them.

Size: Once the most abundant system over large parts of the Coastal Plain, forming the matrix in which most other systems occurred, most occurrences are now naturally small islands or are artificially bounded remnants of small to fairly large size. A few landscape matrix areas of several thousand acres remain.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Adjacent Ecological System Comments: Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) or Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267) are the most commonly associated systems, often forming mosaics. Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) and small floodplain systems may be embedded in matrices of this system.

DISTRIBUTION

Range: This system is found in the Atlantic Coastal Plain (exclusive of the Fall-line Sandhills) from southern Virginia to northeastern Florida.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Bennett and Nelson 1991, Comer et al. 2003, Schafale and Weakley 1990, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723206#references

Description Author: R.E. Evans, mod. M. Pyne

Version: 22 May 2008

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1301 BOREAL ASPEN-BIRCH FOREST (CES103.020)

CLASSIFIERS

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Boreal [Boreal Continental]; Intermediate Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2301; ESLF 4107; ESP 1301

CONCEPT

Summary: These early-successional boreal hardwood forests and woodlands are widespread throughout the boreal region of Canada, extending into parts of the Laurentian-Acadian region, but more localized eastward. They originate naturally after fires and blowdowns, but more commonly originate after logging of conifer or mixed conifer-hardwood systems. *Populus tremuloides* and *Betula papyrifera* are the most important tree species. This system is maintained by repeated disturbance within 50-year return intervals and would otherwise succeed to conifer systems. Localized stands of mixed conifer-hardwoods (pines and spruces) can occur in this type, but are more typically part of conifer systems.

Classification Comments: As defined here, these are deciduous forest-dominated systems; mixed conifer-hardwoods areas will go in the appropriate conifer forest system. In addition, this system is primarily boreal; in the Laurentian-Acadian region, successional aspen-birch or red maple stands would be placed within the appropriate mature Laurentian-Acadian forest system (e.g., aspen-birch stands in Maine are placed within Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565). The perspective here is that *Picea rubens* (red spruce) is not a boreal species; stands of *Picea rubens* often contain many typical northern hardwood associates, rather than *Populus tremuloides* or *Betula papyrifera*. It is not clear how naturally this system occurs in the upper Midwest given catastrophic fires in the 1800s-early 1900s; is the extensive aspen-birch found in northern Minnesota this system or should those be considered part of northern hardwoods or spruce-fir? A workable approach for now would be to restrict this system to northernmost Minnesota and southern Lake Superior [see USFS Ecomap Regions].

Similar Ecological Systems:

- Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565)--occurs farther east and does not overlap.

MEMBERSHIP

Associations:

- *Populus (tremuloides, balsamifera) - (Betula papyrifera) - Picea mariana / Alnus viridis* Forest (CEGL002514, GNR)
- *Populus tremuloides - Betula papyrifera - (Acer rubrum, Populus grandidentata)* Forest (CEGL002467, G5)
- *Populus tremuloides - Betula papyrifera / (Abies balsamea, Picea glauca)* Forest (CEGL002466, G5)
- *Populus tremuloides - Populus balsamifera - Mixed Hardwoods Lowland* Forest (CEGL005036, G5)

Alliances:

- *Populus tremuloides - Betula papyrifera* Forest Alliance (A.269)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

DISTRIBUTION

Range: This system is found in the Upper Great Lakes and southern Canada east to Quebec (and possibly northern portions of the Canadian Maritimes).

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: MB, MI, MN, NB?, ON, QC, WI

Map Zones: 41:C, 50:C, 51:C

USFS Ecomap Regions: 212Ha:CPP, 212Hf:CPP, 212Hi:CPP, 212J:CP, 212Lb:CCC, 212M:CC, 212R:CP, 212S:CP, 212T:CP, 212X:CP, 212Y:CP

TNC Ecoregions: 47:C, 48:C

SOURCES

References: Comer et al. 2003, Eyre 1980

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722685#references

Description Author: D. Faber-Langendoen

Version: 11 Apr 2007

Concept Author: D. Faber-Langendoen and S. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

1344 BOREAL JACK PINE-BLACK SPRUCE FOREST (CES103.022)

CLASSIFIERS

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Outwash plain; Forest and Woodland (Treed); Boreal [Boreal Continental]; Acidic Soil; Sand Soil Texture; F-Landscape/High Intensity; Needle-Leaved Tree

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Oligotrophic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2344; ESLF 4247; ESP 1344

CONCEPT

Summary: This conifer forest system is found on nutrient-poor soils in a variety of topographic settings. It ranges from eastern Alberta to eastern Canada, and southward into Minnesota, the Great Lakes region, and very locally into northwestern Maine. Soils are loamy to sandy, varying from thin soil over bedrock to deeper soils, sometimes sandy. Sites are xeric, but less strongly than barrens and sandplains. The dominant fire regime varies from 50-100 years. *Pinus banksiana* and *Picea mariana* are characteristic overstory species. In the Upper Great Lakes region, *Pinus banksiana* may intermix with *Pinus resinosa*. Canopy structure is mostly closed but can be partially open. Conifers typically dominate the canopy, but boreal hardwoods (*Populus tremuloides*, *Betula papyrifera*) may codominate. As time since fire increases, *Picea mariana* may dominate. The shrub and field layers can be somewhat dense to sparse, and older *Picea mariana* stands may be dominated by feathermosses.

Classification Comments: This system extends from open sandplains, where stands may consist of relatively pure, short jack pine stands to more dry-mesic black spruce / feathermoss stands. Further review is needed. Open bedrock-conifer woodlands are treated under Laurentian Acidic Rocky Outcrop (CES201.019). In Minnesota and the Great Lakes region, jack pine and red pine stands on sand also occur in Laurentian Pine-Oak Barrens (CES201.718). Compare also with Acadian Sub-boreal Spruce Barrens (CES201.561), which occur in similar settings but lack jack pine.

Similar Ecological Systems:

- Acadian Sub-boreal Spruce Barrens (CES201.561)--occur in similar settings but lack *Pinus banksiana*.
- Boreal-Laurentian Conifer Acidic Swamp (CES103.724)
- Laurentian Acidic Rocky Outcrop (CES201.019)--more sparsely vegetated.
- Laurentian Pine-Oak Barrens (CES201.718)--different section distribution.

MEMBERSHIP

Associations:

- *Picea mariana* - *Populus tremuloides* / Mixed Herbs Forest (CEGL002516, G4G5)
- *Picea mariana* / *Pleurozium schreberi* Forest (CEGL002447, G5)
- *Pinus banksiana* - *Picea mariana* / *Vaccinium* spp. / *Pleurozium schreberi* Forest (CEGL002448, G5)
- *Pinus banksiana* - *Populus tremuloides* / *Diervilla lonicera* Forest (CEGL002518, G4G5)
- *Pinus banksiana* / *Abies balsamea* Forest (CEGL002437, G5)
- *Pinus banksiana* / *Arctostaphylos uva-ursi* Forest (CEGL002438, G4G5)
- *Pinus banksiana* / *Vaccinium* spp. / *Pleurozium schreberi* Forest (CEGL002441, G4G5)
- *Populus (tremuloides, balsamifera)* - (*Betula papyrifera*) - *Picea mariana* / *Alnus viridis* Forest (CEGL002514, GNR)

Alliances:

- *Picea mariana* - *Populus tremuloides* Forest Alliance (A.414)
- *Picea mariana* Forest Alliance (A.149)
- *Pinus banksiana* - *Populus tremuloides* Forest Alliance (A.390)
- *Pinus banksiana* Forest Alliance (A.116)
- *Populus tremuloides* - *Betula papyrifera* Forest Alliance (A.269)

DISTRIBUTION

Range: It ranges from eastern Alberta to eastern Canada, and southward into Minnesota and the Great Lakes region and very locally into northwestern Maine.

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: AB?, MB, ME, MI, MN, ON, QC, SK?, WI

Map Zones: 41:C, 50:C, 51:C, 66:P

USFS Ecomap Regions: 212H:CC, 212J:CC, 212L:CC, 212M:CC, 212R:CC, 212S:CC, 212T:CC, 212X:CC, 222Ue:CC?

TNC Ecoregions: 47:C, 48:C, 63:C

SOURCES

References: Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003, Frelich 1992, Heinselman 1973

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722683#references

Description Author: D. Faber-Langendoen

Version: 11 Apr 2007

Concept Author: D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

1365 BOREAL WHITE SPRUCE-FIR-HARDWOOD FOREST (CES103.021)

CLASSIFIERS

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Mesotrophic Soil; Oligotrophic Soil; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2365; ESLF 4307; ESP 1365

CONCEPT

Summary: This system represents the southern edge of the boreal forest, ranging from eastern Alberta to eastern Canada and southward into Minnesota and the Great Lakes region, and possibly the Canadian Maritimes. The low-elevation forests are dominated by *Picea glauca* and *Abies balsamea*. *Picea mariana* is often present, along with occasional *Pinus banksiana*. Codominant boreal hardwoods include *Populus tremuloides* and *Betula papyrifera*. Northern hardwoods are relatively minor. Soils are acidic and usually rocky, and range from well-drained to somewhat poorly drained. This is the matrix forest type of this division. This system may include earlier successional patches, in which *Populus* spp. and *Betula* spp. are dominant or mixed with *Picea* and *Abies*, that will develop into spruce-fir forests. Blowdowns with subsequent gap regeneration are the most frequent form of natural disturbance, with large-scale fires important at longer return intervals.

Similar Ecological Systems:

- Boreal White Spruce Forest and Woodland (CES105.848)--occurs farther north and west.

Related Concepts:

- Boreal Forest (Kost et al. 2007) Undetermined

MEMBERSHIP

Associations:

- *Abies balsamea* - *Betula papyrifera* / *Diervilla lonicera* Forest (CEGL002474, G5)
- *Picea glauca* - *Abies balsamea* - *Populus tremuloides* / Mixed Herbs Forest (CEGL002475, G5)
- *Picea glauca* - *Abies balsamea* / *Acer spicatum* / *Rubus pubescens* Forest (CEGL002446, G4G5)

Alliances:

- *Picea glauca* - *Abies balsamea* - *Populus* spp. Forest Alliance (A.418)
- *Picea glauca* - *Abies balsamea* Forest Alliance (A.148)

DISTRIBUTION

Range: This system ranges from eastern Alberta to eastern Canada and southward into Minnesota and the Great Lakes region, and possibly the Canadian Maritimes.

Divisions: 103:C; 201:C; 205:?

Nations: CA, US

Subnations: AB, MB, MI, MN, NB?, ON, QC, SK, WI

Map Zones: 41:C, 50:C, 51:C

USFS Ecomap Regions: 212Ha:CCC, 212Hf:CCC, 212Hi:CCC, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212R:CC, 212S:CC, 212T:CC, 212X:CC, 212Y:CC

TNC Ecoregions: 47:C, 48:C, 63:?, 66:?

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722684#references

Description Author: D. Faber-Langendoen

Version: 11 Apr 2007

Concept Author: D. Faber-Langendoen

Stakeholders: Canada, East, Midwest
ClassifResp: Midwest

1177 CALIFORNIA COASTAL CLOSED-CONE CONIFER FOREST AND WOODLAND (CES206.922)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Marine Sedimentary; *Cupressus macrocarpa*, *C. goveniana*, *C. abramsiana*

Non-Diagnostic Classifiers: Montane [Lower Montane]; Sideslope; Acidic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2177; ESLF 4268; ESP 1177

CONCEPT

Summary: Small occurrences of this system may be found in scattered locations along California's entire coastline and onto the Channel Islands. They are found on marine sedimentary, non-metamorphosed features, often with podsoles on sterile sandstone. These forests and woodlands are limited to coastal areas with moderate maritime climate and likely receive more annual precipitation than nearby coastal chaparral. Highly localized endemic tree species include *Cupressus macrocarpa*, *Cupressus goveniana*, and *Cupressus abramsiana* in scattered groves along coastal Mendocino, San Mateo, Santa Cruz, and Monterey counties. *Pinus contorta* var. *contorta*, *Pinus contorta* var. *bolanderi*, *Pinus muricata*, *Pinus torreyana*, and *Pinus radiata* are dominant or codominant in these and other occurrences. These occurrences can also include pygmy woodland expressions where nearly lateritic subsoil underlies acidic sands (ancient marine terraces). Stunted and twisted *Pinus contorta* var. *contorta* stands along the Oregon coast (often called pygmy forests) are also part of this system. Other associated plant species include *Arctostaphylos nummularia*, *Ledum groenlandicum*, *Vaccinium ovatum*, *Gaultheria shallon*, *Rhododendron macrophyllum*, and *Morella californica* (= *Myrica californica*). The lichen and moss component of this system is very diverse, includes *Cladonia* spp, and can be abundant in these communities.

Related Concepts:

- Knobcone Pine: 248 (Eyre 1980) Broader. includes Santa Cruz cypress, Baker cypress, McNab cypress and Sargent cypress.
- Lodgepole Pine: 218 (Eyre 1980) Intersecting. *Pinus contorta* ssp. *contorta* stands are a minor component of this ecological system.

MEMBERSHIP

Associations:

- *Cupressus goveniana* ssp. *pygmaea* Shrubland (CEGL003042, G2?)
- *Pinus muricata* - *Arbutus menziesii* / *Vaccinium ovatum* Forest (CEGL003164, G2)
- *Pinus muricata* Forest [Placeholder] (CEGL003074, G2?)
- *Pinus radiata* Forest (CEGL003076, G1)

Alliances:

- *Cupressus goveniana* Shrubland Alliance (A.807)
- *Pinus muricata* Forest Alliance (A.121)
- *Pinus radiata* Forest Alliance (A.125)

SPATIAL CHARACTERISTICS

Size: Some occurrences of this system are large enough to map, especially those dominated by the pines; however, *Cupressus* is always too small to map. Todd Keeler-Wolf (pers. comm. 2005) and Julie Evens (pers. comm. 2005) recommend that Landfire should attempt to map where possible.

Adjacent Ecological Systems:

- California Maritime Chaparral (CES206.929)
- North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841)

DISTRIBUTION

Range: This system is found in scattered locations along California's entire coastline and onto the Channel Islands and possibly just into southern Oregon in southern Coos and Curry counties.

Divisions: 206:C

Nations: US

Subnations: CA, OR?

Map Zones: 2:C, 3:C, 4:C

USFS Ecomap Regions: 261B:CC, 263A:CC

TNC Ecoregions: 14:C, 15:C, 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722759#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid, G. Kittel
Version: 25 Apr 2006
Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West
ClassifResp: West

1015 CALIFORNIA COASTAL REDWOOD FOREST (CES206.921)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Long (>500 yrs) Persistence; Forest and Woodland (Treed); Toeslope/Valley Bottom; Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Intermediate Disturbance Interval; F-Patch/Low Intensity; Needle-Leaved Tree; *Sequoia sempervirens*

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Sideslope; Marine Sedimentary; Ustic

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2015; ESLF 4202; ESP 1015

CONCEPT

Summary: This system occurs from the Klamath Mountains south to Monterey Bay, California. At its northern extent, it transitions into southern examples of the coastal Sitka spruce and western hemlock systems that extend into coastal Alaska. However, the coastal redwood system generally can be found in areas of lower rainfall but still within the fog belt. In the northern portion, it occurs on upland slopes and in riparian zones and on riverine terraces that are flooded approximately every 50-100 years. In the southern portion of the range, annual precipitation may be as little as 50 cm, and the system is limited to coves and ravines. It is commonly found on moderately well-drained marine sediments (non-metamorphosed siltstones, sandstones, etc.). This system forms the tallest forests in North America, with individuals reaching 100 m high (tallest being 106-110 m [350-360 feet]). Typically, mature stands of *Sequoia sempervirens* produce a deep shade, so understories can be limited, but coarse woody debris from past disturbance can be quite large. *Pseudotsuga menziesii* is the common associate among the large trees. *Tsuga heterophylla* is found in old-growth stands, and *Lithocarpus densiflorus* occurs as a subcanopy in almost all stands (possibly as a result of fire suppression). The moist, coastal *Chamaecyparis lawsoniana* stands from southwestern Oregon and northwestern California, often mixed with *Sequoia sempervirens*, *Pseudotsuga menziesii*, or *Tsuga heterophylla*, are included in this system, as ecologically they function in the same way and have the same overall floristic composition. Shade-tolerant understory species include *Rubus parviflorus*, *Oxalis oregana*, *Aralia californica*, *Mahonia nervosa* (= *Berberis nervosa*), *Gaultheria shallon*, and many ferns, such as *Blechnum spicant*, *Polystichum* spp., and *Polypodium* spp. Historically, ground fires likely exposed mineral soil for redwood seed germination. Less frequent disturbance can result in increases in *Tsuga heterophylla* in northern occurrences, as it is sensitive to fire and is a decreaser with fire and flood. Fire suppression has tended to result in increasing abundance of *Lithocarpus densiflorus*, *Umbellularia californica*, *Alnus rubra*, *Arbutus menziesii*, and *Acer macrophyllum*; all respond favorably to fire, flood, wind and slides, becoming more abundant in areas of frequent disturbance.

Classification Comments: Stands dominated or codominated with *Chamaecyparis lawsoniana* that are within 25 km (15 miles) of the coast are part of either California Coastal Redwood Forest (CES206.921) (extreme southern Oregon and northern California) or North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841) (central and northern coastal Oregon). Stands in these areas may or may not have redwood or Sitka spruce present. Stands away from the coast and not on serpentine soils are considered part of North Pacific Maritime Mesic-Wet Douglas-Fir-Western Hemlock Forest (CES204.002).

Related Concepts:

- Port Orford-Cedar: 231 (Eyre 1980) Intersecting. Coastal Port Orford-cedar stands occur in this system.
- Redwood: 232 (Eyre 1980) Equivalent

DESCRIPTION

Dynamics: Recent studies are finding that many of these occurrences now have multi-tiered structures with tall-shrub layers and subcanopies of a variety of other trees, creating fuel ladders which can result in severe fires and increased mortality of *Sequoia sempervirens* when fires occur. In addition, Sillett and Van Pelt (2000) and Sillett and Bailey (2003) report that canopies of *Sequoia sempervirens* support significant biomass of epiphytic ferns and shrubs that are also contributing to an altered crown structure in these forests, which is impacting the fire regime.

MEMBERSHIP

Associations:

- *Abies concolor* - *Chamaecyparis lawsoniana* - *Pseudotsuga menziesii* / (*Mahonia nervosa*) / *Achlys triphylla* Forest (CEGL000041, G2)
- *Chamaecyparis lawsoniana* - *Tsuga heterophylla* / *Gaultheria shallon* - *Rhododendron macrophyllum* Forest (CEGL000045, G1)
- *Chamaecyparis lawsoniana* - *Tsuga heterophylla* / *Polystichum munitum* Forest (CEGL000046, G1)
- *Chamaecyparis lawsoniana* / *Vaccinium ovatum* Forest (CEGL000048, G1)
- *Sequoia sempervirens* - *Pseudotsuga menziesii* Forest (CEGL003173, GNR)
- *Sequoia sempervirens* / *Lithocarpus densiflorus* / *Vaccinium ovatum* Forest (CEGL003172, G3?)
- *Sequoia sempervirens* Forest [Placeholder] (CEGL003125, G3?)

Alliances:

- *Chamaecyparis lawsoniana* Forest Alliance (A.104)
- *Sequoia sempervirens* Forest Alliance (A.110)

SPATIAL CHARACTERISTICS**Adjacent Ecological Systems:**

- North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841)

DISTRIBUTION

Range: This system occurs from the Klamath Mountains south to Monterey Bay, California.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 2:C, 3:C, 4:C

USFS Ecomap Regions: 263A:CC, M242A:PP, M261A:CP, M261B:CC

TNC Ecoregions: 14:C, 15:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Sillett and Bailey 2003, Sillett and Van Pelt 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722760#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 25 Apr 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1031 CALIFORNIA MONTANE JEFFREY PINE-(PONDEROSA PINE) WOODLAND (CES206.918)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Mediterranean [Mediterranean Xeric-Oceanic]; F-Patch/Low Intensity; Needle-Leaved Tree; Broad-Leaved Evergreen Shrub; *Pinus jeffreyi*

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Acidic Soil; F-Patch/Medium Intensity; Graminoid

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2031; ESLF 4218; ESP 1031

CONCEPT

Summary: These forests are found on relatively xeric sites in mountains and plateaus from southern Oregon (600-1830 m [1800-5000 feet] elevation) south into the Sierra Nevada, throughout the Transverse Ranges of California, and into northern Baja California (1200-2740 m [4000-8300 feet]), Mexico. While the two dominant pines tend to segregate by soil fertility and temperature regimes, they may co-occur in certain areas (e.g., Modoc Plateau). These stands are more common on the east side of the Sierra Nevada, although they do occur on the west side. Stands are pure *Pinus jeffreyi*, *Pinus ponderosa*, or a mix of the two. Ponderosa pine and/or Jeffrey pine on the west slope of the Sierras with other conifer species are part of Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916). This system includes sites where *Pinus ponderosa* and/or *Pinus jeffreyi* are the predominant conifers and other tree species do not occur in high abundance, if at all. The exception to this is in southern California on the edges of the Mojave Desert where *Pinus monophylla* or *Juniperus californica* might occur in a subcanopy under *Pinus ponderosa* or *Pinus jeffreyi*. *Pinus jeffreyi* is more tolerant of colder, drier and poorer sites and replaces *Pinus ponderosa* as the dominant at higher elevations. In the north, *Pinus jeffreyi* may be replaced by *Pinus washoensis* (Carson Range and Warner Mountains). Throughout California, pure stands of ponderosa pine are relatively uncommon. Only on the Modoc Plateau do these pines co-occur in mixed stands. *Juniperus occidentalis* (both var. *australis* [in the south] and var. *occidentalis*) can co-occur in these stands but typically is not dominant. On moister and cooler sites, *Abies concolor* can be present in some stands. There can be well-developed shrub understories with strong Great Basin affinities; species can include *Artemisia tridentata*, *Purshia tridentata*, *Symphoricarpos rotundifolius* var. *parishii* (= *Symphoricarpos parishii*), *Arctostaphylos patula*, *Ceanothus cordulatus*, *Ceanothus prostratus*, *Ceanothus integerrimus*, *Chrysolepis sempervirens*, *Eriogonum wrightii*, *Quercus vacciniifolia*, and *Lupinus elatus*. *Cercocarpus ledifolius* is common on steeper slopes throughout the range. Historically, frequent localized ground fires maintained these systems. Stands of ponderosa pine on the east side of the Cascades transition into East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085), or Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030) north of the Warm Springs Reservation of central Oregon.

Classification Comments: *Pinus ponderosa* forests with *Calocedrus decurrens* found on the west side of the Sierra Nevada and in the Klamath Mountains are accommodated in Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916).

Related Concepts:

- Bitterbrush (210) (Shiflet 1994) Intersecting. SRM type includes stands of open *P. jeffreyi* over *Purshia tridentata*.
- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting. This ecological system includes Ponderosa pine in the Sierra Nevada of California.
- Jeffrey Pine: 247 (Eyre 1980) Broader
- Pacific Ponderosa Pine: 245 (Eyre 1980) Intersecting. Ponderosa pine stands in the Sierras and Klamaths are included in this ecological system.

MEMBERSHIP

Associations:

- *Pinus jeffreyi* - *Abies concolor* / *Symphoricarpos rotundifolius* / *Elymus elymoides* Woodland (CEGL008631, G3?)
- *Pinus jeffreyi* - *Pinus monophylla* Woodland (CEGL008629, GNR)
- *Pinus jeffreyi* - *Quercus chrysolepis* / *Arctostaphylos viscida* Woodland (CEGL003156, GNR)
- *Pinus jeffreyi* / *Arctostaphylos patula* Woodland (CEGL008627, G4?)
- *Pinus jeffreyi* / *Ceanothus cordulatus* Woodland (CEGL008628, G3?)
- *Pinus jeffreyi* / *Cercocarpus ledifolius* Woodland (CEGL008626, GNR)
- *Pinus jeffreyi* / *Chrysolepis sempervirens* Woodland (CEGL008625, G3?)
- *Pinus jeffreyi* / *Purshia tridentata* Woodland (CEGL008624, G3G4)
- *Pinus jeffreyi* / *Quercus vacciniifolia* Sierra Nevada Woodland (CEGL008714, GNR)
- *Pinus jeffreyi* Woodland [Placeholder] (CEGL002769, GNR)

Alliances:

- *Pinus jeffreyi* Woodland Alliance (A.541)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085)
- Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)

Adjacent Ecological System Comments: Stands of ponderosa pine on the east side of the Cascades transition into East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085), or Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030) north of the Warm Springs Reservation of central Oregon.

DISTRIBUTION

Range: This system occurs in foothills and mountains from southern Oregon south into the Sierra Nevada, throughout the Transverse Ranges of California and into northern Baja California, Mexico.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), NV, OR

Map Zones: 2:C, 3:P, 4:C, 5:P, 6:C, 7:C, 12:C, 13:?

USFS Ecomap Regions: 263A:CC, 341D:CC, 342B:CC, M242A:PP, M242B:PP, M242C:PP, M261A:CC, M261B:CC, M261C:CP, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 5:C, 12:C, 14:C, 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722763#references

Description Author: P. Comer, T. Keeler-Wolf, mod. G. Kittel

Version: 16 Jan 2009

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

1338 CENTRAL AND SOUTH TEXAS COASTAL FRINGE FOREST AND WOODLAND (CES203.464)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2338; ESLF 4144; ESP 1338

CONCEPT

Summary: This system includes oak-dominated forests woodlands, shrublands and savannas occurring on deep sands of the Pleistocene-aged Ingleside barrier-strandplain of the central Texas coast and the Holocene-aged eolian sand deposits of the South Texas Sand Sheet. Topography varies from larger dunes to smaller ridges and swales. Vegetation of this physiognomically variable and dynamic system primarily includes patches (mottes) of forests, woodlands and shrublands dominated by *Quercus fusiformis*. Associated species vary in a north/south manner across the range of this system. Other canopy species in the vicinity of Aransas National Wildlife Refuge, at the northern end of the range, include *Quercus marilandica*, *Quercus hemisphaerica*, *Persea borbonia*, and *Celtis laevigata*. In this area, understory species include *Ilex vomitoria*, *Smilax bona-nox*, *Vitis mustangensis*, and/or *Morella cerifera*. Other canopy species on the South Texas Sand Sheet, at the southern end of the range, include *Prosopis glandulosa* var. *glandulosa*, *Zanthoxylum hirsutum*, *Condalia hookeri*, *Lantana urticoides* (= *Lantana horrida*), *Ziziphus obtusifolia* var. *obtusifolia*, and a very few other species. Many of the species found in the northern parts of the range of this system are absent in the southern occurrences. A characteristic component of the sparse ground cover within the mottes and forests across the entire range is *Malvaviscus arboreus* var. *drummondii*. Canopy openings are similar in composition to surrounding grasslands. In addition to *Schizachyrium littorale*, other herbaceous species common in canopy openings across the range of this system include *Paspalum plicatulum*, *Paspalum monostachyum*, *Andropogon gerardii*, *Sorghastrum nutans*, *Muhlenbergia capillaris*, *Helianthemum georgianum*, *Croton argyranthemus*, and *Froelichia floridana*. Minor changes in drainage can cause major differences in species composition. On the Ingleside barrier-strandplain, while *Paspalum monostachyum* may dominate slightly lower areas, deeper swales are typically dominated by *Panicum virgatum*, *Spartina patens*, *Fimbristylis* spp., *Hydrocotyle bonariensis*, *Rhynchospora* spp., *Fuirena* spp., *Eleocharis* spp., and *Cyperus* spp.

Classification Comments: More data are needed to better define the boundary and distinction between this system and the surrounding grassland systems. The wooded component of this landscape is considered separately here due to its apparent long-term stability (>100 years) on the landscape, but some of the factors controlling its occurrence are not known. Live oak taxonomy follows that suggested by Nixon and Muller (1997), where all live oaks of coastal Texas southwest of the Brazos are considered *Quercus fusiformis*, likely introgressed with *Quercus virginiana* and/or the Mexican species *Quercus oleoides*. Though *Quercus fusiformis* is the dominant species across the range of this system, associated species vary in a north/south manner. There are probably more associations to be developed for this system.

Similar Ecological Systems:

- Central and Upper Texas Coast Dune and Coastal Grassland (CES203.465)
- South Texas Sand Sheet Grassland (CES301.538)

DESCRIPTION

Environment: This system occurs on deep sands of the Pleistocene-aged Ingleside barrier-strandplain and the Holocene-aged eolian sand deposits of the South Texas Sand Sheet. Topography varies from larger dunes to smaller ridges and swales.

Vegetation: Vegetation of this physiognomically variable and dynamic system primarily includes patches (mottes) of live oak-dominated forests, woodlands and shrublands in a matrix of savannas and grasslands. Closed canopy mottes typically occur within a grassland matrix but may become more extensive forests. In the northern range of this system, other canopy components may include *Quercus marilandica*, *Quercus hemisphaerica*, *Persea borbonia*, and *Celtis laevigata*. In this area, understory species include *Callicarpa americana*, *Ilex vomitoria*, *Smilax bona-nox*, *Vitis mustangensis*, and *Morella cerifera*. Characteristic components of the sparse ground cover within the mottes and forests include *Malvaviscus arboreus* var. *drummondii*, *Scleria triglomerata*, and *Erythrina herbacea*. A shrubland component of this system is also present in some areas and is sometimes extensive, consisting of a rhizomatous expression of sprouting live oaks referred to locally as "running live oak." This shrubland often appears to be a monoculture of shrubby *Quercus fusiformis* (1.5-6 m tall), but other species of the oak motte are also found here, including larger *Quercus fusiformis* trees, *Quercus hemisphaerica*, *Persea borbonia*, *Morella cerifera* (usually in swales), *Toxicodendron pubescens*, *Callicarpa americana*, *Vitis mustangensis*, *Ilex vomitoria*, *Erythrina herbacea*, and scattered *Quercus marilandica*. Small openings with *Sorghastrum nutans* hint at what is thought to have been the historical condition of these areas. These "running-live oak" thickets are thought to be a modified community that is the result of years of fire suppression and severe grazing pressures. Once this shrubland is established, it is difficult to restore the grassland community to these areas. Canopy openings are similar in composition to surrounding grasslands. In addition to *Schizachyrium littorale* and *Paspalum monostachyum*, common components include *Heteropogon contortus*, *Paspalum plicatulum*, *Trichoneura elegans*, *Andropogon gerardii*, *Sorghastrum nutans*, *Bothriochloa*

saccharoides, *Muhlenbergia capillaris*, *Dichantherium* spp., *Elionurus tripsacoides*, *Eriogonum multiflorum*, *Stylosanthes viscosa*, *Helianthemum georgianum*, *Croton glandulosus*, *Paspalum setaceum*, *Tradescantia humilis*, *Physalis cinerascens* var. *spathulifolia*, *Palafoxia hookeriana*, *Scleria triglomerata*, *Thelesperma nuecense*, *Lechea mucronata*, *Liatris elegans* var. *carizzana*, and *Froelichia floridana*. The oak mottes may have expanded at the expense of the oak savanna phase and become more dense in the absence of fire. A maritime component occurs on stabilized dunes composed of deep sand that stretch along San Antonio Bay. This component is characterized by a relatively tall forest (8-12 m) dominated by *Quercus fusiformis*. Other trees that reach the canopy include *Persea borbonia* and *Quercus hemisphaerica*. The midcanopy is dominated by *Persea borbonia* and *Quercus hemisphaerica* with *Celtis laevigata* and *Quercus marilandica* occurring as occasional associates. The understory includes *Ilex vomitoria* and *Callicarpa americana*. A characteristic member of the sparse ground layer is *Scleria triglomerata*. [continued in Other Comments]

Dynamics: Fire, climate, and edaphic factors all likely played a role historically in maintaining a more open structure in this vegetation. Historically, fire likely limited the development of woody cover. Likewise, edaphic conditions limited this system to deep sandy soils. Loss of these natural processes often results in a shift toward a more closed canopy and decrease in native grass cover. Threats to this system include fire suppression, coastal development, invasive exotics, and damage by vehicles.

MEMBERSHIP

Associations:

- *Fuirena scirpoidea* - *Fuirena longa* - *Rhynchospora microcarpa* - *Rhynchospora divergens* Herbaceous Vegetation (CEGL004952, G2)
- *Prosopis glandulosa* var. *glandulosa* - *Acacia greggii* - *Celtis pallida* / *Paspalum setaceum* - *Urochloa ciliatissima* Woodland (CEGL007786, G3?)
- *Prosopis glandulosa* var. *glandulosa* / *Colubrina texensis* - *Monarda fruticulosa* - *Waltheria indica* Woodland (CEGL007788, G3?)
- *Quercus fusiformis* - *Persea borbonia* Forest (CEGL002117, G2?)
- *Quercus fusiformis* - *Prosopis glandulosa* var. *glandulosa* / *Malvaviscus arboreus* var. *drummondii* Forest (CEGL007785, G3)
- *Schizachyrium littorale* - *Paspalum monostachyum* Herbaceous Vegetation (CEGL002207, G3?)
- *Schizachyrium littorale* - *Paspalum plicatulum* Texas Sand Sheet Herbaceous Vegetation (CEGL007821, GNR)
- *Spartina patens* - *Fimbristylis (caroliniana, castanea)* - (*Panicum virgatum*) Herbaceous Vegetation (CEGL007836, G2G3)

Alliances:

- *Fuirena scirpoidea* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Paspalum monostachyum* - (*Panicum amarum*, *Schizachyrium littorale*) Herbaceous Alliance (A.1200)
- *Prosopis glandulosa* Woodland Alliance (A.611)
- *Quercus fusiformis* Forest Alliance (A.1926)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)

SPATIAL CHARACTERISTICS

Spatial Summary: This system occurs in patches (mottes) or as linear occurrences on sand ridges and dunes.

Adjacent Ecological Systems:

- Central and Upper Texas Coast Dune and Coastal Grassland (CES203.465)
- South Texas Sand Sheet Grassland (CES301.538)

DISTRIBUTION

Range: This system is endemic to Texas. It is found within 10 km of the coast on deep sands of ancient Pleistocene strandplains (the Ingleside barrier-strandplain) at its northern extent and within a much greater distance from the coast (100 km) on the Holocene-aged eolian sand deposits of the South Texas Sand Sheet (primarily Kenedy and Brooks counties but extending into adjacent Jim Hogg, Hidalgo, and Willacy counties) at its southern extent.

Divisions: 203:C; 301:C

Nations: US

Subnations: TX

Map Zones: 36:C

USFS Ecomap Regions: 255D:CC

TNC Ecoregions: 30:C, 31:C

SOURCES

References: Comer et al. 2003, Nixon and Muller 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723122#references

Description Author: J. Teague and M. Pyne

Version: 23 Jan 2008

Concept Author: J. Teague, mod. J. Teague, L. Elliott, M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1320 CENTRAL AND SOUTHERN APPALACHIAN MONTANE OAK FOREST (CES202.596)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Unglaciaded; Broad-Leaved Deciduous Tree; *Quercus* - *Carya*

Non-Diagnostic Classifiers: Temperate; Oligotrophic Soil; Acidic Soil; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic; Consolidated; W-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2320; ESLF 4126; ESP 1320

CONCEPT

Summary: This generally oak-dominated system is found in the central and southern Appalachian Mountains. These high-elevation deciduous forests occur on exposed sites, including ridgelines and south- to west-facing slopes, mostly between 915 and 1372 m (3000-4500 feet) elevation, less commonly ranging up to 1680 m (5500 feet). In most associations attributed to this system, the soils are thin, weathered, nutrient-poor, low in organic matter, and acidic. The forests are dominated by *Quercus* spp. (most commonly *Quercus rubra* and *Quercus alba*), with the individuals often stunted or wind-flagged. *Castanea dentata* sprouts are also common, but the importance of chestnut in these forests has been dramatically altered by chestnut blight. *Ilex montana* and *Rhododendron prinophyllum* are characteristic shrubs.

Classification Comments: This system may be interfingering with the non-oak-dominated Southern Appalachian Northern Hardwood Forest (CES202.029), particularly between 1220 and 1525 m (4000-5000 feet) elevation. Above 1372 m (4500 feet) elevation and below spruce-fir communities, this system may be replaced on certain aspects by Southern Appalachian Northern Hardwood Forest (CES202.029).

Similar Ecological Systems:

- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Northern Hardwood Forest (CES202.029)--generally occupies more protected and moister aspects and becomes more prominent at upper elevations.
- Southern Appalachian Oak Forest (CES202.886)--occurs at lower elevations.

Related Concepts:

- Cumberland Highlands Forest (Evans 1991) Finer

DESCRIPTION

Environment: The habitat for this system includes high ridgelines and exposed upper slopes, primarily on south- to west-facing aspects, mostly between 915 and 1372 m (3000-4500 feet) elevation, and less commonly ranging up to 1680 m (5500 feet). It generally occurs as a transition between Southern Appalachian Oak Forest (CES202.886) and more mesic Southern Appalachian Northern Hardwood Forest (CES202.029) that occurs on less-exposed ridgetops and cooler, moister upper slopes (e.g., north- and east-facing aspects). At high elevations (e.g., above 1372 m [4500 feet]), this system is generally less common than Southern Appalachian Northern Hardwood Forest (CES202.029) since the habitat on most slopes at this elevation tends to favor those species adapted to a more mesic environment.

Vegetation: This system is dominated by *Quercus rubra* and, more rarely, *Quercus alba*. Often the trees are stunted or at least not as tall as they would be in other systems farther downslope. Species richness is low to moderate. Tree associates include *Prunus serotina*, *Betula lenta*, and *Betula alleghaniensis*. Typical small trees and shrubs include *Ilex montana*, *Hamamelis virginiana*, *Acer pensylvanicum*, *Menziesia pilosa*, *Rhododendron prinophyllum*, *Vaccinium pallidum*, *Corylus cornuta* var. *cornuta*, and sprouts of *Castanea dentata* <javascript:%20blank()>. The understory is usually dominated by ericaceous shrubs, but some communities are dominated by graminoid species or ferns. *Dennstaedtia punctilobula*, *Carex pensylvanica*, and *Deschampsia flexuosa* are common. Only rarely are the communities dominated by other herbs.

Dynamics: The communities of this system inhabit some of the most inhospitable parts of the Appalachians. Their occurrence on exposed high ridges means they are subject to frequent ice and wind storms in the summer and high winds throughout the year. This probably explains the forests' stunted appearance. In addition, lightning-caused fires may create ground fires that change the understory composition and inhibit some ericaceous shrub species in some areas. Presettlement forests are likely to have experienced lightning-caused fires every 40-60 years (Fleming et al. 2005). In some locations, fire exclusion and competing understory vegetation are a factor in poor oak regeneration, with replacement by more mesophytic species such as *Acer saccharum* (Fleming et al. 2005). Despite the high elevation, chestnut had been a fairly substantial component of this system and can still be seen as rotting stumps in the forest. In the northern Blue Ridge, gypsy moth infestations have caused widespread tree mortality and pose a threat to these systems (Fleming et al. 2005).

MEMBERSHIP

Associations:

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

- *Betula alleghaniensis* - *Quercus rubra* / *Acer (pensylvanicum, spicatum)* / *Dryopteris intermedia* - *Oclemena acuminata* Forest (CEGL008502, G3G4)
- *Betula alleghaniensis* / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest (CEGL008504, G2)
- *Caltha palustris* - *Impatiens capensis* - *Viola cucullata* Herbaceous Vegetation [Provisional] (CEGL006258, GNR)
- *Quercus alba* - *Quercus (rubra, prinus)* / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230, G5)
- *Quercus alba* / *Kalmia latifolia* Forest (CEGL007295, G2Q)
- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium spp.* / *Deschampsia flexuosa* Woodland (CEGL006134, G3G5)
- *Quercus rubra* - *Carya ovalis* / *Collinsonia canadensis* - *Impatiens pallida* Forest (CEGL008519, G3)
- *Quercus rubra* - *Carya ovata* / *Dennstaedtia punctilobula* - *Eupatorium purpureum* - (*Stachys nuttallii*) Forest (CEGL008520, G2)
- *Quercus rubra* - *Fraxinus americana* - *Acer saccharum* / *Actaea racemosa* - *Caulophyllum thalictroides* - *Collinsonia canadensis* Forest (CEGL004256, G2)
- *Quercus rubra* - *Quercus alba* - *Fraxinus americana* - *Carya (ovata, ovalis)* / *Actaea racemosa* Forest (CEGL008518, G3)
- *Quercus rubra* - *Quercus alba* / *Ilex montana* / *Dennstaedtia punctilobula* - *Carex pensylvanica* - *Deschampsia flexuosa* Forest (CEGL008506, G3?)
- *Quercus rubra* - *Quercus prinus* / *Deschampsia flexuosa* - *Danthonia compressa* - *Calamagrostis porteri* Woodland [Provisional] (CEGL004714, GNR)
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299, G4)
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300, G4)
- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima var. roanensis* Forest (CEGL007298, G2)
- *Quercus rubra* / *Ilex montana* - *Menziesia pilosa* / *Dennstaedtia punctilobula* Forest (CEGL008505, G3?)
- *Tilia americana* - *Fraxinus americana* / *Acer pensylvanicum* - *Ostrya virginiana* / *Parthenocissus quinquefolia* - *Impatiens pallida* Woodland (CEGL008528, G3)

Alliances:

- *Acer saccharum* - *Betula alleghaniensis* - (*Fagus grandifolia*) Forest Alliance (A.216)
- *Quercus alba* - (*Quercus rubra*, *Carya spp.*) Forest Alliance (A.239)
- *Quercus alba* Montane Forest Alliance (A.271)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Quercus rubra* Montane Forest Alliance (A.272)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

SPATIAL CHARACTERISTICS

Spatial Summary: Large patches that may be interfingered with Southern Appalachian Northern Hardwood Forest (CES202.029). Southern Appalachian Oak Forest (CES202.886) may occur downslope.

Size: Usually smaller than 10 acres but can be larger if the slope is broadly convex on the upper exposed slopes.

Adjacent Ecological Systems:

- Southern Appalachian Northern Hardwood Forest (CES202.029)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: This system often grades into Southern Appalachian Northern Hardwood Forest (CES202.029) as one proceeds upslope or around slope to less exposed areas. Below 915-1220 m (3000-4000 feet) this system can grade into Southern Appalachian Oak Forest (CES202.886).

DISTRIBUTION

Range: This system is found at higher elevations of the central and southern Appalachian Mountains, Virginia and West Virginia to Georgia. In Kentucky, this system is restricted to the Cumberland Mountains in the extreme southeastern corner of that state. In West Virginia, this is found in the Ridge and Valley.

Divisions: 202:C

Nations: US

Subnations: GA, KY, MD?, NC, SC, TN, VA, WV

Map Zones: 53:P, 57:C, 61:C

USFS Ecomap Regions: M221A:CC, M221B:CP, M221C:CC, M221D:CC

TNC Ecoregions: 50:C, 51:C, 59:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2005, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723012#references

Description Author: R. White, M. Pyne, R. Evans, M. Schafale, S.C. Gawler

Version: 22 May 2008

Concept Author: R. White, M. Pyne, R. Evans, M. Schafale, S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: Southeast

1350 CENTRAL AND SOUTHERN APPALACHIAN SPRUCE-FIR FOREST (CES202.028)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2350; ESLF 4253; ESP 1350

CONCEPT

Summary: This system consists of forests in the highest elevation zone of the Blue Ridge and parts of the Central Appalachians, generally dominated by *Picea rubens*, *Abies fraseri*, or by a mixture of spruce and fir. *Abies fraseri* is the constituent fir from Mount Rogers in Virginia southward. Examples occur above 1676 m (5500 feet) in the Southern Blue Ridge, but as low as 975 m (3200 feet) at the northern range in West Virginia, and may range up to the highest peaks. Elevation and orographic effects make the climate cool and wet, with heavy moisture input from fog as well as high rainfall. Strong winds, extreme cold, rime ice, and other extreme weather are periodically important.

Classification Comments: The border of this system with adjacent systems is often gradational. The non-forested systems that occur in the same elevational zone may have transition zones of open woody vegetation, though some have sharp borders. The transition to Southern Appalachian Northern Hardwood Forest (CES202.029) or other systems that adjoin at lower elevations is marked by a gradual shift in canopy dominance from conifers to hardwoods. In relatively undisturbed stands, the canopy composition and structure are the best way to determine the boundary of this system.

This system is similar to the spruce-fir systems of the northern Appalachians and the boreal forests but differs in having less frequent natural fire, having southern seasonal dynamics (shorter winters, less extreme cold temperatures, lack of long summer days), lacking a history of glaciation, and in a flora and fauna that has southern Appalachian endemics and lacks some characteristic northern species. High-elevation spruce-fir in West Virginia is placed in this system because its location well below the glacial boundary and presence of species of more southern affinity (e.g., *Rhododendron maximum* and *Vaccinium erythrocarpum*) differentiate it from the northern Appalachian system.

Similar Ecological Systems:

- Acadian-Appalachian Montane Spruce-Fir Forest (CES201.566)--occurs on the higher elevations of the northern Appalachians, mostly from New York northward but with a few disjunct patches in Pennsylvania.

DESCRIPTION

Environment: This system occurs at elevations typically above 1300 m (4300 feet), up to the highest peaks. It occurs on most of the landforms that are present in this elevational range; most sites are strongly exposed and convex in shape. Elevation and orographic effects make the climate cool and wet, with heavy moisture input from fog as well as high rainfall. Strong winds, extreme cold, rime ice, and other extreme weather are periodically important. Concentration of air pollutants has been implicated as an important anthropogenic stress in recent years. Soils are generally very rocky, with the matrix ranging from well-weathered parent material to organic deposits over boulders. Soils may be saturated for long periods from a combination of precipitation and seepage. Any kind of bedrock may be present, but most sites have erosion-resistant felsic igneous or metamorphic rocks.

Vegetation: Vegetation consists primarily of forests dominated by *Picea rubens*, *Abies fraseri*, or occasionally by *Sorbus americana*. *Betula alleghaniensis*, *Tsuga canadensis*, and *Quercus rubra* are the only other locally common canopy species. *Acer rubrum*, *Betula lenta*, *Magnolia acuminata*, and *Magnolia fraseri* may occur. Lower strata are most typically dominated by mosses, ferns or forbs, but a few associations have dense shrub layers of *Rhododendron catawbiense*, *Rhododendron maximum*, or *Vaccinium erythrocarpum*.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration on a fine scale. Despite the extreme climate, *Picea rubens* is long-lived (300-400 years). Both *Picea* and *Abies* seedlings are shade-tolerant, and advanced regeneration is important in stand dynamics. Natural disturbances include lightning fire, debris avalanches, wind events, and ice storms (White and Pickett 1985, Nicholas and Zedaker 1989). Occasional extreme wind events disturb larger patches on the most exposed slopes. There are hints of fir wave activity in the uncommon forests strongly dominated by *Abies fraseri*, but this is not well-developed. Fire is a very rare event under natural conditions, due to the wetness and limited flammability of the undergrowth, and return intervals have been estimated between 500-1000 years. If fires occur, they are likely to be catastrophic, because few of the species are at all fire-tolerant. Anthropogenic disturbances and stresses, beyond the effects of logging, have had major effects on dynamics in these systems in recent decades. An introduced insect, the balsam woolly adelgid (*Adelges piceae*), has killed almost all of the mature *Abies fraseri*. Saplings are not susceptible, resulting in many dense stands of young trees. It is unclear if these stands will establish seedlings before they too are killed. Stress caused by concentrated air pollutants on the mountain tops has been suggested as a cause of observed growth declines in *Picea rubens*. Earlier, unnatural fires fueled by logging slash turned large expanses of this system into grass-shrub-hardwood scrub (e.g., Dolly Sods) that has not recovered to conifer dominance after 90 years but that in places has recovered to northern hardwoods forests. Climatic changes may affect this systems severely. Global warming can be expected to raise the lower elevational limit and greatly reduce the land area available to this system.

MEMBERSHIP

Associations:

- (*Prunus pensylvanica*, *Sorbus americana*) - *Rubus* spp. Successional Shrubland (CEGL007293, GNA)
- *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (CEGL006308, G1)
- *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049, G1)
- *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Herbaceous Vegetation (CEGL006597, G3)
- *Chrysosplenium americanum* Herbaceous Vegetation (CEGL006193, G3G5)
- *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130, G1)
- *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Oxalis montana* - *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131, G2)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983, G1?)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Oxalis montana* - *Solidago glomerata* Forest (CEGL006256, G2)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest (CEGL006152, G2G3)
- *Picea rubens* / *Acer rubrum* / *Maianthemum canadense* - (*Lycopodium clavatum*, *Lycopodium dendroideum*) Forest (CEGL008501, G2)
- *Picea rubens* / *Ribes glandulosum* Forest (CEGL007128, G1)
- *Rubus canadensis* - (*Rubus idaeus ssp. strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893, GNA)

Alliances:

- *Abies fraseri* - *Picea rubens* Forest Alliance (A.136)
- *Chrysosplenium americanum* Saturated Herbaceous Alliance (A.1685)
- *Picea rubens* - *Betula alleghaniensis* Forest Alliance (A.384)
- *Picea rubens* Forest Alliance (A.138)
- *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance (A.930)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch to matrix system, dominating the highest mountain areas. Small patches may occur especially due to logging of the matrix/large-patch forest. Small-patch systems may be embedded.

Size: Generally covers most of the landscape in the limited areas at the tops of the highest mountain ranges. Natural patches range from hundreds to thousands of acres. A couple remnant patches of thousands of acres remain, while other intact patches are dozens of acres embedded in landscapes of degraded spruce-fir systems.

Adjacent Ecological Systems:

- High Allegheny Wetland (CES202.069)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Northern Hardwood Forest (CES202.029)
- Southern Appalachian Rocky Summit (CES202.327)

Adjacent Ecological System Comments: Bordered by Southern Appalachian Northern Hardwood Forest (CES202.029) or Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) at lower elevation. It may contain embedded small patches of Southern Appalachian Rocky Summit (CES202.327) and Southern Appalachian Grass and Shrub Bald (CES202.294). In addition, high-elevation wetlands may be present.

DISTRIBUTION

Range: This system ranges from the Balsam Mountains and Great Smoky Mountains of North Carolina and Tennessee northward to the mountains of western Virginia and eastern West Virginia.

Divisions: 202:C

Nations: US

Subnations: NC, TN, VA, WV

Map Zones: 57:C, 61:C

USFS Ecomap Regions: M221A:CC, M221B:CC, M221C:CC, M221D:CC

TNC Ecoregions: 51:C, 59:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2005, Lohman and Watson 1943, Nicholas and Zedaker 1989, White and Pickett 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722677#references

Description Author: M. Schafale and R. Evans, mod. S.C. Gawler and M. Pyne

Version: 23 Jul 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1014 CENTRAL AND SOUTHERN CALIFORNIA MIXED EVERGREEN WOODLAND (CES206.920)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Mediterranean [Mediterranean Xeric-Oceanic]; Xeric; Broad-Leaved Evergreen Tree

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Sideslope; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2014; ESLF 4201; ESP 1014

CONCEPT

Summary: This system occurs from Monterey, California, south across the outer Central Coast Ranges to crests of Peninsular Ranges. It can occur on metasediments and granitics. In much of this area, conifers are relatively infrequent, *Pinus coulteri* occurs in scattered stands and *Pseudotsuga macrocarpa* picks up in Transverse Ranges south to Mexico. Characteristic tree species include *Quercus chrysolepis*, *Quercus agrifolia*, *Quercus kelloggii*, *Umbellularia californica*, *Acer macrophyllum*, and *Arbutus menziesii*. Historic fire frequency was likely higher in this system than in similar systems to the north.

Related Concepts:

- California Coast Live Oak: 255 (Eyre 1980) Intersecting
- Canyon Live Oak: 249 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Pseudotsuga macrocarpa* - *Quercus chrysolepis* Forest [Placeholder] (CEGL003083, G3?)
- *Pseudotsuga macrocarpa* Forest (CEGL003084, G3?)

Alliances:

- *Pseudotsuga macrocarpa* - *Quercus chrysolepis* Forest Alliance (A.140)
- *Pseudotsuga macrocarpa* Forest Alliance (A.141)

DISTRIBUTION

Range: Occurs from Monterey, California, south across the outer Central Coast Ranges to crests of Peninsular Ranges, and in Transverse Ranges south to Mexico.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C, 5:?

USFS Ecomap Regions: 261B:CC, 262A:PP, 322A:PP

TNC Ecoregions: 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722761#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

1369 CENTRAL APPALACHIAN DRY OAK-PINE FOREST (CES202.591)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Acidic Soil; Pinus (strobos, rigida, echinata, virginiana) - Quercus prinus

Non-Diagnostic Classifiers: Lowland; Sideslope; Oligotrophic Soil; Mineral: W/ A-Horizon <10 cm; Loam Soil Texture; Sand Soil Texture; Ustic; F-Patch/Medium Intensity; W-Patch/Low Intensity; Needle-Leaved Tree; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2369; ESLF 4312; ESP 1369

CONCEPT

Summary: These oak and oak-pine forests cover large areas in the low- to mid-elevation Central Appalachians and middle Piedmont. The topography and landscape position range from rolling hills to steep slopes, with occasional occurrences on more level, ancient alluvial fans. In the highly dissected fall zone of Maryland and the District of Columbia, where the Piedmont and Coastal Plain meet, it is also found on dry knolls capped with Pleistocene- and Tertiary-aged fluvial cobble and gravel terrace deposits. Soils are typically coarse and infertile; they may be deep (on glacial deposits in the northern and terrace deposits in the southern parts of the system's range), or more commonly shallow, on rocky slopes of acidic rock (shale, sandstone, other acidic igneous or metamorphic rock). The well-drained soils and exposure create dry conditions. The forest is mostly closed-canopy but can include patches of more open woodlands. It is dominated by a variable mixture of dry-site oak and pine species, most typically *Quercus prinus*, *Pinus virginiana*, and *Pinus strobus*, but sometimes *Quercus alba* and/or *Quercus coccinea*. The system may include areas of oak forest, pine forest (usually small), and mixed oak-pine forest. Heath shrubs such as *Vaccinium pallidum*, *Gaylussacia baccata*, and *Kalmia latifolia* are common in the understory and often form a dense layer. Embedded submesic ravines and concave landforms support slightly more diverse forests characterized by mixtures of oaks, several hickories, *Cornus florida*, and sometimes *Liriodendron tulipifera*. Small hillslope pockets with impeded drainage may support small isolated wetlands with *Acer rubrum* and *Nyssa sylvatica* characteristic. Disturbance agents include fire, windthrow, and ice damage. Increased site disturbance generally leads to secondary forest vegetation with a greater proportion of *Pinus virginiana* and weedy hardwoods such as *Acer rubrum*.

Classification Comments: This system occurs in drier settings than the other matrix oak forest system of the division, i.e., Northeastern Interior Dry-Mesic Oak Forest (CES202.592). It includes the system formerly segregated as Southern Piedmont Dry Oak-Heath Forest (CES202.023). Its analog from central Virginia south is Southern Piedmont Dry Oak-(Pine) Forest (CES202.339), which has somewhat more southern floristics, for example, the typical presence of *Pinus taeda*.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--occurs to the west of this system (e.g., Allegheny Plateau), with the Allegheny Front as the dividing line.
- Central Appalachian Pine-Oak Rocky Woodland (CES202.600)
- Laurentian-Acadian Northern Pine-(Oak) Forest (CES201.719)--occurs to the north.
- Northeastern Interior Dry-Mesic Oak Forest (CES202.592)--more mesic.
- Northern Atlantic Coastal Plain Hardwood Forest (CES203.475)
- Southern Appalachian Oak Forest (CES202.886)--found south of Roanoke River in central Virginia (Blue Ridge/southern Appalachians only).
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)--occurs to the south; its northern limit overlaps slightly with the southern limit of this system but is farther out on the Coastal Plain.

DESCRIPTION

Environment: These oak and oak-pine forests cover large areas in the low- to mid-elevation central Appalachians and middle Piedmont. The topography and landscape position range from rolling hills to steep slopes, with occasional occurrences on more level, ancient alluvial fans. The soils are coarse and infertile; they may be deep (on glacial deposits in the northern part of the system's range), or more commonly shallow, on rocky slopes of acidic rock (shale, sandstone, other acidic igneous or metamorphic rock). The well-drained soils and exposure create dry conditions. In the highly dissected fall zone of Maryland and the District of Columbia, where the Piedmont and Coastal Plain meet, it is also found on dry knolls capped with Pleistocene- and Tertiary-aged fluvial cobble and gravel terrace deposits.

Vegetation: Stands of this forest system are mostly closed-canopied but can include more open woodlands. They are dominated by a variable mixture of dry-site oak and pine species, including *Quercus prinus*, *Pinus virginiana*, and *Pinus strobus*. The system may include areas of pine forest and mixed oak-pine forest. Heath shrubs such as *Vaccinium pallidum*, *Gaylussacia baccata*, and *Kalmia latifolia* are common in the understory. Within these forests, hillslope pockets with impeded drainage may support small isolated wetlands with *Acer rubrum* and *Nyssa sylvatica* characteristic.

Dynamics: Disturbance agents include fire, windthrow, and ice damage.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Quercus muehlenbergii* / *Carex platyphylla* Forest (CEGL006162, GNR)
- *Castanea dentata* - *Quercus prinus* Forest (CEGL007196, GH)
- *Fagus grandifolia* - *Betula lenta* - *Quercus (alba, rubra)* / *Carpinus caroliniana* Forest (CEGL006921, GNR)
- *Fagus grandifolia* - *Quercus (alba, velutina, prinus)* / *Kalmia latifolia* Forest (CEGL006919, G4)
- *Pinus rigida* - *Quercus (velutina, prinus)* Forest (CEGL006290, GNR)
- *Pinus strobus* - *Pinus resinosa* - *Pinus rigida* Forest (CEGL006259, G4G5)
- *Pinus strobus* - *Quercus (rubra, velutina)* - *Fagus grandifolia* Forest (CEGL006293, G5)
- *Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest (CEGL008539, G4)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Quercus (alba, rubra, velutina)* / *Cornus florida* / *Viburnum acerifolium* Forest (CEGL006336, G4G5)
- *Quercus (rubra, velutina, alba)* - *Betula lenta* - (*Pinus strobus*) Forest (CEGL006454, G4G5)
- *Quercus (velutina, alba)* / *Vaccinium pallidum* High Allegheny Plateau, Western Allegheny Plateau Forest (CEGL006018, GNR)
- *Quercus alba* - *Quercus (coccinea, velutina, prinus)* / *Gaylussacia baccata* Forest (CEGL008521, G5)
- *Quercus alba* - *Quercus prinus* - *Carya glabra* / *Cornus florida* / *Vaccinium pallidum* / *Carex pensylvanica* Forest (CEGL008515, G4)
- *Quercus prinus* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest (CEGL006299, G5)
- *Quercus prinus* - *Quercus (rubra, velutina)* / *Vaccinium angustifolium* Forest (CEGL006282, G5)
- *Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest (CEGL008523, G3G4)
- *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest (CEGL008524, G3?)
- *Tsuga canadensis* - *Quercus prinus* - *Betula lenta* Forest (CEGL006923, G3)

Alliances:

- *Castanea dentata* - *Quercus prinus* Forest Alliance (A.224)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Pinus strobus* - *Quercus (alba, rubra, velutina)* Forest Alliance (A.401)
- *Pinus strobus* - *Quercus (coccinea, prinus)* Forest Alliance (A.402)
- *Pinus strobus* Forest Alliance (A.128)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus alba* - (*Quercus rubra, Carya spp.*) Forest Alliance (A.239)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus prinus* - (*Quercus coccinea, Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus prinus* - *Quercus rubra* Forest Alliance (A.250)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch (at outer range) to matrix (in center of range) system that may cover extensive hillslopes and low ridges.

Adjacent Ecological Systems:

- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

DISTRIBUTION

Range: This system is found from central New England through Pennsylvania and south to the Roanoke River in southern Virginia. It is primarily Appalachian but overlaps slightly into the upper Piedmont and fall zone in Virginia, Maryland and the District of Columbia.

Divisions: 202:C

Nations: US

Subnations: CT, DC, MA, MD, ME, NH, NJ, NY, PA, RI, VA, VT, WV

Map Zones: 57:P, 60:C, 61:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 211F:CC, 211G:CC, 211I:CC, 221A:CC, 221B:CC, 221D:CC, 232A:CC, M221A:CC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Bf:CCC, M221Da:CCC

TNC Ecoregions: 52:C, 58:C, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723015#references

Description Author: S.C. Gawler, mod. J. Teague

Version: 05 Feb 2009

Concept Author: S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: East

1377 CENTRAL APPALACHIAN PINE-OAK ROCKY WOODLAND (CES202.600)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Woody-Herbaceous; Ridge/Summit/Upper Slope; Acidic Soil; *Pinus* (*strobus*, *rigida*, *echinata*, *virginiana*) - *Quercus prinus*

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Lowland; Temperate; Oligotrophic Soil; Shallow Soil; Ustic; Consolidated; F-Patch/Medium Intensity; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2377; ESLF 4320; ESP 1377

CONCEPT

Summary: This system encompasses open or sparsely wooded hilltops and outcrops or rocky slopes in the Central Appalachians, High Allegheny Plateau, and Lower New England / Northern Piedmont. It occurs mostly at lower elevations, but occasionally up to 1220 m (4000 feet) in West Virginia. The substrate rock is granitic or of other acidic lithology, including traprock in New England. The vegetation is patchy, with woodland as well as open portions. *Pinus rigida* and (within its range *Pinus virginiana* are diagnostic and often are mixed with xerophytic *Quercus* spp. and sprouts of *Castanea dentata*. Some areas have a fairly well-developed heath shrub layer, others a graminoid layer. Conditions are dry and nutrient-poor, and at many, if not most, sites, a history of fire is evident. In the Central Appalachians ecoregion, this system is sometimes found on sandy soils rather than rock.

Classification Comments: The northern extent of this system in central New England may overlap with Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571), which has *Picea* spp. prominent. The southern extent overlaps with Southern Appalachian Montane Pine Forest and Woodland (CES202.331), which is characterized by *Pinus pungens*. This type is differentiated from the similar Central Appalachian Dry Oak-Pine Forest (CES202.591) by its mosaic nature of wooded and open patches, as opposed to being merely a "thin forest."

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Central Appalachian Dry Oak-Pine Forest (CES202.591)
- Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)--is a restricted type characterized by the dominance (not just incidental occurrence) of *Pinus pungens*.

Related Concepts:

- Low-Elevation Acidic Outcrop Barrens (Fleming et al. 2005) Finer. This system in the southern portion of its range appears similar to Virginia's Low-Elevation Acidic Outcrop Barrens, which are noted to occur in the western Piedmont, Blue Ridge, Cumberland Mountains, and Ridge and Valley.

MEMBERSHIP

Associations:

- *Juniperus virginiana* - *Fraxinus americana* / *Danthonia spicata* - *Poa compressa* Woodland (CEGL006002, G2G3)
- *Kalmia latifolia* - *Gaylussacia baccata* - *Vaccinium (angustifolium, pallidum)* - *Menziesia pilosa* Shrubland (CEGL003939, G2)
- *Penstemon hirsutus* Sparse Vegetation (CEGL006535, GNR)
- *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland (CEGL008508, G1?)
- *Pinus resinosa* - *Quercus rubra* / *Sibbaldiopsis tridentata* / *Danthonia compressa* - *Antennaria virginica* / *Rhytidium rugosum* Woodland (CEGL003766, G1)
- *Pinus resinosa* / *Menziesia pilosa* / *Polypodium appalachianum* Forest (CEGL006108, G1)
- *Pinus rigida* - *Gaylussacia baccata* Shrubland (CEGL006079, G1)
- *Pinus rigida* - *Quercus coccinea* / *Vaccinium angustifolium* Woodland (CEGL006557, GNR)
- *Pinus rigida* / (*Quercus ilicifolia*) / *Photinia melanocarpa* / *Deschampsia flexuosa* Woodland (CEGL006116, GNR)
- *Pinus rigida* / *Corema conradii* Woodland (CEGL006154, G2)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Quercus ilicifolia* - *Prunus pumila* Shrubland (CEGL006121, GNR)
- *Quercus prinus* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland (CEGL008540, G3?)
- *Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland [Provisional] (CEGL008526, G3?)
- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134, G3G5)
- *Quercus rubra* - *Quercus prinus* - *Pinus strobus* / *Penstemon hirsutus* Woodland (CEGL006074, G3G5)
- *Schizachyrium scoparium* - *Danthonia spicata* - *Carex pensylvanica* / *Cladonia* spp. Herbaceous Vegetation (CEGL006544, GNR)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Central Appalachian Dwarf-shrubland (CEGL003958, G4G5)

- *Vaccinium angustifolium* - *Sorbus americana* / *Sibbaldiopsis tridentata* Dwarf-shrubland (CEGL005094, GNR)

Alliances:

- *Juniperus virginiana* Woodland Alliance (A.545)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- *Pinus (rigida, pungens, virginiana)* - *Quercus prinus* Woodland Alliance (A.677)
- *Pinus resinosa* - *Quercus rubra* Woodland Alliance (A.670)
- *Pinus resinosa* Forest Alliance (A.126)
- *Pinus rigida* Shrubland Alliance (A.809)
- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus ilicifolia* Shrubland Alliance (A.906)
- *Quercus prinus* - *Quercus coccinea* Woodland Alliance (A.622)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Schizachyrium scoparium* - (*Sporobolus cryptandrus*) Herbaceous Alliance (A.1224)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Dwarf-shrubland Alliance (A.1113)

DISTRIBUTION

Range: This system occurs from central New England south to Virginia and West Virginia, with peripheral occurrences in southeastern Ohio and easternmost Kentucky.

Divisions: 202:C

Nations: US

Subnations: CT, KY, MA, MD?, ME, NH, NJ, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 57:P, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 211F:CC, 221A:CC, 221B:CC, M211Bb:CCC, M211Bd:CCC, M211C:CC, M221A:CC, M221B:CP

TNC Ecoregions: 49:C, 50:C, 52:C, 59:C, 60:C, 61:C, 64:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723009#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

1361 CENTRAL ATLANTIC COASTAL PLAIN MARITIME FOREST (CES203.261)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2361; ESLF 4264; ESP 1361

CONCEPT

Summary: This system encompasses most woody vegetation of Atlantic Coast barrier islands and similar coastal strands, from Virginia Beach to central South Carolina (approximately the Cooper River where the true Sea Islands begin). It includes forests and shrublands whose structure and composition are influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast. Many examples of this system will include a component of *Quercus virginiana* or *Morella cerifera*. Also included are embedded freshwater depressional wetlands dominated by shrubs or small trees, such as *Cornus foemina*, *Persea palustris*, or *Salix caroliniana*. This system may experience less effects from fire than the equivalent Southern Atlantic Coastal Plain Maritime Forest (CES203.537).

Classification Comments: Southern Atlantic Coastal Plain Maritime Forest (CES203.537) occurs south of this system where barrier islands give way to sea islands (central South Carolina, approximately the Cooper River). Sea islands are wider and more extensive and their size may contribute to a greater ecological influence of fire resulting in a greater component of *Pinus elliotii* and *Pinus palustris* in maritime forests occurring there.

Northern Atlantic Coastal Plain Maritime Forest (CES203.302) occurs north of this system where deciduous trees come to prevail in the maritime forests [see Bellis (1992)] at approximately 37 degrees North latitude. There is a zone where both evergreen and deciduous forests occur (from approximately Nags Head, North Carolina, to Virginia Beach, Virginia), making the geographic boundary between the two systems somewhat unclear. The boundary of cold and warm offshore waters near Cape Hatteras may be an important climatic influence. This system is separated from Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273) by the dominance of woody vegetation, which corresponds to increased shelter from salt spray and increased stability of landforms.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Maritime Forest (CES203.302)--occurs to north.
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)
- Southern Atlantic Coastal Plain Maritime Forest (CES203.537)--occurs to south.

Related Concepts:

- Estuarine Fringe Loblolly Pine Forest (Schafale and Weakley 1990) Finer

DESCRIPTION

Environment: This system occurs on barrier islands, and on coastal strands where barrier islands are lacking, but seldom or never more than 2 or 3 miles from the ocean. Chronic salt spray is an important influence on vegetation structure and composition. However, the extent to which plant communities found in this system are shaped by salt spray varies. Examples closest to the coast are most likely to exhibit classic streamlined canopy shape due to spray sculpting and are less likely to support salt-intolerant plant species. Heavier salt spray often determines the boundary of this system with Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273). It requires some shelter from the ocean, in the form of high dunes or extensive sand flats, to develop. This system may occur from the top of interior dunes to wet swales. Soils are sandy, except for mucks in the wettest swamps. Soils range from excessively drained to permanently saturated. They are presumably low in nutrient-holding capacity, but input of nutrients in salt spray probably makes this system fairly fertile. Topography and apparent moisture may vary widely with little change in vegetation. The ocean's moderation of climate may be a significant factor in the character of this system. A number of plant species extend much farther north in the maritime forests than they do even a few miles inland.

Vegetation: Vegetation includes shrublands and forests. Shrubland dominated by salt-tolerant shrubs such as *Morella cerifera* and *Ilex vomitoria* or by stunted trees often occurs on the seaward edge where salt spray is heavier. Forests are typically dominated by a small set of salt-tolerant evergreen trees, mainly *Quercus virginiana*, *Quercus hemisphaerica*, *Pinus taeda*, and in the southern portions, *Sabal palmetto*. Rare forested wetlands are dominated by a variety of wetland tree species, including *Acer rubrum*, *Nyssa biflora*, and *Taxodium distichum*. A few of the most sheltered areas near the northern end of the range have forests with deciduous species such as *Fagus grandifolia* and *Quercus falcata*. Also included are embedded freshwater depressional wetlands dominated by shrubs or small trees, such as *Cornus foemina*, *Persea palustris*, or *Salix caroliniana*. Communities tend to be low in species richness, with all strata limited to a set of salt-tolerant species.

Dynamics: Maritime Forests occur in the most stable portions of barrier islands, but the maritime environment is still extremely dynamic. Geologic processes such as destruction of dunes by storms or slow movement of dunes may quickly or slowly destroy the environment this system needs. Sand movement may also create new sites for this system to occupy. Extreme salt spray or saltwater

flooding in storms can severely disturb vegetation, though it recovers if the landforms have not been altered. Fire may have naturally occurred infrequently in this system, but probably was not an important factor.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa biflora* - (*Liquidambar styraciflua*, *Fraxinus* sp.) Maritime Swamp Forest (CEGL004082, G2)
- *Cornus foemina* / *Berchemia scandens* Forest (CEGL007384, G1)
- *Morella cerifera* - *Prunus caroliniana* - *Zanthoxylum clava-herculis* Shrubland (CEGL004784, G2?)
- *Morella cerifera* / *Spartina patens* Shrubland (CEGL003839, G3G4)
- *Persea palustris* / *Morella cerifera* Maritime Forest (CEGL004635, G1)
- *Pinus taeda* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL006137, G3)
- *Quercus falcata* - *Pinus taeda* - (*Fagus grandifolia*, *Quercus nigra*) / *Persea palustris* Maritime Forest (CEGL007540, G1)
- *Quercus virginiana* - (*Ilex vomitoria*) Shrubland (CEGL003833, G3)
- *Quercus virginiana* - (*Pinus elliotii* var. *elliotii*, *Sabal palmetto*) / *Persea borbonia* - *Callicarpa americana* Forest (CEGL007032, G2)
- *Quercus virginiana* - *Quercus hemisphaerica* - *Pinus taeda* - *Quercus falcata* / *Persea palustris* Forest (CEGL007026, G2)
- *Quercus virginiana* - *Quercus hemisphaerica* - *Pinus taeda* / *Persea palustris* - *Ilex vomitoria* Forest (CEGL007027, G2)
- *Quercus virginiana* - *Quercus incana* Woodland (CEGL003750, G1)
- *Salix caroliniana* / *Sacciolepis striata* - *Boehmeria cylindrica* Woodland (CEGL004222, G2?)
- *Taxodium distichum* / *Cephalanthus occidentalis* / *Boehmeria cylindrica* - *Ceratophyllum muricatum* Maritime Swamp Forest (CEGL004079, G1)

Alliances:

- *Cornus foemina* Seasonally Flooded Forest Alliance (A.319)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Morella cerifera* Saturated Shrubland Alliance (A.1906)
- *Pinus taeda* - *Quercus nigra* Forest Alliance (A.406)
- *Pinus taeda* Saturated Forest Alliance (A.3009)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Quercus virginiana* - *Ilex vomitoria* - (*Morella cerifera*) Shrubland Alliance (A.785)
- *Quercus virginiana* - *Juniperus virginiana* - (*Sabal palmetto*) Woodland Alliance (A.479)
- *Salix caroliniana* Seasonally Flooded Woodland Alliance (A.1914)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

SPATIAL CHARACTERISTICS

Size: Occurs as medium to large patches. Patch size varies naturally with the character of barrier islands. South-facing islands tend to have more extensive dunes that provide shelter for extensive, contiguous maritime forests. East-facing islands tend to naturally have discontinuous dunes and only small patches sheltered enough to support maritime forests. Presettlement vegetation had a few occurrences of several thousand acres, but only a couple as large as 1000 acres remain. Most occurrences now are artificially bounded remnants or naturally small patches of tens to hundreds of acres.

Adjacent Ecological Systems:

- Southeastern Coastal Plain Interdunal Wetland (CES203.258)
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)
- Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

Adjacent Ecological System Comments: Always bordered by Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273) on the seaward side, and sometimes surrounded by them. May border tidal salt marshes on the back of barrier islands.

DISTRIBUTION

Range: This system is found from southernmost Virginia to central South Carolina (Cooper River).

Divisions: 203:C

Nations: US

Subnations: NC, SC, VA

Map Zones: 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232Ib:CPP

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Bellis 1992, Comer et al. 2003, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723225#references

Description Author: R. Evans

Version: 01 Feb 2007

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1363 CENTRAL INTERIOR HIGHLANDS DRY ACIDIC GLADE AND BARRENS (CES202.692)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous; Sedimentary Rock; Igneous Rock; Acidic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2363; ESLF 4305; ESP 1363

CONCEPT

Summary: This system is primarily found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions with small occurrences in northern Missouri. It occurs on flatrock outcrops and along moderate to steep slopes or valley walls of rivers along most aspects. Parent material includes chert, igneous and/or sandstone bedrock with well- to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter. Grasses such as *Schizachyrium scoparium* and *Sorghastrum nutans* dominate this system with stunted oak species (*Quercus stellata*, *Quercus marilandica*) and shrub species such as *Vaccinium* spp. occurring on variable depth soils. *Juniperus virginiana* can be present and often increases in the absence of fire. In Kentucky, this system includes both sandstone glades found in the Shawnee Hills (EPA Ecoregions 71a, 72h of Woods et al. (2002)), as well as shale glades found in the Knobs region (EPA Ecoregions 70d, 71c of Woods et al. (2002)), both in the Kentucky Interior Low Plateau. It also includes dry *Quercus stellata*-dominated barrens on Cretaceous-aged gravel substrates on the northern fringes of the Upper East Gulf Coastal Plain Ecoregion in southern Illinois and western Kentucky. This system is influenced by drought and infrequent to occasional fires. Prescribed fires help manage this system by maintaining an open glade structure.

Classification Comments: The occurrence of this system in TNC Ecoregion 43 is apparently confined to southern Illinois and/or Kentucky but does not include any portions of states to the south. Not all examples are acidic. Sometimes a layer of limestone or neutral shale occurs in these and thus are not acidic.

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Cumberland Sandstone Glade and Barrens (CES202.337)

Related Concepts:

- Sandstone Prairie (Evans 1991) Finer
- Shale Barrens (Evans 1991) Finer
- Shawnee Hills Sandstone Glade (Evans 1991) Finer
- Xeric Acidic Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system occurs on flat outcrops of sandstone rock and along moderate to steep slopes or valley walls of rivers along most aspects. Parent material includes chert, shale, igneous and/or sandstone bedrock with well- to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter.

Vegetation: Grasses such as *Schizachyrium scoparium* and *Sorghastrum nutans* dominate this system with stunted oak species (*Quercus stellata*, *Quercus marilandica*) and shrub species such as *Vaccinium* spp. occurring on variable depth soils. In the Shawnee Hills (EPA Ecoregions 71a, 72h of Woods et al. (2002)) of the Kentucky Interior Low Plateau, *Quercus marilandica*, *Quercus stellata*, and *Juniperus virginiana* are the dominant trees. *Ulmus alata* may be an understory component. Scattered shrubs, such as *Vaccinium arboreum* and *Chionanthus virginicus*, occur on the margins in patches of deeper soil. *Quercus prinus* may be present in the eastern part of the range. Some other plants that may be associated with these glades include *Andropogon ternarius*, *Danthonia spicata*, *Symphotrichum patens* var. *patentissimum*, *Silene rotundifolia*, *Pityopsis graminifolia* var. *latifolia*, *Coreopsis grandiflora*, *Silene regia*, *Coreopsis lanceolata*, *Croton willdenowii*, *Sedum nuttallianum*, *Selaginella rupestris*, and *Portulaca pilosa*.

Dynamics: This system is influenced by drought and infrequent to occasional fires. Prescribed fires help manage this system by maintaining an open glade structure.

MEMBERSHIP

Associations:

- (*Quercus stellata*, *Ulmus alata*) / *Schizachyrium scoparium* - *Symphotrichum patens* var. *patentissimum* Wooded Herbaceous Vegetation (CEGL007824, G2?)
- *Asplenium montanum* - *Heuchera parviflora* var. *parviflora* - *Silene rotundifolia* Sparse Vegetation (CEGL004392, G3G4)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Quercus falcata* - *Quercus (coccinea, stellata)* / *Schizachyrium scoparium* Woodland (CEGL004214, GNA)
- *Quercus marilandica* - *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Hypericum gentianoides* Wooded Herbaceous Vegetation (CEGL004062, G3?)

- *Quercus marilandica* / *Vaccinium arboreum* / *Danthonia spicata* Scrub Woodland (CEGL002425, G3G4)
- *Quercus prinus* / *Cornus florida* - *Amelanchier arborea* / *Pityopsis graminifolia* var. *latifolia* Woodland (CEGL003706, G2?)
- *Quercus prinus* / *Danthonia spicata* - *Silene caroliniana* Woodland (CEGL004439, G2?)
- *Quercus stellata* - (*Pinus echinata*) / *Vaccinium arboreum* / *Andropogon gerardii* - *Symphotrichum patens* var. *patentissimum* Wooded Herbaceous Vegetation (CEGL007814, G2?)
- *Quercus stellata* - *Quercus marilandica* - *Quercus velutina* - *Carya texana* / *Schizachyrium scoparium* Woodland (CEGL002149, G2G3)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* - *Silphium terebinthinaceum* Wooded Herbaceous Vegetation (CEGL005134, G1)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Wooded Herbaceous Vegetation (CEGL002391, G2G3)
- *Schizachyrium scoparium* - *Aristida dichotoma* - *Croton willdenowii* / Lichens Wooded Herbaceous Vegetation (CEGL002242, G3)
- *Schizachyrium scoparium* - *Sedum nuttallianum* - *Selaginella rupestris* - *Portulaca pilosa* / Lichens Wooded Herbaceous Vegetation (CEGL002244, G1G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Andropogon ternarius* - *Coreopsis grandiflora* Sandstone - Shale Herbaceous Vegetation (CEGL002212, G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Coreopsis lanceolata* - *Croton willdenowii* Wooded Herbaceous Vegetation (CEGL002243, G4?)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Danthonia spicata* - *Silene regia* Chert Herbaceous Vegetation (CEGL002211, G3)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus prinus* - *Quercus coccinea* Woodland Alliance (A.622)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions, with rare and limited occurrences in the Upper East Gulf Coastal Plain of Kentucky and Illinois.

Divisions: 202:C; 203:C

Nations: US

Subnations: AR, IL, IN, KY, MO, OK, TN?

Map Zones: 43:P, 44:C, 47:C, 48:C, 49:C, 53:C

USFS Ecomap Regions: 221E:CC, 223A:CC, 223B:CC, 223D:CC, 223G:CC, 231H:CC, 251C:CC

TNC Ecoregions: 36:C, 38:C, 39:C, 43:C, 44:C

SOURCES

References: Comer et al. 2003, Evans 1991, Heikens and Robertson 1995, Nelson 1985, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722967#references

Description Author: S. Menard and T. Nigh, mod. M. Pyne

Version: 22 May 2008

Concept Author: S. Menard and T. Nigh

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1016 COLORADO PLATEAU PINYON-JUNIPER WOODLAND (CES304.767)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Mesa; Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate [Temperate Xeric]; Aridic; *Pinus edulis*, *Juniperus osteosperma*

Non-Diagnostic Classifiers: Foothill(s); Piedmont; Plateau; Forest and Woodland (Treed); Sideslope; Alkaline Soil; Long Disturbance Interval; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2016; ESLF 4203; ESP 1016

CONCEPT

Summary: This ecological system occurs in dry mountains and foothills of the Colorado Plateau region including the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim, and east into the northwestern corner of New Mexico. It is typically found at lower elevations ranging from 1500-2440 m. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture, ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus osteosperma* dominate the tree canopy. In the southern portion of the Colorado Plateau in northern Arizona and northwestern New Mexico, *Juniperus monosperma* and hybrids of *Juniperus* spp. may dominate or codominate the tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus osteosperma* at higher elevations. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus gambelii*, *Bouteloua gracilis*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, *Poa secunda*, or *Poa fendleriana*. This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland (CES304.773) and Colorado Plateau shrubland systems where sympatric.

Similar Ecological Systems:

- Colorado Plateau Pinyon-Juniper Shrubland (CES304.766)
- Great Basin Pinyon-Juniper Woodland (CES304.773)
- Inter-Mountain Basins Juniper Savanna (CES304.782)

Related Concepts:

- Juniper - Pinyon Pine Woodland (504) (Shiflet 1994) Intersecting
- Juniper - Pinyon Woodland (412) (Shiflet 1994) Broader
- Pinyon - Juniper: 239 (Eyre 1980) Broader
- Rocky Mountain Juniper: 220 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Juniperus monosperma* - *Rhus trilobata* / *Schizachyrium scoparium* Woodland (CEGL002121, GNR)
- *Juniperus monosperma* / *Agave lechuguilla* Woodland (CEGL000703, G4)
- *Juniperus monosperma* / *Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma* / *Artemisia bigelovii* Woodland (CEGL000705, G3?)
- *Juniperus monosperma* / *Artemisia tridentata* Woodland (CEGL000706, G5)
- *Juniperus monosperma* / *Atriplex confertifolia* / *Achnatherum hymenoides* Woodland (CEGL000707, G3G4)
- *Juniperus monosperma* / *Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma* / *Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma* / *Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma* / *Bouteloua hirsuta* Woodland (CEGL000711, GNR)
- *Juniperus monosperma* / *Cercocarpus montanus* - *Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma* / *Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma* / *Ericameria nauseosa* - *Fallugia paradoxa* Woodland (CEGL000715, G4)
- *Juniperus monosperma* / *Fallugia paradoxa* / *Xanthoparmelia neoconspersa* Woodland (CEGL000716, G4)
- *Juniperus monosperma* / *Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Juniperus monosperma* / *Krascheninnikovia lanata* Woodland (CEGL000712, G3G4)
- *Juniperus monosperma* / *Nolina microcarpa* - *Agave lechuguilla* Woodland (CEGL000718, G4)
- *Juniperus monosperma* / *Quercus turbinella* Woodland (CEGL000720, GNR)
- *Juniperus monosperma* / *Quercus X pauciloba* Woodland (CEGL000721, G5)
- *Juniperus osteosperma* - *Juniperus monosperma* / Sparse Understory Woodland (CEGL000737, G4)

- *Juniperus osteosperma* / *Artemisia arbuscula* Woodland (CEGL002757, G5)
- *Juniperus osteosperma* / *Artemisia nova* / Rock Woodland (CEGL000729, G5)
- *Juniperus osteosperma* / *Artemisia nova* Woodland (CEGL000728, G5?)
- *Juniperus osteosperma* / *Artemisia tridentata* / *Achnatherum hymenoides* Woodland (CEGL000731, G4G5)
- *Juniperus osteosperma* / *Artemisia tridentata* ssp. *tridentata* Woodland (CEGL002360, GNR)
- *Juniperus osteosperma* / *Artemisia tridentata* ssp. *wyomingensis* Woodland (CEGL000730, G5?)
- *Juniperus osteosperma* / *Bouteloua gracilis* Woodland [Provisional] (CEGL002361, GNR)
- *Juniperus osteosperma* / *Bromus tectorum* Semi-natural Woodland (CEGL002817, GNA)
- *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Juniperus osteosperma* / *Cercocarpus ledifolius* Woodland (CEGL000734, G3?)
- *Juniperus osteosperma* / *Cercocarpus montanus* Woodland (CEGL000735, G2G3)
- *Juniperus osteosperma* / *Coleogyne ramosissima* Woodland [Provisional] (CEGL002909, GU)
- *Juniperus osteosperma* / *Hesperostipa comata* Wooded Herbaceous Vegetation (CEGL001489, G1Q)
- *Juniperus osteosperma* / *Hesperostipa comata* Woodland (CEGL002815, GNR)
- *Juniperus osteosperma* / *Hesperostipa neomexicana* Woodland (CEGL000740, GUQ)
- *Juniperus osteosperma* / *Leymus salinus* ssp. *salmonis* Wooded Herbaceous Vegetation (CEGL001488, G1Q)
- *Juniperus osteosperma* / *Leymus salinus* Woodland (CEGL003109, G3)
- *Juniperus osteosperma* / *Mahonia fremontii* Woodland (CEGL003965, GNR)
- *Juniperus osteosperma* / Mixed Shrubs Talus Woodland (CEGL002266, GNR)
- *Juniperus osteosperma* / *Pleuraphis jamesii* Woodland (CEGL002362, GNR)
- *Juniperus osteosperma* / *Pleuraphis mutica* Woodland (CEGL000736, G2)
- *Juniperus osteosperma* / *Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus osteosperma* / Sparse Understory Woodland (CEGL000732, GNRQ)
- *Juniperus osteosperma* / *Symphoricarpos oreophilus* Woodland (CEGL000741, GU)
- *Juniperus osteosperma* Wooded Shrubland [Placeholder] (CEGL002964, GNR)
- *Juniperus osteosperma* Woodland (CEGL000727, G5)
- *Juniperus scopulorum* - *Quercus gambelii* Woodland [Provisional] (CEGL002967, GNR)
- *Juniperus scopulorum* / *Artemisia tridentata* Woodland (CEGL000743, G3Q)
- *Pinus edulis* - (*Juniperus monosperma*) / *Bouteloua gracilis* Woodland (CEGL002151, G5?)
- *Pinus edulis* - (*Juniperus monosperma*, *Juniperus osteosperma*) / *Hesperostipa comata* Woodland (CEGL000797, G2?)
- *Pinus edulis* - (*Juniperus osteosperma*) / *Bouteloua gracilis* Woodland (CEGL000778, G5)
- *Pinus edulis* - (*Juniperus* spp.) / *Holodiscus dumosus* Woodland [Provisional] (CEGL002802, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Achnatherum hymenoides* Woodland (CEGL002364, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Amelanchier utahensis* Woodland (CEGL002329, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Arctostaphylos patula* Woodland (CEGL002939, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Artemisia bigelovii* Woodland (CEGL002118, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Artemisia nova* Woodland (CEGL002331, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Artemisia pygmaea* Woodland (CEGL002365, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Atriplex* spp. Woodland [Provisional] (CEGL002366, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Bromus tectorum* Semi-natural Woodland (CEGL002367, GNA)
- *Pinus edulis* - *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000779, G3)
- *Pinus edulis* - *Juniperus osteosperma* / *Cercocarpus ledifolius* Woodland (CEGL002940, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Coleogyne ramosissima* Woodland (CEGL000781, G3)
- *Pinus edulis* - *Juniperus osteosperma* / Cushion Plant Woodland (CEGL002375, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Ephedra torreyana* - *Artemisia bigelovii* Woodland (CEGL002369, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Ephedra viridis* Woodland (CEGL002370, G3)
- *Pinus edulis* - *Juniperus osteosperma* / *Hesperostipa neomexicana* Woodland (CEGL002371, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / Mixed Shrubs Talus Woodland (CEGL002328, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Opuntia fragilis* Woodland (CEGL002374, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Petradoria pumila* Woodland (CEGL002332, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Pleuraphis jamesii* Woodland (CEGL002379, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Psathyrostachys juncea* Semi-natural Woodland (CEGL002368, GNA)
- *Pinus edulis* - *Juniperus osteosperma* / *Purshia stansburiana* Woodland (CEGL000782, G4?)
- *Pinus edulis* - *Juniperus osteosperma* / *Purshia tridentata* Woodland (CEGL000789, G5)
- *Pinus edulis* - *Juniperus osteosperma* / *Quercus havardii* var. *tuckeri* Woodland (CEGL002497, G3?)
- *Pinus edulis* - *Juniperus osteosperma* / *Shepherdia rotundifolia* Woodland (CEGL002335, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / Sparse Understory Woodland (CEGL002148, G5)
- *Pinus edulis* - *Juniperus* spp. / *Artemisia tridentata* (ssp. *wyomingensis*, ssp. *vaseyana*) Woodland (CEGL000776, G5)
- *Pinus edulis* - *Juniperus* spp. / *Cercocarpus montanus* - Mixed Shrubs Woodland (CEGL000780, G5)
- *Pinus edulis* - *Juniperus* spp. / *Leymus salinus* Woodland (CEGL002340, G3G4)
- *Pinus edulis* - *Juniperus* spp. / *Poa fendleriana* Woodland (CEGL000787, G5)
- *Pinus edulis* - *Juniperus* spp. / *Pseudoroegneria spicata* Woodland (CEGL000788, G4)

- *Pinus edulis* - *Juniperus* spp. / *Quercus gambelii* Woodland (CEGL000791, G5)
- *Pinus edulis* - *Quercus arizonica* / *Rhus trilobata* Woodland (CEGL000790, G5?)
- *Pinus edulis* / *Achnatherum nelsonii* ssp. *dorei* Woodland (CEGL000796, G4)
- *Pinus edulis* / *Achnatherum scribneri* Woodland (CEGL000798, G3)
- *Pinus edulis* / *Andropogon hallii* Woodland (CEGL000774, G2)
- *Pinus edulis* / *Arctostaphylos pungens* Woodland (CEGL000775, G3)
- *Pinus edulis* / *Bouteloua curtipendula* Woodland (CEGL000777, GNR)
- *Pinus edulis* / *Festuca arizonica* Woodland (CEGL000783, G3)
- *Pinus edulis* / *Muhlenbergia pauciflora* Woodland (CEGL000785, G4)
- *Pinus edulis* / *Nolina microcarpa* Woodland (CEGL000786, GNR)
- *Pinus edulis* / *Quercus X pauciloba* Woodland (CEGL000793, G5)
- *Pinus edulis* / Rockland Woodland (CEGL000794, G5)
- *Pinus edulis* / Sparse Understory Forest (CEGL000795, G5)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)
- *Juniperus osteosperma* Wooded Herbaceous Alliance (A.1502)
- *Juniperus osteosperma* Wooded Shrubland Alliance (A.2541)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus edulis* Forest Alliance (A.135)

DISTRIBUTION

Range: This system occurs on dry mountains and foothills of the Colorado Plateau region from the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim, and east into the northwestern corner of New Mexico. It is typically found at lower elevations, ranging from 1500-2440 m. In Wyoming, it would occur only in the southern portions of mapzone 22.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, NM, UT, WY?

Map Zones: 13:P, 15:C, 16:C, 17:P, 22:C, 23:C, 24:C, 25:C, 28:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315H:CC, 321A:CC, 322A:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, 342E:CP, 342G:CC, M313A:CC, M313B:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M341B:CC, M341C:CC

TNC Ecoregions: 18:C, 19:C, 20:?

SOURCES

References: Baker and Kennedy 1985, Comer et al. 2003, Stuever and Hayden 1997a, Tuhy et al. 2002, West et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722905#references

Description Author: K.A. Schulz and M.S. Reid

Version: 25 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1017 COLUMBIA PLATEAU WESTERN JUNIPER WOODLAND AND SAVANNA (CES304.082)

CLASSIFIERS

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Aridic; *Juniperus occidentalis*

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2017; ESLF 4204; ESP 1017

CONCEPT

Summary: This woodland system is found along the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. Elevations range from under 200 m along the Columbia River in central Washington to over 1500 m. Generally soils are medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this system grades into relatively mesic forest or grassland habitats, these woodlands become restricted to rock outcrops or escarpments with excessively drained soils. *Pinus monophylla* is not present in this region, so *Juniperus occidentalis* is the only tree species, although *Pinus ponderosa* or *Pinus jeffreyi* may be present in some stands. *Cercocarpus ledifolius* may occasionally codominate. *Artemisia tridentata* is the most common shrub; others are *Purshia tridentata*, *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Ribes cereum*, and *Tetradymia* spp. Graminoids include *Carex filifolia*, *Festuca idahoensis*, *Poa secunda*, and *Pseudoroegneria spicata*. These woodlands are generally restricted to rocky areas where fire frequency is low. Throughout much of its range, fire exclusion and removal of fine fuels by grazing livestock have reduced fire frequency and allowed *Juniperus occidentalis* seedlings to colonize adjacent alluvial soils and expand into the shrub-steppe and grasslands. *Juniperus occidentalis* savanna may occur on the drier edges of the woodland where trees are intermingling with or invading the surrounding grasslands and where local edaphic or climatic conditions favor grasslands over shrublands.

Classification Comments: These woodlands are composed of two very different types. There are old-growth *Juniperus occidentalis* woodlands with trees and stands often over 1000 years old, with fairly well-spaced trees with rounded crowns. There are also large areas where juniper has expanded into sagebrush steppe and bunchgrass-dominated areas, with young, pointed-crowned trees growing closely together. Currently, these two very different types are about equally distributed across the landscape, with *Juniperus occidentalis* continuing to expand, either from the combination of fire exclusion, past grazing or climate change. *Juniperus occidentalis* has also expanded into *Pinus ponderosa* and *Pinus ponderosa* - *Pinus contorta* stands in central Oregon.

Related Concepts:

- Western Juniper - Big Sagebrush - Bluebunch Wheatgrass (107) (Shiflet 1994) Broader. Most of this SRM type corresponds to this ecological system.
- Western Juniper: 238 (Eyre 1980) Equivalent

MEMBERSHIP

Associations:

- *Juniperus occidentalis* / *Achnatherum thurberianum* Woodland (CEGL002635, G2)
- *Juniperus occidentalis* / *Artemisia arbuscula* / *Festuca idahoensis* Wooded Herbaceous Vegetation (CEGL001716, G3?)
- *Juniperus occidentalis* / *Artemisia arbuscula* / *Poa secunda* Wooded Herbaceous Vegetation (CEGL001715, G2)
- *Juniperus occidentalis* / *Artemisia arbuscula* / *Pseudoroegneria spicata* Wooded Herbaceous Vegetation (CEGL001717, G3G4)
- *Juniperus occidentalis* / *Artemisia rigida* / *Poa secunda* Wooded Herbaceous Vegetation (CEGL001718, G2G3)
- *Juniperus occidentalis* / *Artemisia tridentata* - *Purshia tridentata* Wooded Herbaceous Vegetation (CEGL001722, G4Q)
- *Juniperus occidentalis* / *Artemisia tridentata* / *Carex filifolia* Wooded Herbaceous Vegetation (CEGL001719, G1)
- *Juniperus occidentalis* / *Artemisia tridentata* / *Festuca idahoensis* Wooded Herbaceous Vegetation (CEGL001720, G3)
- *Juniperus occidentalis* / *Artemisia tridentata* / *Pseudoroegneria spicata* Wooded Herbaceous Vegetation (CEGL001721, G3G4)
- *Juniperus occidentalis* / *Artemisia tridentata* ssp. *vaseyana* Woodland (CEGL000723, G4)
- *Juniperus occidentalis* / *Cercocarpus ledifolius* - *Symphoricarpos oreophilus* Woodland (CEGL000726, G2)
- *Juniperus occidentalis* / *Cercocarpus ledifolius* / *Carex geyeri* Wooded Herbaceous Vegetation (CEGL000724, G2)
- *Juniperus occidentalis* / *Cercocarpus ledifolius* / *Leymus cinereus* Wooded Herbaceous Vegetation (CEGL001723, G1Q)
- *Juniperus occidentalis* / *Cercocarpus ledifolius* / *Pseudoroegneria spicata* Woodland (CEGL000725, G4)
- *Juniperus occidentalis* / *Festuca idahoensis* Wooded Herbaceous Vegetation (CEGL001724, G2)
- *Juniperus occidentalis* / *Poa secunda* - *Achnatherum occidentale* Wooded Herbaceous Vegetation (CEGL001727, GU)
- *Juniperus occidentalis* / *Pseudoroegneria spicata* Wooded Herbaceous Vegetation (CEGL001728, G3)
- *Juniperus occidentalis* / *Purshia tridentata* / *Festuca idahoensis* - *Pseudoroegneria spicata* Wooded Herbaceous Vegetation (CEGL002622, G3)

Alliances:

- *Juniperus occidentalis* Wooded Herbaceous Alliance (A.1500)
- *Juniperus occidentalis* Wooded Tall Herbaceous Alliance (A.1489)
- *Juniperus occidentalis* Woodland Alliance (A.535)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)

Adjacent Ecological System Comments: This system likely represents a transition between adjacent woodlands and Inter-Mountain Basins Big Sagebrush Steppe (CES304.778).

DISTRIBUTION

Range: This woodland and savanna system is found along the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. It also occurs in scattered localities of northern Nevada and south-central Washington.

Divisions: 304:C

Nations: US

Subnations: CA, ID, NV, OR, WA

Map Zones: 6:C, 7:C, 9:C, 12:C, 18:C

USFS Ecomap Regions: 331A:??, 341G:CC, 342B:CC, 342C:CC, 342D:CP, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M261A:C?, M261D:CC, M261E:CP, M261G:CC, M332G:CC

TNC Ecoregions: 6:C, 7:C, 68:C

SOURCES

References: Barbour and Major 1988, Holland and Keil 1995, Johnson and Clausnitzer 1992, Volland 1976, West et al. 1998, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.740155#references

Description Author: NatureServe Western Ecology Team

Version: 08 Sep 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1308 CROSTIMBERS OAK FOREST AND WOODLAND (CES205.682)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Loam Soil Texture; Sand Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2308; ESLF 4114; ESP 1308

CONCEPT

Summary: This system is primarily found within central Texas and Oklahoma, ranging north to southeastern Kansas, and east into eastern Oklahoma. It is distinct from the surrounding prairie by the higher density of tree species. The area consists of irregular plains with primarily sandy to loamy Ustalf soils that range from shallow to moderately deep. Rainfall can be moderate, but somewhat erratic, therefore moisture is often limiting during part of the growing season. Short, stunted *Quercus stellata* and *Quercus marilandica* characterize and dominate this system. Other species, such as *Carya texana*, *Carya cordiformis*, *Quercus prinoides*, *Ulmus crassifolia*, and *Quercus* spp., can also be present within their respective ranges. The understory often contains species typical of the surrounding prairies, in particular *Schizachyrium scoparium*. Shrubs such as *Rhus* spp. may also be present. Drought, grazing, and fire are the primary natural processes that affect this system. Overgrazing and conversion to agriculture, along with fire suppression, have led to the invasion of some areas by problematic brush species such as *Juniperus virginiana* and *Juniperus ashei* and *Prosopis glandulosa* farther south in Texas and Oklahoma. It has also led to decreases in native grass cover allowing for annual grasses and forbs to invade.

Classification Comments: This system currently includes woodlands of the Arbuckle Mountains, as well as a disjunct occurrence in the Wichita Mountains of Oklahoma comprised of the following member: *Quercus fusiformis* - (*Quercus stellata*) / *Schizachyrium scoparium* Granite Woodland (CEGL004937) (B. Hoagland pers. comm. 2005). This vegetation could also be considered an outlier of Edwards Plateau Limestone Savanna and Woodland (CES303.660).

Similar Ecological Systems:

- East-Central Texas Plains Post Oak Savanna and Woodland (CES205.679)

DESCRIPTION

Environment: This system is located on irregular plains comprised of sandy to loamy Ustalf soils. These soils range from shallow to moderately deep. Rainfall can be moderate, but sporadic, leading to periods of limiting moisture. This system also includes smaller patch woodlands dominated by *Quercus stellata* occurring over Mollisols and scattered throughout the limestone uplands of the eastern Edwards Plateau and Lampasas Cutplain of Texas, locally referred to as "Redlands" (B. Carr pers. comm. 2005).

Vegetation: This system is distinguished by the dominance of short, stunted *Quercus stellata* and *Quercus marilandica*. Other tree species, such as *Carya texana*, *Carya cordiformis*, *Quercus prinoides*, *Ulmus crassifolia*, and *Quercus* spp., can also be present within their respective ranges. The understory often contains species typical of the surrounding prairies, in particular, *Schizachyrium scoparium*. Shrubs such as *Rhus* spp. may also be present. Other species may include *Celtis laevigata*, *Cercis canadensis*, *Cotinus obovatus*, *Fraxinus texensis*, *Gleditsia triacanthos*, *Juniperus ashei*, *Juniperus virginiana* var. *virginiana*, *Quercus fusiformis*, *Quercus buckleyi*, *Quercus velutina*, *Ulmus alata*, and *Ulmus americana*.

Dynamics: Drought, grazing, and fire primarily influence this system. Overgrazing and conversion to agriculture have allowed for the invasion of eastern red-cedar (*Juniperus virginiana*), Ashe's juniper (*Juniperus ashei*), and honey mesquite (*Prosopis glandulosa*) in some areas. Decreases in native grass cover associated with overgrazing can also lead to an increase in invasive annual grasses and forbs.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Quercus muehlenbergii* / *Cotinus obovatus* Forest (CEGL004795, G2G3Q)
- *Quercus buckleyi* - *Fraxinus texensis* - *Quercus muehlenbergii* Forest (CEGL004912, G2G3)
- *Quercus stellata* - (*Ulmus crassifolia*) / *Sideroxylon lanuginosum* / *Nassella leucotricha* Paluxy Sands Woodland (CEGL004213, GNR)
- *Quercus stellata* - *Juniperus virginiana* var. *virginiana* Forest (CEGL004935, GNA)
- *Quercus stellata* - *Quercus marilandica* - (*Carya texana*) Forest (CEGL002074, G4)
- *Quercus stellata* - *Quercus marilandica* - *Carya texana* - (*Quercus shumardii*, *Quercus velutina*) Forest (CEGL002324, G3G5)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Woodland (CEGL002147, G4)
- *Quercus stellata* - *Ulmus alata* Forest (CEGL004546, GNR)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Nassella leucotricha* Herbaceous Vegetation (CEGL004070, GNR)
- *Schizachyrium scoparium* - *Lechea tenuifolia* - *Acalypha radians* Herbaceous Vegetation (CEGL004913, G2G3)

Alliances:

- *Juniperus virginiana* - *Quercus* (*stellata*, *velutina*, *marilandica*) Forest Alliance (A.383)

- *Quercus buckleyi* Forest Alliance (A.242)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus stellata* - *Quercus marilandica* Forest Alliance (A.253)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)

DISTRIBUTION

Range: This system is primarily found within central Texas and Oklahoma, with the northern extent reaching into southeastern Kansas in the Cross Timbers (EPA level III ecoregion 29). It also includes the "Lower Canadian Hills" and "Osage Cuestas" in eastern Oklahoma and the Edwards Plateau Woodland, Semiarid Edwards Plateau and Broken Red Plains of Texas (37e, 40b, 30a, 30d, 27i of EPA, respectively).

Divisions: 205:C; 303:C

Nations: US

Subnations: KS, OK, TX

Map Zones: 32:C, 34:P, 35:C, 38:?, 43:C, 44:C

USFS Ecomap Regions: 231G:CC, 251E:CC, 251H:CC, 255A:CC, 255B:C?, 255E:CC, 315C:CC, 315D:CC, 315G:CC, 321B:CC

TNC Ecoregions: 28:C, 29:C, 32:C, 33:C

SOURCES

References: Barbour and Billings 1988, Burns and Honkala 1990b, Comer et al. 2003, Griffith et al. 2004, Hoagland 2000, Hoagland pers. comm., Ricketts et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722977#references

Description Author: S. Menard and K. Kindscher, mod. J. Teague and M. Pyne

Version: 30 Oct 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1322 CROWLEY'S RIDGE MESIC LOESS SLOPE FOREST (CES203.079)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Unglaciaded

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Loess; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2322; ESLF 4128; ESP 1322

CONCEPT

Summary: This ecological system of mesic upland forests is confined to Crowley's Ridge, along the western side of the lower Mississippi River, extending from Missouri south into Arkansas. This vegetation and the ridge itself are very distinctive from that of the adjacent alluvial plain. The ridge is a remnant loess-capped feature rising from 30 m to over 60 m (100-200 feet) above the alluvial plain surface, to about 150 m (450 feet) above sea level. The base of the ridge is comprised of Tertiary substrates overlain by Quaternary alluvial deposits and capped with up to 15 m (50 feet) of Pleistocene loess. The system is generally comprised of mesic forests that occupy ravines between narrow, "finger" ridges and slopes in a highly dissected landscape. The sites tend to be more mesic than sites elsewhere in the southeastern United States. In many cases, these slopes and ravines provide habitat for plant species that are rare or absent from other parts of the alluvial plain (e.g., *Liriodendron tulipifera*, *Tilia americana*). Canopies are dominated by *Fagus grandifolia*, *Quercus alba*, and *Liriodendron tulipifera*, with many associates.

Classification Comments: This type does not include all forests across the entire extent of southern Crowley's Ridge; excluded are dry and dry-mesic forests, typically on west-facing slopes and ridgetops. This system is best developed on southern Crowley's Ridge where loess is most pronounced, and becomes much more isolated and rare on the ridge north of approximately Jonesboro, Arkansas. Conversely, dry-mesic oak and shortleaf pine communities are rare within this system, becoming dominant on western slopes and in the northern ridge, respectively. The vegetation may share some superficial similarities with types referred to as western mesophytic forests, but it is well-separated geographically from these. A similar ecological system is East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481) which occurs farther eastward and is restricted to the loess bluffs east of the Mississippi River. The vegetation of these areas is believed to share a great deal of overlap. They are recognized as distinct for now due to geographic separation; further work may suggest that these two systems should be merged. There are a number of state parks and small natural areas on Crowley's Ridge, including Village Creek State Park, Crowley's Ridge State Park, Wittsburg Natural Area and Chalk Bluff Natural Area (which is toward the northern end of the ridge). All of these have moderate to high-quality examples of this system.

Similar Ecological Systems:

- Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest (CES203.071)

Related Concepts:

- Mesic Loess/Glacial Till Forest (Nelson 2005) Broader

DESCRIPTION

Environment: These diverse-canopy forests occur in ravines in a highly dissected environment. The system is best expressed on southern Crowley's Ridge, Arkansas (Cross County south through Phillips County), with additional limited occurrences to the north, in undisturbed valleys and coves. Deep loessal soil is the most characteristic and diagnostic component of the environment of this system.

Vegetation: This system consists of forests that are typically dominated by beech, oaks and other hardwoods. Due to the apparent richness of the loessal soils, *Ostrya virginiana* is a particularly common species across many of the component community types.

Dynamics: These are stable, generally fire-sheltered forests, with relatively low fire frequency and intensity. There is presumably some natural disturbance from the effects of windstorms and collapse of the fragile loess.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Quercus* (*alba*, *rubra*) / *Acer barbatum* / *Asimina triloba* Forest (CEGL004072, G2G3)
- *Quercus* (*rubra*, *alba*, *velutina*) / *Acer barbatum* / *Asimina triloba* Forest (CEGL004069, G1G2)
- *Quercus alba* - *Quercus falcata* - *Quercus velutina* / *Ostrya virginiana* Forest (CEGL004068, G1G2)
- *Quercus alba* - *Quercus rubra* - *Acer saccharum* - *Carya cordiformis* / *Lindera benzoin* Forest (CEGL002058, G3?)

Alliances:

- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch to large patch.

DISTRIBUTION

Range: This system is endemic to Crowley's Ridge (Arkansas, Missouri), which is a distinctive landscape feature in the Mississippi River Alluvial Plain.

Divisions: 203:C

Nations: US

Subnations: AR, MO

Map Zones: 45:C

USFS Ecomap Regions: 234D:CC

TNC Ecoregions: 42:C

SOURCES

References: Clark 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 2005, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.798100#references

Description Author: T. Foti, D. Zollner, M. Pyne

Version: 04 Feb 2009

Concept Author: T. Foti, D. Zollner, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1510 CROWLEY'S RIDGE SAND FOREST (CES203.072)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Sand; Unglaciaded

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2510; ESLF 4332; ESP 1510

CONCEPT

Summary: This system of upland shortleaf pine - hardwood forests is confined to Crowley's Ridge on the western side of the Mississippi River. This vegetation is very distinctive from that of the adjacent alluvial plain, and the ridge itself also contrasts sharply with the adjacent alluvial plain. Crowley's Ridge is a remnant loess-capped feature rising from 30 m to over 60 m (100-200 feet) above the alluvial plain surface, to about 150 m (450 feet) above sea level. The base of the northern ridge is comprised of Tertiary substrates overlain by alluvial deposits and capped with generally thin layers of Pleistocene loess. The Pleistocene alluvial deposits are often sandy, and in a very limited area, there are outcrops of sandstone of uncertain origin. Forests on the ridgetops are dominated by *Pinus echinata* with varying amounts of *Quercus alba*, *Quercus rubra*, *Quercus falcata*, *Quercus stellata*, *Carya texana*, and *Quercus velutina*. Loess slopes and ravines are dominated by mesic or dry-mesic hardwood forests such as those of the southern ridge, but are of relatively limited extent.

Classification Comments: This system has been little studied, with the best description in Clark (1974). The presettlement and then-current distribution were mapped, and several sites were sampled. Clark classed the predominant community as Oak-Hickory-Pine, with shortleaf pine dominance ranging from 12-56% and combined white oak and post oak, the most abundant oaks, ranging from 24-60%.

Similar Ecological Systems:

- Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest (CES203.071)

Related Concepts:

- Dry-mesic Sand Forest (Nelson 2005) Intersecting

DESCRIPTION

Environment: These forests occur on sandy ridges and slopes in a dissected environment. The system is best expressed on northern Crowley's Ridge, but there are limited occurrences on the southern ridge as well, on sandy, exposed sites. They generally lie to the east of hydroxeric Pleistocene terrace flatwoods (now usually converted to cropland) that burned frequently. Those fires would have continued into these dry to dry-mesic forests, thereby increasing the fire frequency.

Vegetation: This system consists of forests that are typically dominated by shortleaf pine with oaks and other hardwoods. Depending upon local soil moisture and other factors, canopy oaks can vary from *Quercus stellata* and *Quercus falcata* on the driest sites to *Quercus alba* and other oaks on more mesic sites. Associated species in the subcanopy and understory vary along this moisture gradient as well (refer to association-level descriptions for more details).

Dynamics: These are fire-adapted forests. There is presumably some natural disturbance from the effects of windstorms and collapse of the fragile loess.

MEMBERSHIP

Associations:

- *Pinus echinata* Crowley's Ridge Forest [Provisional] (CEGL007919, G3G4)
- *Quercus stellata* - *Quercus falcata* / *Ostrya virginiana* Forest (CEGL004064, G1)

Alliances:

- *Pinus echinata* Forest Alliance (A.119)
- *Quercus falcata* Forest Alliance (A.243)

DISTRIBUTION

Range: This system is endemic to Crowley's Ridge in the Mississippi River Alluvial Plain of Arkansas and Missouri (Nelson 2005).

Divisions: 203:C

Nations: US

Subnations: AR, MO

Map Zones: 45:C

USFS Ecomap Regions: 234D:CC

TNC Ecoregions: 42:C

SOURCES

References: Clark 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 2005, Southeastern Ecology Working Group

n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798110#references

Description Author: T. Foti, D. Zollner, M. Pyne

Version: 04 Feb 2009

Concept Author: T. Foti, D. Zollner, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1018 EAST CASCADES MESIC MONTANE MIXED-CONIFER FOREST AND WOODLAND (CES204.086)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Long (>500 yrs) Persistence; Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Needle-Leaved Tree; *Abies grandis* - Mixed; *Tsuga heterophylla*, *Thuja plicata*; *Pseudotsuga menziesii*

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Mesotrophic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2018; ESLF 4205; ESP 1018

CONCEPT

Summary: This ecological system occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon. Elevations range from 610 to 1220 m (2000-4000 feet) in a very restricted range occupying less than 5% of the forested landscape in the east Cascades. This system is associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations. This ecological system is composed of variable montane coniferous forests typically below Pacific silver fir forests along the crest east of the Cascades. This system also includes montane forests along rivers and slopes, and in mesic "coves" which were historically protected from wildfires. Most occurrences of this system are dominated by a mix of *Pseudotsuga menziesii* with *Abies grandis* and/or *Tsuga heterophylla*. Several other conifers can dominate or codominate, including *Thuja plicata*, *Pinus contorta*, *Pinus monticola*, and *Larix occidentalis*. *Abies grandis* and other fire-sensitive, shade-tolerant species dominate forests on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by wildfire. They are very productive forests in the eastern Cascades which have been priority stands for timber production. *Mahonia nervosa*, *Linnaea borealis*, *Paxistima myrsinites*, *Acer circinatum*, *Spiraea betulifolia*, *Symphoricarpos hesperius*, *Cornus nuttallii*, *Rubus parviflorus*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure and contains species more restricted to the Cascades, for example, *Achlys triphylla*, *Anemone deltoidea*, and *Vancouveria hexandra*. Typically, stand-replacement fire-return intervals are 150-500 years with moderate-severity fire-return intervals of 50-100 years.

Classification Comments: Includes *Tsuga heterophylla* and *Thuja plicata* associations and moister *Abies grandis* associations in eastern Cascades.

Similar Ecological Systems:

- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Related Concepts:

- Grand Fir: 213 (Eyre 1980) Intersecting. Grand fir stands are an important component of this ecological system.
- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting
- Western Hemlock: 224 (Eyre 1980) Intersecting. 80% W. Hemlock
- Western Larch: 212 (Eyre 1980) Intersecting. Western larch stands are a seral component of this ecological system.
- Western Redcedar - Western Hemlock: 227 (Eyre 1980) Intersecting
- Western Redcedar: 228 (Eyre 1980) Intersecting

DESCRIPTION

Dynamics: Landfire VDDT models: R#MCONm Eastside mixed conifer moist (GF/DF) model is applied with stages A-B-E.

MEMBERSHIP

Associations:

- *Abies concolor* - *Pinus contorta* / *Carex pensylvanica* - *Achnatherum occidentale* Forest (CEGL000256, G3)
- *Abies grandis* - *Picea engelmannii* / *Maianthemum stellatum* Forest (CEGL000278, G2)
- *Abies grandis* - *Pseudotsuga menziesii* / *Trientalis borealis* ssp. *latifolia* Forest (CEGL000040, G3)
- *Abies grandis* - *Thuja plicata* / *Achlys triphylla* Forest (CEGL002669, G2)
- *Abies grandis* - *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000286, G2)
- *Abies grandis* / *Acer circinatum* Forest (CEGL000266, G4)
- *Abies grandis* / *Achlys triphylla* Forest (CEGL000268, G3)
- *Abies grandis* / *Arctostaphylos nevadensis* Woodland (CEGL000915, G2G3)
- *Abies grandis* / *Chrysolepis chrysophylla* Forest (CEGL000038, G1)
- *Abies grandis* / *Polemonium pulcherrimum* Forest (CEGL000039, G3)
- *Abies grandis* / *Symphoricarpos albus* Forest (CEGL000282, G3?)
- *Abies grandis* / *Vaccinium membranaceum* - *Achlys triphylla* Forest (CEGL000291, G2G3)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies grandis* Forest Alliance (A.153)
- *Abies grandis* Woodland Alliance (A.558)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)
- North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)
- North Pacific Mountain Hemlock Forest (CES204.838)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)
- Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

Adjacent Ecological System Comments: This system lies between and interfingers with the higher North Pacific Mountain Hemlock Forest (CES204.838), North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097) or Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830) and the lower Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805). Westward in the Columbia River Gorge, this system merges with North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001).

DISTRIBUTION

Range: This ecological system occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 7:C, 9:P

USFS Ecomap Regions: 242A:CC, 342H:CP, 342I:CC, M242B:CC, M242C:CC, M242D:CC, M261G:CC

TNC Ecoregions: 4:C

SOURCES

References: Hessburg et al. 1999, Hessburg et al. 2000, Lillybridge et al. 1995, Topik 1989, Topik et al. 1988, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.740349#references

Description Author: G. Kittel, mod. C. Chappell and M.S. Reid

Version: 31 Mar 2005

Concept Author: R. Crawford

Stakeholders: Canada, West

ClassifResp: West

1060 EAST CASCADES OAK-PONDEROSA PINE FOREST AND WOODLAND (CES204.085)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; F-Patch/Medium Intensity

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Forest and Woodland (Treed); Temperate [Temperate Continental]; Circumneutral Soil; F-Landscape/Low Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2060; ESLF 4301; ESP 1060

CONCEPT

Summary: This narrowly restricted ecological system appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Elevations range from 460 to 1920 m. Most occurrences of this system are dominated by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees characterize parts of this system. Clonal *Quercus garryana* can create dense patches across a grassy landscape or can dominate open woodlands or savannas. The understory may include dense stands of shrubs or, more often, be dominated by grasses, sedges or forbs. Shrub-steppe shrubs may be prominent in some stands and create a distinct tree / shrub / sparse grassland habitat, including *Purshia tridentata*, *Artemisia tridentata*, *Artemisia nova*, and *Chrysothamnus viscidiflorus*. Understories are generally dominated by herbaceous species, especially graminoids. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Carex inops*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and *Poa bulbosa*. These woodlands occur at the lower treeline/ecotone between *Artemisia* spp. or *Purshia tridentata* steppe or shrubland and *Pinus ponderosa* and/or *Pseudotsuga menziesii* forests or woodlands. In the Columbia River Gorge, this system appears as small to large patches in transitional areas in the Little White Salmon and White Salmon river drainages in Washington and Hood River, Rock Creek, Moiser Creek, Mill Creek, Threemile Creek, Fifteen Mile Creek, and White River drainages in Oregon. *Quercus garryana* can create dense patches often associated with grassland or shrubland balds within a closed *Pseudotsuga menziesii* forest landscape. Commonly the understory is shrubby and composed of *Ceanothus integerrimus*, *Holodiscus discolor*, *Symphoricarpos albus*, and *Toxicodendron diversilobum*. Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. In the past, most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Soil drought plays a role, maintaining an open tree canopy in part of this dry woodland habitat.

Classification Comments: Mapping this system presents a typical scale problem. Areas of pure ponderosa pine are found directly adjacent to oak stands. This system is a matrix type with stands of *Pinus ponderosa*, *Quercus garryana*, *Pinus ponderosa* - (*Pseudotsuga menziesii*) - *Quercus garryana*; still need to get a mapping protocol and concept to distinguish *Pseudotsuga menziesii* with *Quercus garryana* patches in the east gorge White Salmon. The Little White Salmon drainage near Augspurgen Mountain is the transition area between North Pacific Oak Woodland (CES204.852) and this system (Dog Mountain is the westernmost in Washington).

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Broader
- Oregon White Oak: 233 (Eyre 1980) Broader

DESCRIPTION

Dynamics: Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. Most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Landfire VDDT models: #R OAP1 Oregon White Oak-Ponderosa Pine model describes general successional pathways treating drier pine succession separate from more mesic Douglas-fir pathways.

MEMBERSHIP

Associations:

- *Pinus ponderosa* - *Quercus garryana* / *Balsamorhiza sagittata* Woodland (CEGL000881, G2)
- *Pinus ponderosa* - *Quercus garryana* / *Carex geyeri* Woodland (CEGL000882, G2G3)
- *Pinus ponderosa* - *Quercus garryana* / *Purshia tridentata* Woodland (CEGL000883, G3)
- *Pinus ponderosa* - *Quercus garryana* / *Symphoricarpos albus* Woodland (CEGL000884, G2G3)

- *Pseudotsuga menziesii* - *Quercus garryana* / *Symphoricarpos albus* Woodland (CEGL000929, G2G3)
- *Quercus garryana* / *Carex geyeri* Woodland (CEGL000549, G1G2)
- *Quercus garryana* / *Elymus glaucus* Woodland (CEGL000550, G1G2)
- *Quercus garryana* / *Festuca idahoensis* Woodland (CEGL000551, G1?)
- *Quercus garryana* / *Pseudoroegneria spicata* Woodland (CEGL000552, G1G2)
- *Quercus garryana* / *Symphoricarpos albus* Woodland (CEGL000553, G2G3)

Alliances:

- *Pinus ponderosa* - *Quercus garryana* Woodland Alliance (A.689)
- *Pseudotsuga menziesii* - *Quercus garryana* Woodland Alliance (A.688)
- *Quercus garryana* Woodland Alliance (A.630)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- California Montane Jeffrey Pine-(Ponderosa Pine) Woodland (CES206.918)

DISTRIBUTION

Range: This narrowly restricted ecological system appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Disjunct occurrences in Klamath and Siskiyou counties, Oregon, have more sagebrush and bitterbrush in the understory, along with other shrubs.

Divisions: 204:C; 304:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 7:C, 8:C

USFS Ecomap Regions: 342H:CC, 342I:CC, M242B:C?, M242C:CC, M242D:CC

TNC Ecoregions: 4:C, 6:C

SOURCES

References: John and Tart 1986, Lillybridge et al. 1995, Topik et al. 1988, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.740345#references

Description Author: G. Kittel, mod. C. Chappell and M.S. Reid

Version: 23 Jan 2006

Concept Author: R. Crawford

Stakeholders: Canada, West

ClassifResp: West

1372 EAST GULF COASTAL PLAIN INTERIOR SHORTLEAF PINE-OAK FOREST (CES203.506)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Short Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2372; ESLF 4315; ESP 1372

CONCEPT

Summary: This forested system of the East Gulf Coastal Plain occurs most extensively on generally rolling uplands north of the range of *Pinus palustris*. It was the historical matrix in large areas of the region in Alabama and Mississippi, particularly between about 32 degrees 30 minutes N latitude (the approximate local northern limit of the historic range of *Pinus palustris*), and about 35 degrees N latitude (the approximate limit where relatively extensive examples of *Pinus echinata* are replaced by predominantly hardwood-dominated systems, although isolated examples of this system may occur both north and south of these boundaries in limited areas. Stands tend to occur on generally well-drained sandy or clayey soils with dry to dry-mesic moisture regimes. *Pinus echinata* is the dominant pine species of the generalized "dry and dry-mesic oak-pine" forest type in the Gulf Coastal Plain (White and Lloyd 1998) and is the most characteristic floristic component of this system. The actual amount of *Pinus echinata* present varies based on a number of factors, but intact examples of this system often include stands that are dominated by *Pinus echinata* grading into stands with a mixture of upland hardwoods. Locally, on mid to lower slopes, *Pinus taeda* may be a component, extending further upslope in the absence of fire. Fire is possibly the most important natural process affecting the floristic composition and vegetation structure of this system, although fire-return intervals are lower than those associated with the East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496). *Pinus echinata* may have difficulty replacing itself in the absence of fire, particularly on sites other than the driest ones (Eyre 1980). Landers (1989) inferred a fire-return interval of 10 times per century for *Pinus echinata*. Local topographic conditions affecting natural fire compartment size generally lend themselves to this fire frequency, although some examples may have more frequent fires and some less than this generalized value. Where fire is most frequent the system may develop a relatively pure canopy of *Pinus echinata* typified by a very open woodland structure with scattered overstory trees and an herbaceous-dominated understory; such examples are rare on the modern landscape. More typical are areas in which *Quercus* spp., *Carya* spp., *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Acer* spp., and *Nyssa sylvatica* have become prominent in the midstory and even overstory and in which herbaceous patches are rare. Although the general distributional boundaries described above indicate where this system formed an historical landscape matrix, smaller patches of the system may also be present in limited areas both north and south of these boundaries. Although Lawson (1990) maps the native range of shortleaf throughout a relatively large area of western Tennessee, the actual distribution of the species appears to be much more confined and almost absent from the Coastal Plain (Chester 1990); when present, it occurs in only small stands on dry southwestern aspects (C. Nordman pers comm.).

Classification Comments: The range of this system overlaps with East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483) in the Fall Line Hills ecoregion (65i) of Alabama and in the Southern Hilly Gulf Coastal Plain ecoregion (65d) of Mississippi and may overlap to some degree with Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560) as well. In parts of the overlapping range (including the Oakmulgee Ranger District of the Talladega National Forest), these types occur in a mosaic which is difficult to interpret environmentally and ecologically (A. Schotz pers. comm.). East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482) replaces this system along the northern and northwestern boundary in Tennessee.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)
- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)
- Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)

DESCRIPTION

Environment: The core distribution of this system lies between about 32 degrees 30 minutes N latitude and about 35 degrees N latitude; more localized occurrences may be found as small patches both north and south of these boundaries embedded in other systems. The belted character of this region, in the form of inner lowlands and cuestas and other low-ridge landforms (Bowman 1911, Fenneman 1938), the associated diversity of soil types, and differences in settlement history appear to account for the importance of shortleaf pine in the Gulf Coast region when compared to the Atlantic Coastal Plain (White and Lloyd 1998). Cuestas and other hills create strong environmental gradients which, coupled with soil characteristics, promote a variety of mixed pine and pine-hardwood vegetation in this region; local differences in topography, parent material, and exposure influence site characteristics, resulting in numerous different plant communities. This system primarily occupies the dry and dry-mesic portion of regional moisture gradients. Wide variation in vegetation composition across this gradient is also strongly related to fire frequency and intensity (White and Lloyd 1998). Generally to the south and southeast it grades into longleaf pine-dominated system(s), and to the north into

hardwood-dominated ones.

Vegetation: This system is primarily composed of forest or woodland vegetation dominated by trees generally up to about 33 m (100 feet) in height. Individual patches or stands may be predominantly evergreen, predominantly deciduous, or mixed. The canopy will be primarily relatively closed (greater than 60%), but some areas may exhibit lower canopy closures, either as a result of repeated surface fires, timber removal, or other disturbances. This system includes the Shortleaf Pine-Oak Cover Type (Eyre 1980) as expressed in the Upper East Gulf Coastal Plain. In contrast to most of the Atlantic Coastal Plain, *Pinus echinata* is a much more ecologically and economically important species across much of the Gulf Coastal Plain, both presently and historically (Mohr 1901, Harper 1920, 1943). The actual vegetation composition depends greatly upon local site conditions, ongoing management, and disturbance history of an area. Locally, the species that comprise the system are strongly influenced by soil, slope, and aspect (Eyre 1980). Examples may be composed of various mixtures of pines and hardwoods. Although the actual amount of *Pinus echinata* present varies based on a number of factors, intact examples of this system often include stands that are dominated by *Pinus echinata* grading into stands with a mixture of upland hardwoods. Where fire is most frequent the system may develop a relatively pure canopy of shortleaf typified by a very open woodland structure with scattered overstory trees and an herbaceous-dominated understory; such examples are rare on the modern landscape. More typical are areas in which *Pinus echinata* trees occur in mixture with *Quercus* spp. and *Carya* spp. Many such areas also support *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Acer* spp., and *Nyssa sylvatica*, and even *Pinus taeda*. When these species are prominent in the overstory and midstory it is generally thought to be indicative of fire suppression. *Quercus alba* and *Quercus stellata* are common hardwood components, particularly in later-seral or higher-quality stands, typically combined with *Carya alba*, *Carya pallida*, *Carya glabra*, and other *Carya* spp. Higher-quality areas may exhibit somewhat open canopies. Other tree species indicative of recent disturbance and/or fire suppression are *Quercus nigra*, *Quercus hemisphaerica*, *Quercus falcata*, and *Quercus velutina*. Subcanopies will typically contain *Cornus florida*, *Oxydendrum arboreum*, *Nyssa sylvatica*, and *Liquidambar styraciflua*. The patchy shrub layer includes *Vaccinium arboreum*, *Vaccinium elliotii*, *Asimina parviflora*, *Aesculus pavia*, *Hamamelis virginiana*, *Calliandra americana*, *Hypericum hypericoides*, *Gelsemium sempervirens*, *Vitis rotundifolia*, and *Arundinaria gigantea*. Herbs, which may be few and sparse, include *Cnidioscolus stimulosus*, *Indigofera caroliniana*, *Aristolochia serpentaria*, *Piptochaetium avenaceum*, *Chasmanthium sessiliflorum*, *Elephantopus tomentosus*, *Hexastylis arifolia*, *Iris verna*, *Rudbeckia fulgida*, *Solidago juncea*, *Euphorbia pubentissima*, *Mitchella repens*, and *Desmodium* spp. (NatureServe Ecology unpubl. data 2003). Other associates may include *Smilax* spp., *Symphytotrichum* spp., *Coreopsis* spp., *Lespedeza* spp., *Viola pedata*, *Mimosa microphylla*, *Antennaria* spp., *Clitoria mariana*, *Senna* spp., *Chasmanthium latifolium*, *Dichantherium* spp., *Andropogon* spp., *Schizachyrium scoparium*, and *Carex* spp. (Lawson 1990).

Dynamics: The frequent presence of surface fire is important in order to support the reproduction of *Pinus echinata*, which is a critical species characteristic to the system. *Pinus echinata* is a shade-intolerant species and does not survive or grow well when fire-suppressed. Outbreaks of *Dendroctonus frontalis* (Southern Pine Beetle) also play an important role in shaping the dynamics of this system and the balance of pine versus hardwood dominance over time. Young shortleaf pines are generally slower growing and slower to dominate a site than *Pinus taeda* or many hardwood competitors, but they usually will endure competition longer than the common associate, *Pinus taeda*. *Pinus echinata* can maintain dominance on most sites after it overtops competing vegetation, but in general hardwoods cannot be eliminated from pine sites. On very good sites (i.e., with high site index), however, it may not outgrow competing species such as sweetgum and red maple (Lawson 1990).

MEMBERSHIP

Associations:

- *Pinus echinata* - *Pinus taeda* - *Quercus* (*alba*, *stellata*) - *Carya alba* / *Oxydendrum arboreum* Forest (CEGL008493, G2G3)
- *Pinus echinata* - *Quercus alba* - *Carya alba* East Gulf Coastal Plain Forest (CEGL004050, G2G3)
- *Pinus echinata* - *Quercus falcata* East Gulf Coastal Plain Forest (CEGL004052, G2G3)
- *Pinus echinata* - *Quercus stellata* - (*Quercus marilandica*) Forest (CEGL004053, G1)
- *Pinus echinata* Early-Successional Forest (CEGL006327, GNA)

Alliances:

- *Pinus echinata* - *Quercus* (*alba*, *falcata*, *stellata*, *velutina*) Forest Alliance (A.394)
- *Pinus echinata* Forest Alliance (A.119)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Southern Loblolly-Hardwood Flatwoods (CES203.557)
- Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560)
- Southern Coastal Plain Limestone Forest (CES203.502)
- Western Highland Rim Prairie and Barrens (CES202.352)

Adjacent Ecological System Comments: Southern Coastal Plain Limestone Forest (CES203.502) occurs adjacent in parts of the region, especially the Black Belt.

DISTRIBUTION

Range: This system is restricted to the East Gulf Coastal Plain; it was the historical matrix in large areas of the region in Alabama and Mississippi, particularly between about 32 degrees 30 minutes N latitude and about 35 degrees N latitude. In southwestern Mississippi, this system is apparently dominant on the landscape west of 91 degrees W longitude to the limits of the alluvial plain and northwest of a line running approximately from the intersection of 31 degrees N latitude and 91 degrees W longitude, northeastward to the city of Jackson, Mississippi, extending at least to about 34 degrees N latitude. This is consistent with the ranges of Oak-Pine

vegetation (generally equivalent to this system) versus Longleaf-Loblolly-Slash Pines in Shantz and Zon (1924).

Divisions: 203:C

Nations: US

Subnations: AL, MS, TN?

Map Zones: 46:C, 47:?, 99:C

USFS Ecomap Regions: 231B:CC, 231H:CC

TNC Ecoregions: 43:C

SOURCES

References: Bowman 1911, Chester 1990, Comer et al. 2003, Eyre 1980, Fenneman 1938, Harper 1920b, Harper 1943, Landers 1989, Lawson 1990, Mohr 1901, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman pers. comm., Schotz pers. comm., Shantz and Zon 1924, White and Lloyd 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723082#references

Description Author: R. Evans and A. Schotz

Version: 25 Aug 2004

Concept Author: R. Evans and A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

1349 EAST GULF COASTAL PLAIN INTERIOR UPLAND LONGLEAF PINE WOODLAND (CES203.496)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); East Gulf Coastal Plain; Very Short Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2349; ESLF 4252; ESP 1349

CONCEPT

Summary: This system represents longleaf pine forests of rolling, dissected uplands of the East Gulf Coastal Plain. These stands occur primarily in Ecoregion 65 (EPA 2004). It is found inland of the coastal flatlands (*sensu* Peet and Allard (1993); Ecoregion 75a (EPA 2004)) and extends landward into the Upper East Gulf Coastal Plain Ecoregion (*sensu* TNC) by about 80 km (50 miles). It potentially occupies a much larger geographic area than the related longleaf pine woodlands of the outer coastal area. The characteristic species is *Pinus palustris*, although many stands may support only relictual individuals following a long history of exploitation, harvest, and stand conversion, primarily to *Pinus taeda*. This system includes stands with a range of soil and moisture conditions. Mesic stands on medium- to fine-textured soils are more typical of the system, although limited xeric areas on deep sands are also present. In natural condition, fire is believed to have been frequent enough to limit development of intolerant species of hardwoods and both *Pinus taeda* and *Pinus echinata*. Although such species may be present or even common in the most mesic stands, they generally do not share dominance in the overstory unless the system has been fire-suppressed.

Classification Comments: The dominance of *Pinus palustris* in examples of this ecological system may be lost through fire suppression, bark beetle infestations, forestry and agricultural land conversion, and mechanical disturbance. Loss of *Pinus palustris* dominance will fundamentally change the ecological function of the landscape occupied by the system, primarily by altering the fire regime. Without the appropriate fire regime, canopy closure will increase along with shrub dominance, and grasses, forbs and other finer-fuel components will decline, further altering the fire regime dynamics.

Systems dominated by *Pinus palustris* are subdivided by biogeography, from northeast to southwest across the coastal plains from Virginia to Texas. Longleaf pine-dominated stands in the rocky submontane areas of the Piedmont as well as the Ridge and Valley (from North Carolina to Alabama) are classified as a separate system, Southeastern Interior Longleaf Pine Woodland (CES202.319).

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
- East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)
- Southeastern Interior Longleaf Pine Woodland (CES202.319)

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Undetermined
- Sandhill (FNAI 1990) Broader
- Upland Pine Forest (FNAI 1990) Undetermined

DESCRIPTION

Environment: This system once occupied extensive areas of the East Gulf Coastal Plain from the northern range limits of *Pinus palustris* southward to the inland terminus of the Coastal Flatlands (*sensu* Peet and Allard (1993); Ecoregion 75a (EPA 2004)). In its natural condition, this system occupied a range of upland soils from clays and loams to deep sands. Although "sandhills" and "loamhills" are generally recognizable components of this system (due to locally distinctive understory, shrub and herbaceous vegetation associated with differing soil textures), within the range of this system, they are generally interspersed to such an extent that differentiating them as separate systems is not practical. Although the topography of this system is overall much more rolling than East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375) to the south, the largest and best developed examples are more likely to occupy landscapes with few impediments to the ignition and spread of natural fires. Localized soil characteristics determine the specific composition of the lower strata in various examples of this system. Ultisols are the dominant order and cover most of the range of the system. Ultisols most commonly associated with longleaf pine are the Typic Paleudults and Plinthic Paleudults. More limited areas are occupied by Psamments and other coarser-textured materials. Longleaf pine grows in warm, wet temperate climates characterized by hot summers and mild winters. Annual mean temperatures range from 16 to 23 degrees C (60-74 degrees F), and annual precipitation ranges from 1090 to 1750 mm (43-69 inches) (Boyer 1990). Fall is the driest season of the year, although periods of drought during the growing season are not unusual (Boyer 1990).

Vegetation: Occurrences of this system are typically more-or-less open-canopy stands (woodlands) dominated by the evergreen needle-leaved tree *Pinus palustris*. In parts of the range, and on more rolling topography, other pines may be present, including *Pinus echinata* and *Pinus taeda*. These may increase or become codominant with extended fire-return times. Unless fire suppression is extreme, deciduous trees generally do not share dominance in the canopy. More mesic stands (e.g., those on finer-textured soils) may contain oaks, such as *Quercus falcata*, *Quercus nigra*, or *Quercus pumila*, and occasionally species favoring more xeric conditions, such as *Quercus marilandica* or *Quercus stellata*, in combination with the more mesic oaks. Even more xeric stands (uncommon in

this system) may contain "scrub oaks" such as *Quercus incana*, *Quercus laevis*, *Quercus margarettiae*, or *Quercus arkansana*. In fire-suppressed areas, *Quercus falcata*, *Liquidambar styraciflua*, *Acer rubrum*, *Quercus nigra*, *Nyssa sylvatica*, *Cornus florida*, *Callicarpa americana*, and/or *Rhus copallinum* may invade or increase. Some typical mesic to dry-mesic herbaceous species include *Andropogon ternarius*, *Andropogon gyrans* var. *gyrans*, *Schizachyrium scoparium*, *Sorghastrum nutans*, and *Panicum virgatum*. *Aristida stricta* or *Aristida beyrichiana* are also dominant or at least present in the herbaceous layer of many more southern and coastward examples. Variation in floristic composition of this wide-ranging system is related to site conditions, fire-return interval, and local or regional floristics. The herbaceous layer typically becomes much less diverse with increased fire-return interval. The wiregrass *Aristida beyrichiana* is not present throughout the range of this system, and even within the range of this species, it tends to be dominant or more abundant in moister sites, particularly in the western part of the system's range (and also in examples of East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)).

MEMBERSHIP

Associations:

- *Pinus palustris* - *Pinus (echinata, taeda)* / *Quercus (marilandica, laevis)* / *Schizachyrium scoparium* Woodland (CEGL008491, G3)
- *Pinus palustris* - *Pinus (echinata, taeda)* / *Schizachyrium tenerum* - *Vernonia angustifolia* Woodland (CEGL004774, G2G3)
- *Pinus palustris* / *Asimina angustifolia* / *Aristida beyrichiana* - *Schizachyrium scoparium* - *Dyschoriste oblongifolia* Woodland (CEGL004485, G3?)
- *Pinus palustris* / *Quercus falcata* / *Cornus florida* / *Aristida beyrichiana* Woodland (CEGL004945, G1G2)
- *Pinus palustris* / *Quercus falcata* / *Cornus florida* / *Schizachyrium scoparium* Woodland (CEGL003575, G3)
- *Pinus palustris* / *Quercus incana* / *Sporobolus clandestinus* Woodland (CEGL004957, G1G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida beyrichiana* - *Pityopsis aspera* Woodland (CEGL003583, G3)
- *Pinus palustris* / *Quercus laevis* / *Schizachyrium scoparium* - *Rhynchosia cytisoides* Woodland (CEGL003587, G3)
- *Pinus palustris* / *Quercus laevis* / *Serenoa repens* - *Clinopodium coccineum* Woodland (CEGL003601, G2)
- *Pinus palustris* / *Quercus laevis* / *Serenoa repens* / *Aristida condensata* Woodland (CEGL003588, G2)
- *Pinus palustris* / *Quercus marilandica* / *Schizachyrium scoparium* - *Schizachyrium tenerum* - *Rhexia alifanus* Woodland (CEGL003598, G2G3)
- *Pinus palustris* / *Quercus pumila* / *Aristida beyrichiana* Woodland (CEGL007749, G2G3)
- *Pinus palustris* / *Schizachyrium scoparium* - *Coreopsis tripteris* - *Baptisia bracteata* var. *leucophaea* Woodland (CEGL004955, G2)
- *Pinus palustris* / *Schizachyrium scoparium* - *Verbesina aristata* Loamhill Woodland (CEGL008452, G2G3)

Alliances:

- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Woodland Alliance (A.520)

DISTRIBUTION

Range: This system formerly occupied an extensive range across the southern parts of Alabama, Florida, and Mississippi, and was also present in limited areas of Louisiana and Georgia. It has been greatly reduced in its extent, with much of its range now occupied by agriculture and/or forestry operations. In southwestern Mississippi, this system is apparently absent (or very rare and limited) west of 91 degrees W longitude to the limits of the alluvial plain and northwest of a line running approximately from the intersection of 31 degrees N latitude and 91 degrees W longitude, northeastward to the city of Jackson, Mississippi. This is consistent with the ranges of "Oak-Pine" vegetation versus "Longleaf-Loblolly-Slash Pines" (generally equivalent to this system) in Shantz and Zon (1924).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 46:C, 55:C, 99:C

USFS Ecomap Regions: 231B:CC, 232B:CC, 232C:CC, 232J:CC, 232K:CC

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Boyer 1990, Comer et al. 2003, EPA 2004, Peet and Allard 1993, Shantz and Zon 1924

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723090#references

Description Author: R. Evans, A. Schotz, M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans, A. Schotz, M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1380 EAST GULF COASTAL PLAIN MARITIME FOREST (CES203.503)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); East Gulf Coastal Plain; Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2380; ESLF 4323; ESP 1380

CONCEPT

Summary: This system encompasses a mosaic of woody vegetation present on barrier islands and near-coastal strands along the northern Gulf of Mexico, from the Florida panhandle to southern Mississippi. Examples may include forests and/or shrublands that are found in somewhat more protected environments than East Gulf Coastal Plain Dune and Coastal Grassland (CES203.500). Such areas include relatively stabilized coastal dunes, sometimes with a substantial shell component. Vegetation structure and composition are influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast. Stands may be dominated by a variety of needle-leaved and broad-leaved evergreen trees, including *Pinus clausa*, *Pinus elliottii* var. *elliottii*, *Pinus palustris*, *Quercus virginiana*, *Sabal palmetto*, *Carya glabra*, and *Carya pallida*. Wetland inclusions may be dominated by *Taxodium ascendens* and *Magnolia virginiana*. The most heavily salt-influenced examples may appear pruned or sculpted.

Similar Ecological Systems:

- East Gulf Coastal Plain Dune and Coastal Grassland (CES203.500)

Related Concepts:

- Maritime Hammock (FNAI 1990) Broader
- Shell Mound (FNAI 1990) Intersecting

DESCRIPTION

Vegetation: Stands may be dominated by a variety of needle-leaved and broad-leaved evergreen trees, including *Pinus clausa*, *Pinus elliottii* var. *elliottii*, *Pinus palustris*, *Quercus virginiana*, *Sabal palmetto*, *Carya glabra*, and *Carya pallida*. Wetland inclusions may be dominated by *Taxodium ascendens* and *Magnolia virginiana*. Understory trees and shrubs may include *Quercus geminata*, *Quercus myrtifolia*, *Ilex vomitoria*, *Serenoa repens*, *Morella cerifera*, *Ilex glabra*, *Vaccinium arboreum*, *Juniperus virginiana*, *Zanthoxylum clava-herculis*, *Sideroxylon lanuginosum*, *Persea borbonia*, *Conradina canescens*, and *Callicarpa americana*. Herbs may include *Spartina patens*, *Juncus roemerianus*, and *Panicum virgatum*. Wetland inclusions may contain *Cladium mariscus* ssp. *jamaicense*.

MEMBERSHIP

Associations:

- *Pinus clausa* - *Quercus geminata* - *Quercus hemisphaerica* / *Quercus myrtifolia* Forest (CEGL004942, G1G2)
- *Pinus clausa* / *Ceratiola ericoides* / *Cladonia* spp. Woodland (CEGL004668, G1G2)
- *Pinus clausa* / *Quercus geminata* - *Quercus myrtifolia* - *Conradina canescens* Woodland (CEGL003554, G2)
- *Pinus elliottii* var. *elliottii* - (*Pinus palustris*) / *Ilex vomitoria* - *Serenoa repens* - *Morella cerifera* Woodland (CEGL004658, G2G3)
- *Pinus elliottii* var. *elliottii* / *Serenoa repens* - *Ilex glabra* - *Morella cerifera* - *Ilex vomitoria* Woodland (CEGL004680, G3)
- *Pinus elliottii* var. *elliottii* / *Spartina patens* - *Juncus roemerianus* - (*Panicum virgatum*) Woodland (CEGL004958, G3?)
- *Quercus geminata* / *Serenoa repens* - *Ilex vomitoria* - (*Sideroxylon lanuginosum*) Forest (CEGL007019, G2?)
- *Quercus virginiana* - (*Juniperus virginiana*) - *Zanthoxylum clava-herculis* / *Sideroxylon lanuginosum* Woodland (CEGL003523, G2G3)
- *Quercus virginiana* - (*Pinus elliottii* var. *elliottii*, *Sabal palmetto*) / *Persea borbonia* - *Callicarpa americana* Forest (CEGL007032, G2)
- *Quercus virginiana* - *Pinus clausa* / *Carya (glabra, pallida)* / *Serenoa repens* Forest (CEGL004976, G2Q)
- *Quercus virginiana* / *Vaccinium arboreum* - *Ilex vomitoria* Forest (CEGL007028, G2G3)
- *Taxodium ascendens* / *Magnolia virginiana* / *Cladium mariscus* ssp. *jamaicense* Forest (CEGL004914, G1)

Alliances:

- *Pinus clausa* Forest Alliance (A.117)
- *Pinus clausa* Woodland Alliance (A.511)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* Woodland Alliance (A.520)
- *Quercus geminata* Forest Alliance (A.52)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Quercus virginiana* - *Juniperus virginiana* - (*Sabal palmetto*) Woodland Alliance (A.479)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)

DISTRIBUTION

Range: This system is found along the northern Gulf of Mexico, from the Florida panhandle to southern Mississippi, restricted to the most coastward part of the "Gulf Coast Flatwoods" (Ecoregion 75a of EPA (2004)).

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, EPA 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723085#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Jun 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1307 EAST GULF COASTAL PLAIN NORTHERN DRY UPLAND HARDWOOD FOREST (CES203.483)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2307; ESLF 4113; ESP 1307

CONCEPT

Summary: This system represents dry, upland, predominantly hardwood forests of limited portions of the Coastal Plain of western Kentucky and Tennessee, northern Mississippi and Alabama. The core range of this type lies within the Northern Hilly Coastal Plain (Level IV Ecoregion 65e) of Omernik (EPA 2004), which includes the Northern Pontotoc Ridge (222Cf), Upper Loam Hills (222Cg), and Northern Loessal Hills (222Ce) subsections of Keys et al. (1995). These areas occupy the eastern margin of the upper Coastal Plain where elevation is greatest and influence of loess is less than adjacent areas to the west. The vegetation has been broadly considered distinct from other Coastal Plain forests (Bryant et al. 1993, Fralish and Franklin 2002) but has received almost no specific study. Although vastly forested when compared to the loess plains to the west (USGS 1992), most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000). *Quercus alba* dominates the upland forests which have been studied in a limited portion of this area (Franklin and Kupfer 2000), but communities have not been described to the same detail as in other ecological systems.

Classification Comments: The range of this system overlaps with East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506) in the Fall Line Hills (Ecoregion 65i) of Alabama and in the Southern Hilly Gulf Coastal Plain (Ecoregion 65d) of Mississippi and may overlap to some degree with Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560) at its southern boundary as well. In parts of the overlapping range (including the Oakmulgee Ranger District of the Talladega National Forest), these types occur in a mosaic which is difficult to interpret environmentally and ecologically (A. Schotz pers. comm.). The vegetation of this system has received almost no specific study and is extremely poorly documented.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DESCRIPTION

Environment: The most northern examples (e.g., western Tennessee and Kentucky) occur along the eastern margin of the Coastal Plain where elevation is greatest and influence of loess is minimal, and where they occur as predominantly slope forests in relatively deep, dissected stream valleys. The vegetation in this region has been broadly considered distinct from other Coastal Plain forests (Bryant et al. 1993, Fralish and Franklin 2002) but has received almost no specific study (Franklin and Kupfer 2000). Although vastly forested when compared to the loess plains to the west (USGS 1992), most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000). *Quercus alba* dominates the upland forests which have been studied in a limited portion of this area (Franklin and Kupfer 2000), but communities have not been described to the same detail as in other ecological systems.

Vegetation: Stands may contain *Aesculus pavia*, *Carya alba*, *Carya glabra*, *Carya pallida*, *Carya* spp., *Celtis laevigata*, *Iris verna* var. *smalliana*, *Kalmia latifolia*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Ostrya virginiana*, *Oxydendrum arboreum*, *Quercus alba*, *Quercus falcata*, *Quercus marilandica*, *Quercus muehlenbergii*, *Quercus pagoda*, *Quercus stellata*, *Quercus velutina*, *Styrax grandifolius*, *Vaccinium arboreum*, *Vaccinium* spp., and *Vaccinium stamineum*.

Dynamics: Fire suppression and the resulting greater understory density and resulting cooler conditions on the forest floor affect this system.

MEMBERSHIP

Associations:

- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Carya glabra* / Mixed Herbs Coastal Plain Forest (CEGL007226, G4?)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus falcata* - *Quercus stellata* - *Carya alba* / *Vaccinium* spp. Coastal Plain Forest (CEGL007246, G4?)
- *Quercus muehlenbergii* - *Carya* spp. / *Ostrya virginiana* Upper East Gulf Coastal Plain Forest (CEGL003903, G3)
- *Quercus pagoda* - (*Quercus falcata*) / *Ostrya virginiana* Forest (CEGL003871, G3?)
- *Quercus prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261, G3G4)
- *Quercus prinus* - *Quercus* spp. / *Vaccinium arboreum* - (*Kalmia latifolia*, *Styrax grandifolius*) Forest (CEGL007700, G4)
- *Quercus stellata* - *Quercus marilandica* - *Carya* (*alba*, *pallida*) Upper East Gulf Coastal Plain Woodland (CEGL003952, G2G3)
- *Quercus velutina* - *Carya pallida* - *Tilia americana* var. *heterophylla* / *Celtis laevigata* / *Aesculus pavia* Forest (CEGL008565, G3G4)

Alliances:

- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

SPATIAL CHARACTERISTICS**Adjacent Ecological Systems:**

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)
- South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)

Adjacent Ecological System Comments: To the west this system grades into East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482). The two types are similar and may be difficult to distinguish where they come together. The loess plain type is believed to be more mesic and richer floristically due to the influence of the loessal soils. However, it is also rare due to the fertility of the soils for agriculture. More work is needed to better quantify the differences between these types and their exact boundaries.

DISTRIBUTION

Range: This system is found in the Coastal Plain of western Kentucky and Tennessee, ranging south to northern Mississippi and Alabama.

Divisions: 203:C

Nations: US

Subnations: AL, KY, MS, TN

Map Zones: 46:C, 47:C

USFS Ecomap Regions: 231B:CC, 231H:CC

TNC Ecoregions: 43:C

SOURCES

References: Bryant et al. 1993, Comer et al. 2003, Fralish and Franklin 2002, Franklin and Kupfer 2000, Keys et al. 1995, Smalley et al. 1996, Springer and Elder 1980, USGS 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723103#references

Description Author: R. Evans and M. Pyne

Version: 05 Apr 2007

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1327 EAST GULF COASTAL PLAIN NORTHERN LOESS BLUFF FOREST (CES203.481)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Loess deposit (undifferentiated); Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2327; ESLF 4133; ESP 1327

CONCEPT

Summary: This system is largely confined to steep bluffs bordering the northern portion of the eastern edge of the Mississippi River Alluvial Plain. The geology is typically mapped as the Jackson Formation. These bluffs extend up to 150 m (500 feet) in elevation and from 30 to 60 m (100-200 feet) above the adjacent plain. They consist of a belt of Pleistocene and Tertiary eolian deposits (Braun 1950) that are often deeply eroded and very steep, with fertile top soil and abundant moisture (Miller and Neiswender 1987). The vegetation is often richer than surrounding non-loessal areas, or those with only thin loess deposits. The forests found on these bluffs are intermediate in soil moisture for the region and may best be thought of as mesic. The vegetation may sometimes be referred to as western mesophytic forest and may share some superficial similarities with cove forests of the Interior Highlands. In many cases, these bluffs provide habitat for plant species that are rare or absent from other parts of the Coastal Plain. Braun (1950) noted that the composition of forest changes from north to south along the bluffs; more southerly examples are represented by the East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556), and these would contain *Magnolia grandiflora* as an important component. As currently defined this system ranges northward from about 32 degrees N latitude (where the Big Black River cuts through the bluffs), and occurs only in the westernmost portions of the Upper East Gulf Coastal Plain, including northern and central Mississippi, western Tennessee, and western Kentucky, being restricted to the northern part of the Loess Bluff Hills (Ecoregion 74a of EPA (2004)).

Classification Comments: Similar ecological systems include East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556) which occurs further southward in the East Gulf Coastal Plain and has greater dominance by broad-leaved and needle-leaved evergreen trees, Southern Coastal Plain Mesic Slope Forest (CES203.476), and East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477). There are other mixed deciduous mesic systems in the West Gulf Coastal Plain as well as other mesic forest systems to the east of this one, in areas other than the loess bluffs.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)

Related Concepts:

- Coastal Plain Mesophytic Cane Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system is largely confined to steep bluffs east of the Mississippi River consisting of a belt of Pleistocene and Tertiary eolian deposits (Braun 1950) that are often deeply eroded and very steep, with fertile topsoil and abundant moisture (Miller and Neiswender 1987). The core of this is mapped as the Jackson Formation (Hardeman 1966) and corresponds more broadly with Ecoregion 74a (Bluff Hills) (EPA 2004). These bluffs border the eastern edge of the Mississippi River Alluvial Plain from about 32 degrees N latitude (where the Big Black River cuts through the bluffs) northward to western Tennessee and Kentucky. Examples may extend up to 150 m (500 feet) in elevation and from 30 to 60 m (100-200 feet) above the adjacent Mississippi Alluvial Plain. In Tennessee the loess soils may be 9-27.5 m (30-90 feet deep) (Springer and Elder 1980).

Vegetation: Examples of this system have deciduous canopies dominated by *Fagus grandifolia* or this species in combination with *Quercus alba*. The most mesic stands may lack codominance by *Quercus* spp. In addition, a variety of other hardwood species may also be found in the overstory, including *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Acer rubrum*, *Nyssa sylvatica*, *Fraxinus americana*, *Magnolia acuminata* (of local distribution), and *Pinus taeda* (in more southern stands). This system is defined as being north of the range of *Magnolia grandiflora*, which excludes the "Beech-Magnolia" forests of the southern loess bluffs. Some subcanopy components (in addition to canopy species) include *Carpinus caroliniana*, *Diospyros virginiana*, *Oxydendrum arboreum*, *Cornus florida*, *Acer barbatum*, *Magnolia macrophylla*, *Ostrya virginiana*, *Ulmus alata*, and *Ilex opaca*. Other shrubs and woody vines include *Decumaria barbara*, *Rhododendron canescens*, *Toxicodendron radicans*, *Vitis rotundifolia*, and *Smilax glauca*. Important herbs include *Polystichum acrostichoides*, *Woodwardia areolata*, *Osmunda cinnamomea*, *Mitchella repens*, and *Hexastylis arifolia*. In many cases, these bluffs provide habitat for plant species that are rare or absent from other parts of the Coastal Plain, such as *Magnolia acuminata*, *Aralia racemosa*, and *Hydrophyllum canadense* (Chester et al. 1997).

Dynamics: These are stable, generally fire-sheltered forests. There is presumably some natural disturbance from the effects of windstorms, which are relatively frequent in the range of this system.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Quercus (alba, rubra)* / *Acer barbatum* / *Asimina triloba* Forest (CEGL004072, G2G3)
- *Liquidambar styraciflua* - *Carya illinoensis* - *Quercus nigra* Forest (CEGL004122, GNA)
- *Quercus pagoda* - *Quercus nigra* Forest (CEGL004109, G3)

Alliances:

- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

DISTRIBUTION

Range: This system is endemic to the loess bluffs ("Bluff Hills" [Ecoregion 74a] of EPA (2004)) along the eastern edge of the Mississippi River Alluvial Plain in Mississippi, Tennessee, and Kentucky.

Divisions: 203:C

Nations: US

Subnations: KY, MS, TN

Map Zones: 46:C, 47:C

USFS Ecomap Regions: 231H:CC

TNC Ecoregions: 43:C

SOURCES

References: Braun 1950, Chester et al. 1997, Comer et al. 2003, EPA 2004, Hardeman 1966, Miller and Neiswender 1987, Springer and Elder 1980

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723105#references

Description Author: R. Evans and M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1306 EAST GULF COASTAL PLAIN NORTHERN LOESS PLAIN OAK-HICKORY UPLAND (CES203.482)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Loess deposit (undifferentiated); Forest and Woodland (Treed); Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2306; ESLF 4112; ESP 1306

CONCEPT

Summary: This is the former matrix hardwood system flanking the loess bluffs of the most northern portions of the Upper East Gulf Coastal Plain of western Tennessee, western Kentucky, possibly southern Illinois, and northern Mississippi. The core distribution of this system is mapped as the Loess Plains (Level IV Ecoregion 74b) of Omernik (EPA 2004). Extensive forests once covered this broad area of generally flat to rolling uplands. Most have been cleared for agriculture due to the rich, productive soils derived from relatively thick loess deposits. The areal extent of this forested system has been so heavily reduced that the component community types remain undocumented and speculative at best. Typical stands would contain oaks and other hardwoods. Some typical canopy dominants include *Quercus falcata*, *Quercus alba*, *Carya alba*, *Quercus stellata*, *Quercus marilandica*, and *Quercus velutina*. Scattered successional stands would be dominated by *Juniperus virginiana* var. *virginiana*. In addition, *Liquidambar styraciflua* and *Liriodendron tulipifera* may be present.

Classification Comments: The southern boundary of this system has not been clearly delineated; Omernik (EPA 2004) Ecoregion 74b extends farther south than the presumed boundary of this system. For now, the boundary is assumed to occur in northern Mississippi at the latitude of the junction of Omernik (EPA 2004) Ecoregion 65e and Ecoregion 65d (ca. 34 degrees N). To the east, this system grades into East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483). The two types may be similar and difficult to distinguish where they come together, but the former is believed to be more mesic and richer floristically due to the influence of the loessal soils. However, it is also rare due the fertility of the soils for agriculture. More work is needed to better quantify the differences between these types and their exact boundaries.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

Related Concepts:

- Acidic Subxeric Forest (Evans 1991) Broader

DESCRIPTION

Environment: Soils included in this system in western Tennessee are silty and rich, derived from loess deposits. Most of the soils have fragipans and some are poorly drained (Springer and Elder 1980).

Vegetation: Typical stands would contain oaks and other hardwoods. Some typical canopy dominants include *Quercus falcata*, *Quercus alba*, *Carya alba*, *Quercus stellata*, *Quercus marilandica*, and *Quercus velutina*. Scattered successional stands would be dominated by *Juniperus virginiana* var. *virginiana*. In addition, *Liquidambar styraciflua* and *Liriodendron tulipifera* may be present.

MEMBERSHIP

Associations:

- *Liquidambar styraciflua* - *Quercus* (*alba*, *falcata*) Forest (CEGL007217, GNA)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)

Alliances:

- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)

SPATIAL CHARACTERISTICS

Spatial Summary: Historically a matrix system which dominated the landscape; in current condition only exists in small isolated patches.

Adjacent Ecological Systems:

- East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353)
- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)
- South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480)

Adjacent Ecological System Comments: Included within this former matrix system were patches of other systems including East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353), South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480), and South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479). It is bordered on the west by East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477) and to the east by East Gulf Coastal Plain Northern Dry Upland

Hardwood Forest (CES203.483).

DISTRIBUTION

Range: This system would have occupied the most northern portions of the Upper East Gulf Coastal Plain of western Tennessee, western Kentucky, possibly southern Illinois, and northern Mississippi. Today it is reduced to remnants in a largely agricultural landscape.

Divisions: 203:C

Nations: US

Subnations: IL?, KY, MS, TN

Map Zones: 46:C, 47:C, 49:?

USFS Ecomap Regions: 231H:CC

TNC Ecoregions: 43:C

SOURCES

References: Comer et al. 2003, EPA 2004, Springer and Elder 1980

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723104#references

Description Author: R. Evans and M. Pyne

Version: 25 Jan 2008

Concept Author: R. Evans and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1325 EAST GULF COASTAL PLAIN NORTHERN MESIC HARDWOOD SLOPE FOREST (CES203.477)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Slope; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2325; ESLF 4131; ESP 1325

CONCEPT

Summary: This system includes mesic deciduous hardwood forests of inland portions of the East Gulf Coastal Plain, including Alabama, Mississippi, western Kentucky, and western Tennessee. This system covers parts of the more mesic forests in the coastal plain portion of the Western Mesophytic Forest Region of Braun (1950) referred to as mesophytic mixed hardwoods, as well as mesic forests in the adjacent "Oak-Pine-Hickory" region to the south (Greller 1988). Examples of this system occur on slopes and ravines between dry uplands and stream bottoms. Mesic forests of the loess bluffs are treated in separate ecological systems, being confined to that landform of steep bluffs and ravines on deep loess. The most characteristic feature of the vegetation in some examples may be *Fagus grandifolia*, but a variety of other hardwood species may also be found in the overstory, and *Fagus grandifolia* may not always be present. Some stands may be dominated by *Fagus grandifolia* and *Quercus alba*, others by *Quercus alba* or *Quercus pagoda* with other mesic hardwoods. In addition, *Pinus taeda* may be common in some examples in the southern portion of the range and, depending on previous disturbance and site conditions, may be locally dominant [see CEGLO04763]. To the south this system is replaced by Southern Coastal Plain Mesic Slope Forest (CES203.476), which is within the range of *Pinus glabra* and *Magnolia grandiflora*. Most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000).

Classification Comments: Southern Coastal Plain Mesic Slope Forest (CES203.476) is a similar mesic forest system to the south of this one in the East Gulf Coastal Plain with greater dominance by broad-leaved evergreen trees. The systems of the loess bluffs to the west of this one, bordering the Mississippi River Alluvial Plain, are treated as distinct and are more extensive and continuous in their extent both vertically and latitudinally [see East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481) and East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)]. One association now (2005) included here (*Quercus alba* - *Fagus grandifolia* / *Hydrangea quercifolia* - *Viburnum acerifolium* / *Carex picta* - *Polystichum acrostichoides* Forest (CEGL007213)) has the majority of its occurrences in the interior regions (southern Cumberland Plateau, Ridge and Valley), but its flora contains some Coastal Plain elements as well as more interior ones. It is from a "transition region" where *Quercus rubra* may be present in parts of the upper Coastal Plain and conversely some more southerly affiliated species (e.g., *Decumaria barbara*) range farther north. This association is now affiliated with two different ecological systems.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)
- East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)

Related Concepts:

- Deep Soil Mesophytic Forest (Evans 1991) Intersecting

DESCRIPTION

Environment: This system occurs along the eastern margin of the Upper Coastal Plain where elevation is greatest and influence of loess is minimal where they occur as predominantly slope forests in relatively deep, dissected stream valleys. The vegetation in this region has been broadly considered distinct from other Coastal Plain forests (Bryant et al. 1993, Fralish and Franklin 2002) but has received almost no specific study (Franklin and Kupfer 2000). Although vastly forested when compared to the loess plains to the west (USGS 1992), most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000).

Quercus alba dominates the upland forests which have been studied in a limited portion of this area (Franklin and Kupfer 2000), but communities have not been described to the same detail as in other ecological systems.

Vegetation: The most characteristic feature of the vegetation is a high cover value for *Fagus grandifolia*, but a variety of other hardwood species may also be found in the overstory. Stands are mesic, and some may be dominated by *Fagus grandifolia* and *Quercus alba*, others by *Quercus alba* or *Quercus pagoda* with other mesic hardwoods. This system is defined as being north of the range of *Magnolia grandiflora*, which excludes the "Beech-Magnolia" forests of the deeper south. From north to south, there is some floristic variability in the component floristics of this system. *Quercus rubra* will be of greater importance north of 35 degrees N latitude, and *Pinus taeda* conversely of greater importance to the south of this boundary. The core concept of this system consists of association types in which *Quercus* spp. can be present in the canopy, but are not dominant; but some may exhibit codominance by *Fagus grandifolia* and *Quercus alba* or other mesic *Quercus* spp. Other important canopy components include *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Acer rubrum*, *Nyssa sylvatica*, *Fraxinus americana*, *Magnolia acuminata* (of local distribution), *Magnolia virginiana*, and *Pinus taeda*. Some subcanopy components (in addition to canopy species) include *Carpinus caroliniana*, *Diospyros virginiana*, *Oxydendrum arboreum*, *Cornus florida*, *Acer barbatum*, *Magnolia macrophylla* (to the south), *Ostrya virginiana*, *Ulmus*

alata, and *Ilex opaca*. Other shrubs and woody vines include *Decumaria barbara*, *Rhododendron canescens*, *Toxicodendron radicans*, *Vitis rotundifolia*, and *Smilax glauca*. Important herbs include *Polystichum acrostichoides*, *Woodwardia areolata*, *Osmunda cinnamomea*, *Mitchella repens*, and *Hexastylis arifolia*. This system is found north of the distribution of *Pinus glabra* and *Magnolia grandiflora*, which will be absent.

Dynamics: These are stable, generally fire-sheltered forests. There is presumably some natural disturbance from the effects of hurricanes (to the south), or from other windstorms, which are relatively frequent in the range of this system.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Acer saccharum* - *Liriodendron tulipifera* Unglaciated Forest (CEGL002411, G4?)
- *Fagus grandifolia* - *Liriodendron tulipifera* / *Euonymus americanus* / *Athyrium filix-femina* ssp. *asplenioides* Forest (CEGL007201, G4)
- *Fagus grandifolia* - *Quercus alba* / *Cornus florida* Forest (CEGL007881, G4)
- *Pinus taeda* - *Quercus alba* / *Chasmanthium sessiliflorum* Forest (CEGL004763, G3G4)
- *Quercus alba* - *Carya (alba, ovata)* - *Liriodendron tulipifera* - (*Quercus phellos*) / *Cornus florida* Forest (CEGL007709, G4)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Fagus grandifolia* / *Hydrangea quercifolia* - *Viburnum acerifolium* / *Carex picta* - *Polystichum acrostichoides* Forest (CEGL007213, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acidic Forest (CEGL002067, G3)
- *Quercus pagoda* - *Quercus (michauxii, shumardii)* Forest (CEGL004545, G3G4)
- *Quercus pagoda* - *Quercus nigra* Forest (CEGL004109, G3)

Alliances:

- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Pinus taeda* - *Quercus (alba, falcata, stellata)* Forest Alliance (A.404)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

DISTRIBUTION

Range: This system is found in northern and inland portions of the East Gulf Coastal Plain, including Alabama, Mississippi, western Kentucky, and western Tennessee.

Divisions: 203:C

Nations: US

Subnations: AL, AR?, GA, KY, MS, TN

Map Zones: 46:C, 47:C

USFS Ecomap Regions: 231B:CC, 231H:CC

TNC Ecoregions: 43:C

SOURCES

References: Braun 1950, Bryant et al. 1993, Comer et al. 2003, Fralish and Franklin 2002, Franklin and Kupfer 2000, Greller 1988, USGS 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723109#references

Description Author: R. Evans, M. Pyne, A. Schotz

Version: 17 Jan 2003

Concept Author: R. Evans, M. Pyne, A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

1329 EAST GULF COASTAL PLAIN SOUTHERN LOESS BLUFF FOREST (CES203.556)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Loess deposit (undifferentiated); Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2329; ESLF 4135; ESP 1329

CONCEPT

Summary: This system of upland hardwood-dominated forests is defined as including both the steep loess bluffs bordering the eastern edge of the Mississippi River Alluvial Plain, ranging from south-central Mississippi to southeastern Louisiana, as well as hardwood vegetation of the "Loess Plains" immediately to the east of these bluffs and ravines. The vegetation is often richer than surrounding non-loessal areas, or those with only thin loess deposits. At least in some examples of this system, tree species normally associated with bottomland habitats are found to be abundant or even dominant in non-flooded uplands. In many cases, the bluffs provide habitat "refugia" for plant species that are more common to the north (Delcourt and Delcourt 1975). Braun (1950) noted that the general composition of forests along the bluffs changes from north to south; the more northerly examples are represented in this classification by East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481), north of the range of *Magnolia grandiflora* and *Pinus glabra*. As currently defined this system ranges from about 32 degrees N latitude (where the Big Black River dissects the bluffs) southward and is restricted to the southern part of the Loess Bluff Hills (Ecoregion 74a of EPA (2004)).

Classification Comments: The vegetation of this system has been poorly studied and documented, and few associations have currently been described in the USNVC for this system. More information is needed. This system meets the East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506) farther to the east in Louisiana and Mississippi.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)
- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)

DESCRIPTION

Environment: This system occupies upland loess bluffs, ravines, and adjacent plains that are considerably higher in elevation than the adjacent Mississippi River Alluvial Plain. These bluffs consist of a belt of Pleistocene and Tertiary eolian deposits (Braun 1950) that are often deeply eroded and very steep, with fertile top soil and abundant moisture.

Vegetation: Forest stands of the southern loess bluffs are characteristically dominated by *Fagus grandifolia* and *Magnolia grandiflora*, with *Quercus pagoda*, *Liquidambar styraciflua*, and other hardwood species, along with *Pinus glabra* and *Pinus taeda*. Vegetation of the loess plains would more likely be dominated by *Quercus pagoda*, *Liquidambar styraciflua*, and other hardwood species, along with *Pinus taeda*.

MEMBERSHIP

Associations:

- (*Fagus grandifolia*) - *Quercus pagoda* - *Magnolia grandiflora* / *Hydrangea quercifolia* / *Cystopteris protrusa* - *Thelypteris kunthii* Forest (CEGL007461, G3?)
- *Fagus grandifolia* - *Quercus alba* - *Liquidambar styraciflua* / *Magnolia grandiflora* / *Smilax pumila* - *Hexastylis arifolia* Forest (CEGL007210, G4)
- *Quercus alba* - *Quercus nigra* - *Carya pallida* - (*Quercus pagoda*) / *Magnolia (grandiflora, macrophylla)* Forest (CEGL004775, G3G4)
- *Quercus shumardii* - *Quercus pagoda* - *Fraxinus americana* / *Ostrya virginiana* - *Cornus florida* / *Trillium ludovicianum* Forest (CEGL007272, G1)

Alliances:

- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

DISTRIBUTION

Range: This system is endemic to the loess bluffs ("Bluff Hills" [Ecoregion 74a] of EPA (2004)) and the immediately adjacent Southern Rolling Plains (western portion of Ecoregion 74c) along the eastern edge of the Mississippi River Alluvial Plain in southwestern Mississippi and adjacent Louisiana.

Divisions: 203:C

Nations: US

Subnations: LA, MS
Map Zones: 46:C, 99:C
USFS Ecomap Regions: 231H:CC
TNC Ecoregions: 43:C

SOURCES

References: Braun 1950, Comer et al. 2003, Delcourt and Delcourt 1975, EPA 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723048#references

Description Author: R. Wieland and R. Evans, mod. M. Pyne

Version: 14 Mar 2005

Concept Author: R. Wieland and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1358 EAST-CENTRAL TEXAS PLAINS PINE FOREST AND WOODLAND (CES205.896)

CLASSIFIERS

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2358; ESLF 4261; ESP 1358

CONCEPT

Summary: This system, dominated by *Pinus taeda*, is endemic to central Texas. Locally this is known as the "Bastrop Pines." Examples may share similarities, in terms of the vegetation, with Coastal Plain pine-hardwood systems to the east (TNC Ecoregions 40 and 41) but differ in the fact that this system contains only loblolly pine which is generally considered successional in the more eastern systems. The vegetation includes a range of communities (that have yet to be defined) that range from very dry to xeric uplands to dry and even mesic areas with different suites of hardwood associates. The *Pinus taeda* of this region is genetically different than strains to the east; it has much greater drought tolerance. It is possible that this area was one of the epicenters of early southern pine colonization of the Coastal Plain based on fossil pollen evidence.

Classification Comments: No associations have currently been described in the NVC for this system. More information is needed.

DESCRIPTION

Environment: The Reclaw Formation is the substrate for this system (D. Diamond pers. comm.).

Vegetation: Vegetation includes pine-dominated and mixed stands (loblolly pine - post oak / blackjack oak forest and woodland).

DISTRIBUTION

Range: This system is endemic to central Texas.

Divisions: 205:C

Nations: US

Subnations: TX

Map Zones: 32:?, 35:?, 36:C, 37:P

USFS Ecomap Regions: 255C:CC

TNC Ecoregions: 32:C

SOURCES

References: Comer et al. 2003, Diamond pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722785#references

Description Author: R. Evans and M. Pyne

Version: 15 Mar 2003

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1519 EAST-CENTRAL TEXAS PLAINS POST OAK SAVANNA AND WOODLAND (CES205.679)

CLASSIFIERS

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Loam Soil Texture; Sand Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2519; ESLF 4158; ESP 1519

CONCEPT

Summary: This system is primarily found within eastern Texas, lying in a broad band west of the Upper West Gulf Coastal Plain and Gulf Coast Prairies and Marshes ecoregions, ranging from Live Oak and Atascosa counties in the south and trending in a northeasterly band to the Red River along the Oklahoma-Texas border. It exhibits some floristic and physiognomic variation across this northeast-southwest gradient. Its range is roughly co-incident with (parts of) the "East Central Texas Plains" (Level III Ecoregion 33) of EPA (Griffith et al. 2004). It is distinguished from the surrounding prairie by the higher density of trees and diversity of woody species. The system differs from the floristically similar Crosstimbers Oak Forest and Woodland (CES205.682) in that it generally occurs on Tertiary (primarily Eocene) geologic formations on the East-Central Texas Plains, while the related Crosstimbers ecological system occupies Cretaceous and older formations of the interior plains (EPA Level III Ecoregion 29). Floristically, Post Oak Savanna (at least north of the Colorado River) contains species of more eastern affinities such as *Callicarpa americana*, *Sassafras albidum*, *Cornus florida*, *Vaccinium arboreum*, *Ulmus alata*, and particularly *Ilex vomitoria*, the latter species being absent from Crosstimbers Oak Forest and Woodland (CES205.682). Post Oak Savanna generally occurs on sandy or loamy soils, often underlain by a claypan subsoil. Rainfall ranges from about 120 cm in the northeastern part of the range to about 70 cm in the southwest, where it becomes increasingly erratic. Therefore moisture is often limiting during part of the growing season. The system was historically characterized as having significant areas of graminoid cover with species composition resembling that of nearby prairie systems, punctuated by short, stunted woodlands and forests dominated by *Quercus stellata* and *Quercus marilandica*. Other species, such as *Carya texana*, *Quercus incana* (on more xeric sites), *Quercus fusiformis*, *Ulmus alata*, *Juniperus virginiana*, and *Prosopis glandulosa*, can also be present. In some sites, particularly in the south, *Quercus fusiformis* may codominate the woodlands. Shrubs may attain significant cover in the understory, with species including *Ilex vomitoria* (often dominant), *Callicarpa americana*, *Vaccinium arboreum*, *Sideroxylon lanuginosum*, *Ilex decidua*, *Toxicodendron radicans*, and *Symphoricarpos orbiculatus*. Where light penetration allows the development of an herbaceous understory or in areas with reduced woody canopy, the understory contains species typical of the surrounding prairies, in particular *Schizachyrium scoparium*, but also including *Andropogon gerardii*, *Bothriochloa laguroides* ssp. *torreyana*, *Paspalum plicatulum* (to the south), *Sorghastrum nutans*, and *Sporobolus cryptandrus*. Drought, grazing, and fire are the primary natural processes that affect this system. Much of this system has been impacted by conversion to improved pasture or crop production. Overgrazing and fire suppression have led to increased woody cover on most extant occurrences and the invasion of some areas by problematic brush species such as *Juniperus virginiana* var. *virginiana* and *Prosopis glandulosa* in the southern part of the system's range. These factors have also led to decreases in native grass cover allowing for annual grasses and forbs to invade.

Classification Comments: Vegetation of East-Central Texas Plains Xeric Sandyland (CES205.897) can be embedded within the matrix-forming East-Central Texas Plains Post Oak Savanna and Woodland (CES205.679). East-Central Texas Plains Xeric Sandyland (CES205.897) was formerly called Crosstimbers Southern Xeric Sandhill but has been renamed to reflect this relationship.

Similar Ecological Systems:

- Crosstimbers Oak Forest and Woodland (CES205.682)--is found to the west of this system.
- East-Central Texas Plains Xeric Sandyland (CES205.897)--has an overlapping range but occupies sandier soils.

DESCRIPTION

Environment: This system is located on irregular plains comprised of sandy to loamy Alfisols, generally associated with Tertiary (primarily Eocene) formations of the East Central Texas Plains (Level III Ecoregion 33) of EPA (Griffith et al. 2004). These soils range from shallow to moderately deep and are often underlain by claypan subsoils. Rainfall ranges from about 120 cm in the northeastern part of the range to about 70 cm in the southwest, where it becomes increasingly erratic.

Vegetation: The system was historically characterized as having significant areas of graminoid cover with species composition resembling that of nearby prairie systems, punctuated by short, stunted woodlands and forests dominated by *Quercus stellata* and *Quercus marilandica*. Other species, such as *Carya texana*, *Quercus incana* (on more xeric sites), *Quercus fusiformis*, *Ulmus alata*, *Juniperus virginiana* var. *virginiana*, and *Prosopis glandulosa*, can also be present. In some sites, particularly in the south, *Quercus fusiformis* may codominate the woodlands. Floristically, the post oak savanna system contains species of eastern affinities such as *Callicarpa americana*, *Sassafras albidum*, *Cornus florida*, *Vaccinium arboreum*, *Ulmus alata*, and particularly *Ilex vomitoria*, the latter species (which may dominate the shrub stratum) being absent from Crosstimbers Oak Forest and Woodland (CES205.682). Other shrubs and small trees which are typically present include *Sideroxylon lanuginosum*, *Ilex decidua*, *Toxicodendron radicans*, and *Symphoricarpos orbiculatus*. Where light penetration allows the development of an herbaceous understory or in areas with reduced woody canopy, the understory contains species typical of the surrounding prairies, in particular *Schizachyrium scoparium*, but also

including *Andropogon gerardii*, *Bothriochloa laguroides* ssp. *torreyana*, *Paspalum plicatulum* (to the south), *Sorghastrum nutans*, and *Sporobolus cryptandrus*.

Dynamics: Drought, grazing, and fire are the primary natural processes that affect this system. Much of this system has been impacted by conversion to improved pasture. Overgrazing and fire suppression have led to increased woody cover on most extant occurrences and the invasion of some areas by problematic brush species such as *Juniperus virginiana* var. *virginiana* and *Prosopis glandulosa* in the southern part of the system's range. These factors have also led to decreases in native grass cover allowing for annual grasses and forbs to invade.

MEMBERSHIP

Associations:

- *Quercus stellata* - *Juniperus virginiana* var. *virginiana* Forest (CEGL004935, GNA)
- *Quercus stellata* - *Quercus marilandica* - (*Carya texana*) Forest (CEGL002074, G4)
- *Quercus stellata* - *Quercus marilandica* - *Carya texana* - (*Quercus shumardii*, *Quercus velutina*) Forest (CEGL002324, G3G5)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Woodland (CEGL002147, G4)
- *Quercus stellata* - *Ulmus alata* Forest (CEGL004546, GNR)
- *Quercus virginiana* - *Quercus stellata* / *Schizachyrium scoparium* - *Paspalum plicatulum* Woodland (CEGL002155, G3)

Alliances:

- *Juniperus virginiana* - *Quercus* (*stellata*, *velutina*, *marilandica*) Forest Alliance (A.383)
- *Quercus stellata* - *Quercus marilandica* Forest Alliance (A.253)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus virginiana* - *Quercus stellata* Woodland Alliance (A.668)

DISTRIBUTION

Range: This system is primarily found within eastern Texas, lying in a broad band west of the Upper West Gulf Coastal Plain from Live Oak and Atascosa counties in the south and trending in a northeasterly band to the Red River along the Oklahoma-Texas border. Its range is roughly co-incident with (parts of) the East Central Texas Plains (level III ecoregion 33) of EPA (Griffith et al. 2004).

Divisions: 203:P; 205:C

Nations: US

Subnations: OK, TX

Map Zones: 32:P, 35:P, 36:C, 37:C

USFS Ecomap Regions: 231Ef:CCC, 231Eg:CCC, 231Eo:CCC, 255A:CP, 255Ba:CCC, 255C:CC, 315E:CC

TNC Ecoregions: 31:C, 32:C, 40:C

SOURCES

References: Barbour and Billings 1988, Griffith et al. 2004, MacRoberts and MacRoberts 2004, MacRoberts et al. 2002a, MacRoberts et al. 2002b, McBryde 1933, Ricketts et al. 1999, Singhurst et al. 2004, Smeins and Diamond 2986, Southeastern Ecology Working Group n.d., Ward and Nixon 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.802251#references

Description Author: L. Elliott and J. Teague

Version: 06 Jun 2007

Concept Author: L. Elliott and J. Teague

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1331 EASTERN GREAT PLAINS TALLGRASS ASPEN PARKLAND (CES205.688)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lakeplain; Forest and Woodland (Treed); Woody-Herbaceous; Sandplains/Glacial Outwash or Flats; Glaciated

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2331; ESLF 4137; ESP 1331

CONCEPT

Summary: This system is found primarily on part of the Glacial Lake Agassiz plain in northwestern Minnesota, ranging into southern Canada. Calcareous glacial drift overlain with lacustrine soils ranging from loamy to gravelly is characteristic of the lakeplain within the range of this system. Historically this system included a mosaic of tallgrass prairie, wet prairie, brush prairie and aspen-oak woodlands. It is dominated by *Populus tremuloides* with scattered *Quercus macrocarpa* and *Betula papyrifera*. Shrubs such as willow (*Salix* spp.) and hazel (*Corylus* spp.) are also common. The dominant tallgrass species is *Andropogon gerardii* often associated with *Sorghastrum nutans*, *Calamagrostis* spp., and *Sporobolus heterolepis*. Fire is the most important natural dynamic in this system and helps maintain the open parkland or brush nature of this system. Wind and grazing are also important dynamics. Conversion to agriculture and fire suppression have decreased the range of this system and allowed more shrubs and trees to establish.

Similar Ecological Systems:

- Northwestern Great Plains Aspen Forest and Parkland (CES303.681)--biogeography and understory species separate. NW Great Plains system has a more mixed understory with *Stipa*, *Bouteloua*, and *Festuca*. *Festuca* would be a good differential genus.

MEMBERSHIP

Associations:

- *Betula papyrifera* / *Corylus cornuta* Forest (CEGL002079, G2G3)
- *Populus tremuloides* - *Quercus macrocarpa* - *Salix* spp. / *Andropogon gerardii* Shrubland (CEGL002182, G2G3)
- *Populus tremuloides* / *Corylus americana* Forest (CEGL002063, G5)
- *Populus tremuloides* / *Corylus* spp. / *Andropogon gerardii* Woodland (CEGL005205, G4G5)
- *Quercus macrocarpa* - *Populus tremuloides* / *Corylus* spp. Woodland (CEGL002139, G4?)
- *Salix petiolaris* - (*Betula pumila*) / *Spartina pectinata* - *Carex pellita* Shrubland (CEGL002434, G3)

Alliances:

- *Betula papyrifera* Forest Alliance (A.267)
- *Populus tremuloides* - *Quercus* spp. - *Salix* spp. Shrubland Alliance (A.903)
- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Woodland Alliance (A.610)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Salix petiolaris* - *Salix* spp. Temporarily Flooded Shrubland Alliance (A.949)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Tallgrass Prairie (CES205.686)
- Northwestern Great Plains Aspen Forest and Parkland (CES303.681)

DISTRIBUTION

Range: This system is found primarily on part of the Glacial Lake Agassiz plain in northwestern Minnesota, ranging into southern Canada.

Divisions: 201:P; 205:C

Nations: CA, US

Subnations: MB, MN, ND

Map Zones: 39:P, 40:C, 41:P

USFS Ecomap Regions: 222N:CC, 251A:PP

TNC Ecoregions: 35:C, 46:?, 47:P, 66:P

SOURCES

References: Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722971#references

Description Author: S. Menard

Version: 11 Apr 2007

Stakeholders: Canada, Midwest

1375 EASTERN SERPENTINE WOODLAND (CES202.347)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Rock Outcrops/Barrens/Glades; Serpentine; Unglaciated; Ultramafic with low Ca:Mg ratio

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2375; ESLF 4318; ESP 1375

CONCEPT

Summary: This system consists of distinct vegetation associated with ultramafic rock substrates in the Piedmont and Blue Ridge of the eastern United States. Most examples are open woodlands with *Pinus rigida*, *Pinus virginiana*, and/or *Quercus alba*, *Quercus marilandica*, and *Quercus stellata* in the often stunted canopy. Extreme edaphic conditions lead to locally xerophytic growing conditions that contribute to relatively open canopies and a ground cover dominated by prairie grasses and a variety of forbs. Disjunct species from drier regions and some endemic plant taxa are often present. The unusual and extreme soil chemistry determines the underlying floristics and distinctive flora of the type, but that fire frequency determines the physiognomy of particular examples over time.

Classification Comments: While details of flora vary widely among the scattered examples of this system, all associations have in common a composition that is distinct from communities on other substrates and that is more xeric in aspect. Serpentine substrates support distinctive barren vegetation in most places where they occur. This system is distinguished from serpentine barrens in other regions because of the distinctive flora, as well as the climate, lack of glaciation, and other factors distinct to this region. A closely related Piedmont system, Piedmont Hardpan Woodland and Forest (CES202.268), may be only incompletely distinguished from this system. In this Appalachian system *Pinus rigida* / *Schizachyrium scoparium* - *Packera plattensis* Wooded Herbaceous Vegetation (CEGL006084) occurs in both the Appalachians and in the Piedmont.

Ultramafic rock substrate is apparently not sufficient to create this system. Some Piedmont areas with ultramafic rock outcrops on the most mesic sites support mesic forest vegetation not distinguishable from that on other substrates. It may be that these outcrops have less extreme chemistry, or that sufficient moisture levels or a long period without natural disturbance in the form of fire will override the effects of chemistry. The presence of unusually xerophytic or barren vegetation should be the defining characteristic of this system.

DESCRIPTION

Environment: This system occurs in a variety of topographic settings, perhaps excluding only alluvial sites. The bedrock is serpentinite, dunite, or other ultramafic rocks. The soil has unusual and extreme chemical composition that includes strongly skewed calcium-to-magnesium ratios and often high levels of heavy metals such as chromium. Owing to a high level of toxic metals and a deficiency in nutrients, serpentine outcrops are ecologically unique and provide habitat for many plant species that grow nowhere else. The soil may be shallow and rocky, or deep, and is usually very clayey. Seepage may be present locally.

Vegetation: Vegetation is generally an open woodland of pines or xerophytic hardwoods. The dominant vegetation is more xerophytic and more open than the topographic setting, soil moisture, and climate would suggest, and contrasts strongly with adjacent vegetation on other kinds of rock. *Pinus rigida* and *Pinus virginiana* are frequent canopy dominants, but *Quercus marilandica*, *Quercus alba*, and *Quercus stellata* dominate some examples. There is generally not a well-developed understory. Shrubs may be sparse to dense. The herb layer is usually dense; grasses, including prairie elements such as *Schizachyrium scoparium*, *Andropogon gerardii*, and/or *Sorghastrum nutans*, usually dominate, but a number of forbs may be present. In the northern portion of this system's range in Pennsylvania and Maryland, *Phlox subulata* and the endemic *Symphotrichum depauperatum* are characteristic; in the southern Appalachian portion of its range, *Packera plattensis*, *Hexastylis arifolia* var. *ruthii*, and *Thalictrum macrostylum* are characteristic. Often, paradoxical mixtures of xerophytic and mesophytic species are present, though the overall plant composition is characteristic of a drier setting. Disjunct species from drier regions and some endemic plant taxa are often present. There is one site where *Pinus palustris* occurs over serpentine (Burks Mountain, Columbus County, Georgia), but this is classed as a "Piedmont Longleaf" site.

Dynamics: Although the unique soil chemistry is the crucial determining factor for this system, fire is generally a crucial process influencing species composition and vegetation structure. Without fire, vegetation can sometimes become dense enough to suppress or eliminate the distinctive herbaceous layer, as well as turning a distinctive savanna or woodland structure into dense forest. Southern pine beetles are an important factor in examples dominated by pines.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Pinus virginiana* - *Pinus rigida* / *Microstegium vimineum* - *Smilax* spp. Serpentine Forest (CEGL006439, G1G2)
- *Acer rubrum* - *Quercus* spp. / *Smilax* spp. Serpentine Forest (CEGL006438, G1G2)
- *Deschampsia caespitosa* - *Vernonia noveboracensis* Herbaceous Vegetation (CEGL006316, GNR)

- *Juniperus virginiana* - *Pinus virginiana* / *Smilax rotundifolia* Serpentine Forest (CEGL006440, G1G2)
- *Pinus rigida* - *Quercus alba* / *Sporobolus heterolepis* - *Andropogon gerardii* Woodland (CEGL003768, G1)
- *Pinus rigida* - *Quercus stellata* / *Andropogon gerardii* - *Packera paupercula* Woodland (CEGL004968, G1)
- *Pinus rigida* / *Schizachyrium scoparium* - *Packera plattensis* Wooded Herbaceous Vegetation (CEGL006084, G1)
- *Pinus virginiana* - *Pinus rigida* - *Quercus stellata* / *Ceanothus americanus* - *Kalmia latifolia* / *Thalictrum revolutum* Woodland (CEGL007721, G1)
- *Pinus virginiana* / *Quercus marilandica* Serpentine Forest (CEGL006266, GNA)
- *Quercus alba* / *Physocarpus opulifolius* / *Packera plattensis* - *Hexastylis arifolia* var. *ruthii* Forest (CEGL007296, G1)
- *Schizachyrium scoparium* - *Sporobolus heterolepis* Serpentine Herbaceous Vegetation (CEGL006442, G1G2)
- *Sorghastrum nutans* - *Schizachyrium scoparium* Serpentine Herbaceous Vegetation (CEGL006441, G1G2)

Alliances:

- (*Pinus rigida*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1921)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Pinus rigida* - *Quercus* (*alba*, *stellata*) Woodland Alliance (A.681)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus alba* Montane Forest Alliance (A.271)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Sporobolus heterolepis* - (*Deschampsia caespitosa*, *Schizachyrium scoparium*) Herbaceous Alliance (A.1402)

SPATIAL CHARACTERISTICS

Spatial Summary: Small- to large-patch system, most examples covering a few dozen acres at most. The largest, in Maryland, is 2000 acres.

Size: Most examples naturally cover a few to perhaps several dozen acres. A few in Pennsylvania and Maryland are 100-200 acres, with one Maryland site covering 2000 acres.

Adjacent Ecological System Comments: May be bordered by any other system appropriate for the region, often with abrupt boundaries at geologic contacts. Ultramafic rocks are often associated with mafic rocks such as amphibolite, so systems with basic soils are likely to be associated.

DISTRIBUTION

Range: This system is widely scattered throughout the southern and central Appalachians and Piedmont, from Pennsylvania to North Carolina.

Divisions: 202:C

Nations: US

Subnations: MD, NC, PA, VA

Map Zones: 57:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 221An:CCC, 221Da:CCC, 221Db:CCC, 231Ib:CCC, 232Hd:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

TNC Ecoregions: 51:C, 52:C, 61:C

SOURCES

References: Arabas 2000, Barton and Wallenstein 1997, Brooks 1987, Comer et al. 2003, Harshberger 1903, Latham 1993, Mansberg and Wentworth 1984, Pennell 1910, Pennell 1912, Pennell 1929, Radford 1948, Wherry 1963

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723163#references

Description Author: M. Schafale, R. Evans, S.C. Gawler, M. Pyne

Version: 14 Jan 2008

Concept Author: M. Schafale, R. Evans, S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: Southeast

1523 EDWARDS PLATEAU DRY-MESIC SLOPE FOREST AND WOODLAND (CES303.656)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Midslope; Forest and Woodland (Treed); Broad-Leaved Deciduous Tree; Broad-Leaved Evergreen Tree

National Mapping Codes: EVT 2523; ESLF 4331; ESP 1523

CONCEPT

Summary: This system occurs on dry-mesic, middle slopes of the rolling uplands of the Edwards Plateau of Texas. The canopy is typically dominated by deciduous trees, including *Quercus buckleyi*, *Fraxinus texensis*, or *Ulmus crassifolia*. *Quercus fusiformis* and *Juniperus ashei* are often present but not dominant in this system. Canopy closure is variable, and this system can be expressed as forests and woodlands.

Classification Comments: Further field investigation is needed to better develop the association-level information for this system.

Similar Ecological Systems:

- Edwards Plateau Limestone Savanna and Woodland (CES303.660)--is typically expressed as a mixed evergreen-deciduous woodland or forest characterized by *Quercus fusiformis* and/or *Juniperus ashei*. It occurs on rolling uplands and dry to xeric slopes.
- Edwards Plateau Mesic Canyon (CES303.038)--is currently described as limited to steep, narrow canyons that support more mesic forests. It is limited in extent to steep canyons bordering the Balcones Escarpment.

DESCRIPTION

Environment: This system occurs on dry-mesic, primarily north- and east-facing limestone slopes in the Edwards Plateau of Texas.

Vegetation: This system is characterized by deciduous trees, including *Quercus buckleyi*, *Fraxinus texensis*, and *Ulmus crassifolia*. *Quercus fusiformis* and *Juniperus ashei* are often present but not dominant in this system.

MEMBERSHIP

Associations:

- *Juniperus ashei* - *Quercus buckleyi* Woodland (CEGL004172, G4)
- *Muhlenbergia reverchonii* - *Bouteloua hirsuta* var. *pectinata* - *Carex microdonta* Herbaceous Vegetation (CEGL004520, G3?)
- *Quercus buckleyi* - *Fraxinus texensis* - *Juniperus ashei* Forest (CEGL002135, G3)
- *Quercus laceyi* - *Juniperus ashei* Woodland (CEGL002136, G2)

Alliances:

- *Juniperus ashei* Woodland Alliance (A.501)
- *Muhlenbergia reverchonii* Herbaceous Alliance (A.1218)
- *Quercus buckleyi* Forest Alliance (A.242)
- *Quercus laceyi* Woodland Alliance (A.616)

SPATIAL CHARACTERISTICS

Spatial Summary: This system often forms deciduous bands at midslope on hills in the Edwards Plateau of Texas.

Adjacent Ecological Systems:

- Edwards Plateau Carbonate Glade and Barrens (CES303.655)
- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)
- Edwards Plateau Upland Depression (CES303.654)

Adjacent Ecological System Comments: The predominantly evergreen Edwards Plateau Limestone Savanna and Woodland (CES303.660) occurs on adjacent drier upland ridges, flats and upper slopes. Very steep and moist canyons of the Edwards Plateau are classified as Edwards Plateau Mesic Canyon (CES303.038).

DISTRIBUTION

Range: This system is expected to occur on dry-mesic slopes in the Edwards Plateau and Lampasas Cutplain.

Divisions: 303:C

Nations: US

Subnations: TX

Map Zones: 35:C

USFS Ecomap Regions: 255E:CC, 315C:C?, 315D:CC, 315G:C?

TNC Ecoregions: 29:C

SOURCES

References: Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791384#references

Description Author: J. Teague

Version: 30 Oct 2007

Concept Author: L. Elliott and J. Teague

Stakeholders: Midwest, Southeast, West

ClassifResp: Southeast

EDWARDS PLATEAU FLOODPLAIN (CES303.651)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Floodplain; Lowland; Forest and Woodland (Treed); Depositional stream terrace

National Mapping Codes: ESLF 4154

CONCEPT

Summary: This system occurs on floodplain terraces along perennial rivers and streams in central Texas. Canopy dominants may include *Ulmus crassifolia*, *Juniperus ashei*, *Celtis laevigata*, *Quercus fusiformis*, *Fraxinus texensis*, *Platanus occidentalis*, *Acer negundo*, *Juglans major*, *Quercus macrocarpa*, or *Carya illinoensis*. *Carya illinoensis* may be more likely to occur in deeper and better-developed alluvial soils. Apparent dominance of *Carya illinoensis* may also be an artifact of preferential harvesting of other species, leaving this species in greater abundance. Alluvial sedimentation processes dominate the formation and maintenance of this system. However, overgrazing and/or overbrowsing may influence recruitment of overstory species and composition of the understory and herbaceous layers.

Classification Comments: Further field investigation is needed to better develop the association-level information for this system. It occurs along larger, lower gradient rivers and streams in contrast with Edwards Plateau Riparian (CES303.652) which occurs along smaller, higher gradient streams. Any particular reach of a river would be classified and mapped as one or the other system.

Similar Ecological Systems:

- Edwards Plateau Riparian (CES303.652)--occurs along smaller, higher gradient streams.
- Southeastern Great Plains Floodplain (CES205.710)

DESCRIPTION

Environment: This system occurs on alluvial terraces along permanent rivers and streams in central Texas.

Vegetation: Canopy dominants may include *Ulmus crassifolia*, *Ulmus americana*, *Celtis laevigata*, *Quercus fusiformis*, *Fraxinus texensis*, *Platanus occidentalis*, *Acer negundo*, *Juglans major*, *Quercus macrocarpa*, or *Carya illinoensis*.

Dynamics: Alluvial sedimentation processes dominate the formation and maintenance of this system. However, overgrazing and/or overbrowsing may influence recruitment of overstory species and composition of the understory and herbaceous layers.

MEMBERSHIP

Associations:

- *Andropogon glomeratus* var. *pumilus* Herbaceous Vegetation (CEGL004099, GNA)
- *Carya illinoensis* - *Celtis laevigata* Forest (CEGL002087, G4?)
- *Carya illinoensis* - *Ulmus crassifolia* / *Elymus virginicus* Floodplain Forest (CEGL004200, GNR)
- *Juniperus ashei* Semi-natural Forest (CEGL004159, GNA)
- *Justicia americana* - *Bacopa monnieri* Edwards Plateau Herbaceous Vegetation (CEGL004926, G3)
- *Muhlenbergia reverchonii* - *Bouteloua curtipendula* - *Desmanthus velutinus* Herbaceous Vegetation (CEGL004219, GNR)
- *Panicum virgatum* - *Andropogon glomeratus* - *Cladium mariscus* ssp. *jamaicense* Herbaceous Vegetation (CEGL004928, G2G3)
- *Platanus occidentalis* - *Salix nigra* Woodland (CEGL002093, G5?)
- *Prosopis glandulosa* - *Ulmus crassifolia* / *Nassella leucotricha* Riparian Woodland (CEGL004180, GNA)
- *Quercus fusiformis* - (*Celtis laevigata* var. *reticulata*, *Ulmus crassifolia*) Woodland (CEGL002153, G4?)
- *Quercus macrocarpa* - *Carya illinoensis* / *Cornus drummondii* - *Frangula caroliniana* Forest (CEGL004196, GNR)
- *Salix nigra* Forest (CEGL002103, G4)
- *Ulmus americana* - *Celtis* (*laevigata*, *occidentalis*) - *Fraxinus pennsylvanica* Forest (CEGL002090, G3?)
- *Ulmus crassifolia* - *Celtis laevigata* / *Ilex decidua* / *Elymus virginicus* Forest (CEGL008468, G3?)
- *Zizania texana* - *Potamogeton illinoensis* Herbaceous Vegetation (CEGL004512, G1)

Alliances:

- *Andropogon glomeratus* Temporarily Flooded Herbaceous Alliance (A.1338)
- *Carya illinoensis* - (*Celtis laevigata*) Temporarily Flooded Forest Alliance (A.282)
- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis* (*occidentalis*, *laevigata*) Temporarily Flooded Forest Alliance (A.286)
- *Juniperus ashei* Semi-natural Forest Alliance (A.2023)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Muhlenbergia reverchonii* Herbaceous Alliance (A.1218)
- *Panicum virgatum* Temporarily Flooded Herbaceous Alliance (A.1343)
- *Platanus occidentalis* - (*Juglans major*, *Juglans microcarpa*, *Salix nigra*) Temporarily Flooded Woodland Alliance (A.2018)
- *Prosopis glandulosa* Temporarily Flooded Woodland Alliance (A.637)
- *Quercus fusiformis* - *Celtis laevigata* var. *reticulata* Woodland Alliance (A.663)

- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Zizania (aquatica, texana) - Potamogeton illinoensis* Semipermanently Flooded Herbaceous Alliance (A.1437)

SPATIAL CHARACTERISTICS

Spatial Summary: This system is characteristically linear in spatial configuration.

Adjacent Ecological Systems:

- Edwards Plateau Carbonate Glade and Barrens (CES303.655)
- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)
- Edwards Plateau Upland Depression (CES303.654)
- Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)

DISTRIBUTION

Range: This system occurs along larger permanent rivers and streams throughout the Edwards Plateau of Texas and possibly adjacent ecoregions. It occurs from the Leon watershed in the Limestone Cutplain (EPA 29e) south to the edge of the Bacones Canyonlands (EPA 30c), west through the Edwards Plateau and north to the Pecan Bayou and Concho River watersheds in the lower Limestone Plains (EPA 27j) and lower Crosstimbers (EPA 29c) (EPA 2001).

Divisions: 302:C; 303:C

Nations: US

Subnations: TX

Map Zones: 32:C, 35:C

USFS Ecomap Regions: 255Ec:CCC, 255Ed:CCC, 315Cc:CCC, 315Da:CCC, 315Db:CCC, 315Dc:CCC, 315Ga:CCC, 321B:PP

TNC Ecoregions: 29:C

SOURCES

References: EPA 2004, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791372#references

Description Author: L. Elliott and J. Teague

Version: 04 Feb 2009

Concept Author: L. Elliott and J. Teague

Stakeholders: Midwest, Southeast, West

ClassifResp: Southeast

1383 EDWARDS PLATEAU LIMESTONE SAVANNA AND WOODLAND (CES303.660)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate [Temperate Continental]; Unglaciaded; Alkaline Soil; Calcareous; Ustic

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2383; ESLF 4326; ESP 1383

CONCEPT

Summary: This upland system occurs primarily on limestone soils in the Edwards Plateau and forms the matrix within this ecoregion. It can also occur on limestone in the shortgrass regions of Texas and north into Oklahoma in areas such as the Arbuckle Mountains. This system is typified by a mosaic of evergreen oak forests, woodlands and savannas over shallow soils of rolling uplands and upper slopes within the Edwards Plateau and Lampasas Cutplain. *Quercus fusiformis* or *Juniperus ashei* typically dominate the canopy of this system. Other species may include *Quercus buckleyi*, *Quercus laceyi*, *Quercus stellata*, *Ulmus crassifolia*, *Fraxinus texensis*, *Quercus sinuata*, *Quercus vaseyana*, and *Diospyros texana*. Physiographic expression of this system varies from dense mottes (patches of forest where canopy cover approaches 100%) interspersed with grasslands to open savannalike woodlands with scattered individual or small groups of trees. Understories can contain various shrubs and graminoids, including *Cercis canadensis* var. *texensis*, *Forestiera pubescens*, *Sideroxylon lanuginosum*, *Diospyros texana*, *Rhus trilobata*, *Bouteloua* spp., *Schizachyrium scoparium*, *Nassella leucotricha*, *Carex planostachys*, *Aristida purpurea*, *Aristida oligantha*, *Liatris mucronata*, *Stillingia texana*, *Symphotrichum ericoides*, *Hedyotis nigricans*, *Monarda citriodora*, and *Salvia texana*. Grasslands dominated by *Schizachyrium scoparium* occur in small patches within more closed woodlands and in larger patches between mottes or in open savannalike woodlands with scattered trees. Grasslands in this system tend to grade from shortgrass communities in the west to mixedgrass communities to the east. Substrate (limestone) determines the range of this system within given examples. Some disturbed areas of the western plateau are now dominated by mesquite woodland. Natural mesquite woodlands are believed to have occurred on the deeper soils of adjacent riparian systems.

Classification Comments: Distribution in Oklahoma needs to be reviewed. This system is described as a mosaic of grassland and woodland or forest communities.

Similar Ecological Systems:

- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)

DESCRIPTION

Environment: This system is primarily restricted to limestone soils of rolling uplands within the Cretaceous limestone formations of the Edwards Plateau and dissected Pennsylvanian limestone formations within Texas and north into Oklahoma. Soil moisture and topography influence this system.

Vegetation: This forest and woodland system is dominated by species such as *Quercus fusiformis*, *Quercus laceyi*, *Quercus vaseyana*, *Juniperus ashei*, or *Pinus remota*. Other species may include *Quercus buckleyi*, *Ulmus crassifolia*, *Fraxinus texensis*, *Quercus sinuata*, and *Diospyros texana*. Certain uplands may have mottes of *Quercus fusiformis* dominating a savannalike woodland. Physiographic expression varies from dense mottes (patches of forest where canopy cover approaches 100%) interspersed with large or small grassland patches to open savannalike woodlands with scattered individual or small groups of trees. Understories can contain various shrubs and graminoids, including *Cercis canadensis* var. *texensis*, *Forestiera pubescens*, *Sideroxylon lanuginosum*, *Diospyros texana*, *Rhus trilobata*, *Bouteloua* spp., *Schizachyrium scoparium*, *Nassella leucotricha*, *Carex planostachys*, *Aristida purpurea*, *Aristida oligantha*, *Liatris mucronata*, *Stillingia texana*, *Symphotrichum ericoides*, *Hedyotis nigricans*, *Monarda citriodora*, and *Salvia texana*. Grasslands dominated by *Schizachyrium scoparium* occur in small patches within more closed woodlands and in larger patches between mottes or in open savannalike woodlands with scattered trees. Grasslands in this system tend to grade from shortgrass communities in the west to mixedgrass communities to the east. Substrate (limestone) determines the range of this system within given examples.

Dynamics: Substrate (limestone) and topographic position primarily influence this system. Fire, grazing and browsing may also influence this system.

MEMBERSHIP

Associations:

- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL002238, G3?)
- *Juniperus ashei* - *Quercus buckleyi* Woodland (CEGL004172, G4)
- *Juniperus ashei* - *Quercus sinuata* var. *breviloba* Woodland (CEGL004170, G4)
- *Juniperus ashei* - *Quercus vaseyana* Woodland [Provisional] (CEGL004221, GNR)

- *Muhlenbergia reverchonii* - *Bouteloua hirsuta* var. *pectinata* - *Carex microdonta* Herbaceous Vegetation (CEGL004520, G3?)
- *Pinus remota* - *Juniperus ashei* - *Quercus* spp. Woodland (CEGL002124, G2G3)
- *Quercus fusiformis* - *Quercus buckleyi* - *Ulmus crassifolia* / *Schizachyrium scoparium* Woodland (CEGL004168, GNR)
- *Quercus fusiformis* - *Quercus buckleyi* / *Quercus sinuata* - (*Juniperus ashei*) Woodland (CEGL004215, GNR)
- *Quercus fusiformis* / *Hilaria belangeri* Woodland (CEGL002116, GNR)
- *Quercus fusiformis* / *Schizachyrium scoparium* Woodland (CEGL002115, G2G4)
- *Quercus sinuata* var. *breviloba* Shrubland (CEGL004453, G2G3)
- *Quercus stellata* - (*Quercus marilandica*, *Ulmus crassifolia*) / *Schizachyrium scoparium* Woodland (CEGL004176, GNR)
- *Schizachyrium scoparium* - (*Sorghastrum nutans*) - *Sporobolus compositus* var. *compositus* - *Liatris mucronata* Herbaceous Vegetation (CEGL004211, GNR)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Nassella leucotricha* Herbaceous Vegetation (CEGL004070, GNR)

Alliances:

- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Alliance (A.1214)
- *Juniperus ashei* Woodland Alliance (A.501)
- *Muhlenbergia reverchonii* Herbaceous Alliance (A.1218)
- *Pinus remota* Woodland Alliance (A.523)
- *Quercus fusiformis* Woodland Alliance (A.477)
- *Quercus sinuata* var. *breviloba* Shrubland Alliance (A.907)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Edwards Plateau Carbonate Glade and Barrens (CES303.655)
- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)
- Edwards Plateau Upland Depression (CES303.654)
- Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)

Adjacent Ecological System Comments: A common component of Edwards Plateau Limestone Savanna and Woodland (CES303.660), *Quercus buckleyi*, is conspicuously absent from Llano Uplift Acidic Forest, Woodland and Glade (CES303.657).

DISTRIBUTION

Range: This system is found primarily within the Edwards Plateau ecoregion but can extend north into Oklahoma and into portions of the Southern Shortgrass region of Texas.

Divisions: 303:C

Nations: US

Subnations: OK, TX

Map Zones: 34:?, 35:C

USFS Ecomap Regions: 255E:CC, 315C:CC, 315D:CC, 315G:CC

TNC Ecoregions: 28:P, 29:C, 33:?

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999, TNC 2004b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722998#references

Description Author: S. Menard and K. Kindscher, mod. J. Teague

Version: 30 Oct 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Southeast

1524 EDWARDS PLATEAU MESIC CANYON (CES303.038)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Canyon Mosaic; Forest and Woodland (Treed); Toeslope/Valley Bottom; Ustic; Flood Scouring; Canyon

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Moss/Lichen (Nonvascular); Temperate [Temperate Continental]; Alkaline Soil; Calcareous; Landslide

National Mapping Codes: EVT 2524; ESLF 4153; ESP 1524

CONCEPT

Summary: This system is largely endemic to the Edwards Plateau ecoregion and occurs on canyon bottoms, mesic lower slopes and steep canyons, primarily in the Southern Balcones Escarpment, but also in the Eastern Balcones Escarpment. This system also includes cliff faces and lower slopes of boxed canyons occurring as narrow, sometimes long bands in areas often with seeps where moisture is consistently more available than on adjacent slopes. The tree canopy is generally closed. Common components include *Ulmus crassifolia*, *Juglans major*, *Quercus buckleyi*, *Quercus laceyi*, *Prunus serotina* var. *eximia* (becoming less common to the north), *Fraxinus texensis* (dominant in the northeastern plateau), *Quercus muehlenbergii*, and *Acer grandidentatum*. Canyon bottoms may have scattered *Quercus macrocarpa*. Substrate (limestone) and topographic position (north and east aspects and lower slopes) are the dominant characteristics of this system. Small seepage areas are often dominated by *Adiantum capillus-veneris*, with *Thelypteris ovata* var. *lindheimeri* on nearby moist habitats. Other prominent species include *Buddleja racemosa*, *Ungnadia speciosa*, and *Toxicodendron radicans* ssp. *eximium*. Fire probably plays little role in the system, while grazing and browsing (by native as well as exotic ungulates) may play an important role in recruitment and understory composition. Adjacent, drier slopes are usually dominated by various *Quercus* species and *Juniperus ashei*.

Similar Ecological Systems:

- Edwards Plateau Cliff (CES303.653)--represents sparsely vegetated cliff faces and could be considered a part this system and may not be justified as distinct from it.
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)--represents dry-mesic slopes in the Edwards Plateau characterized by woodlands often dominated by *Quercus buckleyi*.

DESCRIPTION

Environment: This system occurs on mesic lower slopes, primarily with northern and eastern aspects and steep canyons over limestone in the Edwards Plateau region of Texas.

Vegetation: The tree canopy is generally closed. Common components include *Ulmus crassifolia*, *Juglans major*, *Quercus buckleyi*, *Quercus laceyi*, *Prunus serotina* var. *eximia* (becoming less common to the north), *Fraxinus texensis* (dominant in the northeastern plateau), *Quercus muehlenbergii*, and *Acer grandidentatum*. Canyon bottoms may have scattered *Quercus macrocarpa*. Small seepage areas are often dominated by *Adiantum capillus-veneris*, with *Thelypteris ovata* var. *lindheimeri* on nearby moist habitats. Other prominent species include *Buddleja racemosa*, *Ungnadia speciosa*, and *Toxicodendron radicans* ssp. *eximium*.

Dynamics: Substrate (limestone) and topographic position (northern and eastern aspects and lower slopes) are the dominant characteristics of this system. Fire probably plays little role in the system, while grazing and browsing (by native as well as exotic ungulates) may play an important role in recruitment and understory composition.

MEMBERSHIP

Associations:

- *Acer grandidentatum* - (*Quercus muehlenbergii*) / *Carex edwardsiana* Lampasas Cutplain Forest (CEGL002319, G1)
- *Acer grandidentatum* - *Quercus muehlenbergii* - *Quercus laceyi* / *Carex edwardsiana* - *Chaetopappa effusa* Southern Edwards Plateau Forest (CEGL004931, G2)
- *Adiantum capillus-veneris* - (*Thelypteris ovata* var. *lindheimeri*, *Thelypteris kunthii*) Herbaceous Vegetation (CEGL004514, G2)
- *Muhlenbergia reverchonii* - *Bouteloua hirsuta* var. *pectinata* - *Carex microdonta* Herbaceous Vegetation (CEGL004520, G3?)
- *Quercus laceyi* - *Juniperus ashei* Woodland (CEGL002136, G2)
- *Quercus muehlenbergii* - *Juglans major* - (*Ulmus rubra*) / *Verbesina virginica* Forest (CEGL004927, G2G3)

Alliances:

- *Acer grandidentatum* - *Quercus buckleyi* - *Quercus muehlenbergii* Forest Alliance (A.215)
- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Muhlenbergia reverchonii* Herbaceous Alliance (A.1218)
- *Quercus laceyi* Woodland Alliance (A.616)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Edwards Plateau Carbonate Glade and Barrens (CES303.655)
- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Riparian (CES303.652)
- Edwards Plateau Upland Depression (CES303.654)
- Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)

DISTRIBUTION

Range: Largely endemic to the Edwards Plateau ecoregion and occurs on canyon bottoms, mesic lower slopes and steep canyons, primarily in the Southern Balcones Escarpment, but also in the Eastern Balcones Escarpment.

Divisions: 303:C

Nations: US

Subnations: TX

Map Zones: 35:C

USFS Ecomap Regions: 255E:CC, 315D:CC

TNC Ecoregions: 29:C

SOURCES

References: Comer et al. 2003, TNC 2004b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722669#references

Description Author: L. Elliott and K. Schulz, mod. J. Teague

Version: 30 Oct 2007

Concept Author: L. Elliott, K. Schulz

Stakeholders: Southeast, West

ClassifResp: Southeast

1356 FLORIDA LONGLEAF PINE SANDHILL (CES203.284)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Xeric; Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2356; ESLF 4259; ESP 1356

CONCEPT

Summary: This system represents stands of *Pinus palustris* on excessively well-drained, sandy soils in the Outer Coastal Plain and adjacent Inner Coastal Plain of Florida. This includes the "high pine islands" of central Florida, as well as vegetation of extensive areas of sand in the panhandle, as at Eglin Air Force Base. In central Florida, these stands are found in relation with sand pine scrub vegetation. This system represents larger patches of *Pinus palustris* Sandhills, ranging from 60 to 4000 hectares in size. Examples also occur on the Ocala National Forest, the southern end of the Lake Wales Ridge, the Brooksville Ridge, and in other parts of the Florida Peninsula. Fire is absolutely essential to maintain this system, without which it may be almost completely replaced by scrub vegetation or other non-longleaf pine-dominated vegetation.

Related Concepts:

- Sandhill (FNAI 1990) Broader

DESCRIPTION

Environment: Soils are typically Entisols (Psamments), with very limited profile development. Some soil series associated with this system include the Astatula series (Kalisz 1982), as well as the Lake, Tavares, and Orsino series (Abrahamson et al. 1984). In some cases the soils may be unusually dark in color at the surface, which has been attributed, in part, to the presence of charcoal. Soils are strongly acidic (pH 4.7-5.0). At least some of these sites have silt or clay in the subsoil contributing to significantly higher extractable bases at the surface when compared to nearby scrub sites (Kalisz 1982). Excluded are areas with a "shallow sand cap" (K. Outcault pers. comm.). On Eglin Air Force Base, habitat for this system includes areas covered by the Citronelle Formation. Psamments are the dominant soil suborder in the areas of Florida where this system is found (NRCS n.d.).

Vegetation: Stands of this system typically lack a well-developed subcanopy, especially in contrast to surrounding *Pinus clausa* scrub vegetation. However, the shrub layer may be well-developed, even under frequent fire conditions, and appears to be dominated by sprouts of *Quercus laevis* and *Quercus myrtifolia*. A rich herbaceous layer is present. Characteristic species in this stratum are *Aristida beyrichiana* and *Licania michauxii*. In addition, a number of species found primarily in central Florida may also be present, among the most frequent of which is *Chapmannia floridana*. Other geographically limited species may include *Sabal etonia*, *Polygonella ciliata*, and *Arnoglossum floridanum*.

Dynamics: Fire is absolutely essential to maintain this system, without which it may be almost completely replaced by scrub vegetation (in the Florida Peninsula).

MEMBERSHIP

Associations:

- *Bigelovia nuttallii* - *Schizachyrium scoparium* - *Eurybia hemispherica* Florida Sandstone Herbaceous Vegetation (CEGL004946, G1)
- *Pinus palustris* - *Pinus clausa* / *Quercus laevis* / *Sporobolus junceus* Woodland (CEGL003604, GNA)
- *Pinus palustris* / *Quercus (incana, margarettiae)* / *Aristida beyrichiana* - *Asimina angustifolia* Woodland (CEGL008586, G2?)
- *Pinus palustris* / *Quercus (laevis, myrtifolia)* / *Aristida beyrichiana* - *Chapmannia floridana* Woodland (CEGL008569, G2)
- *Pinus palustris* / *Quercus laevis* - *Quercus geminata* / *Ceratiola ericoides* Woodland (CEGL004491, G1G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida beyrichiana* - *Pityopsis aspera* Woodland (CEGL003583, G3)
- *Pinus palustris* / *Quercus laevis* / *Schizachyrium scoparium* - *Rhynchosia cytisoides* Woodland (CEGL003587, G3)

Alliances:

- *Bigelovia nuttallii* Herbaceous Alliance (A.1617)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)

SPATIAL CHARACTERISTICS

Spatial Summary: This system represents larger patches of *Pinus palustris* Sandhills (in Florida), ranging from 60 to 4000 hectares in size.

Adjacent Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- Florida Peninsula Inland Scrub (CES203.057)

Adjacent Ecological System Comments: Adjacent to Central Florida Wet Prairie and Herbaceous Seep (CES203.491) and Central

Florida Pine Flatwoods (CES203.382). It can be surrounded by Florida Peninsula Inland Scrub (CES203.057).

DISTRIBUTION

Range: This system is found in the Outer Coastal Plain and adjacent Inner Coastal Plain of Florida, including the central Florida Peninsula (Ocala National Forest, Brooksville Ridge, southern end of the Lake Wales Ridge) (Abrahamson et al. 1984) and the panhandle (e.g., Eglin Air Force Base).

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C, 99:C

USFS Ecomap Regions: 232D:CC, 232G:CC, 232K:CC

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Abrahamson et al. 1984, Comer et al. 2003, Kalisz 1982, NRCS n.d., Outcalt pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723204#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1387 FLORIDA PENINSULA INLAND SCRUB (CES203.057)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Xeric; F-Patch/High Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2387; ESLF 5318; ESP 1387

CONCEPT

Summary: This system appears in many forms, but generally consists of xeromorphic shrub vegetation (mostly oak species) with or without an emergent overstory of *Pinus clausa* (sand pine). Ground cover is always sparse, and bare soil patches are typically evident. It is found on a sequence of sand ridges and ancient dune fields which are oriented essentially north-south in the Florida Peninsula. This system has long been noted for its unique and interesting vegetation by authors such as Vignoles (1823), Harper (1914), Mulvania (1931), Kurz (1942), and Laessle (1958, 1968). More recent treatments by Myers (1990) and Menges (1999) have provided the most comprehensive summaries of scrub available. According to Harper (1927), "the nearly pure white sand of the ground surface, when viewed from a short distance, gives the impression of a thin rift of wind-driven snow. The vegetation is mostly dwarfed, gnarled and crooked, and presents a tangled, scraggly aspect." The appearance, floristics, and boundary of Florida scrub contrast dramatically with the "high pine" or sandhill vegetation which is often adjacent (Laessle 1968).

Related Concepts:

- Scrub (FNAI 1990) Finer

DESCRIPTION

Environment: This system is restricted to a sequence of north/south-trending sand ridges, ancient dune fields, and former shorelines in the Florida peninsula. The largest inland scrub is found in two primary areas, essentially isolated from one another. The so called "Big Scrub" of the Ocala National Forest is the largest expanse of this system, with a somewhat smaller, more southerly area associated with the Lake Wales Ridge. According to Myers (1990), inland scrub occurs on Quartzipsamments which are excessively well-drained, nearly pure siliceous sands low in nutrients. Although all scrub soils are Entisols, there is considerable variation in soil color. This color variation appears to be related to the amount of leaching which has taken place, and appears to be related to the amount of time a site has been occupied by scrub vegetation. Excessive leaching, due to inferred long occupation by scrub vegetation, is believed to bleach upper soil horizons and develop pure white soils (such as the St. Lucie series), while moderate leaching, due to shorter occupation by scrub, contributes to less bleaching and consequently more yellow-colored soils (Paola and Orsino series).

Vegetation: This system is dominated by xeromorphic, evergreen shrub species with or without an emergent layer of *Pinus clausa*. The shrub layer composition is relatively constant, as is the abundance of individual species. *Quercus myrtifolia*, *Quercus inopina*, *Serenoa repens*, *Quercus geminata*, *Quercus chapmanii*, *Lyonia ferruginea*, and *Ceratiola ericoides* are the most important species. Myers (1990) indicates that much of the variability in Florida scrub is due to variation in fire-return interval, ranging from once every 10 to 100 years. Ground cover is always sparse but typically includes *Licania michauxii*, *Rhynchospora megalocarpa*, *Andropogon floridanus*, and a variety of lichens (*Cladonia* and *Cladina* species). There are a number of endemic plant species which may occur in inland Florida scrubs, including at least 13 federally listed species; many of the rarest scrub species are found only in the Lake Wales region.

Dynamics: Florida scrub is a pyrogenic system with floral and faunal components adapted to fire. Unlike most ecological systems of the Gulf and Atlantic coastal plains, this system is maintained by high-intensity, infrequent fires. Litter-fall rates are high, while turnover rates are low, contributing to fuel buildup (Lugo and Zucca 1983, Schmalzer and Hinkle 1996). However, scrub typically lacks fine-textured fuels necessary to ignite fires; most scrub fires ignite in other adjacent systems. If fire spreads into scrub it is only under severe conditions of high wind, low humidity, and low fuel moisture. When fires occur in scrub they are often stand-replacing events. *Pinus clausa*, if present, is killed outright but may regenerate from seed released from serotinous cones. The shrub layer is typically killed back to ground layer but rapidly resprouts and returns to prefire levels of cover (Abrahamson 1984, Schmalzer and Hinkle 1992b). Other species such as *Ceratiola ericoides* may regenerate from seeds stored in soil (Johnson 1982). Several narrowly endemic herb species exhibit peaks in survival, recruitment, and density after fire (Menges 1999). Many scrub fires burn heterogeneously with resulting patches of unburned fuels, especially in the most xeric types like rosemary scrub (Menges 1994). In the sustained absence of fire, smaller shrubs and herbs may be lost as a consequence of increasing dominance of oak stems (Menges et al. 1993).

This system has likely persisted on fossil dunes since the Pleistocene (Laessle 1968), but remaining examples are merely remnants of an ecosystem once expansive in the late Pleistocene (Myers 1990). The stature and appearance of Florida scrub may be due primarily to nutrient-poor soils, to which many of the scrub species have adapted evergreen habits (Monk 1966). Drought stress is most likely during winter and early spring, but frequent fog during these periods may ameliorate such conditions (Menges 1994). Surprisingly, given the excessively well-drained soils, drought stress may not be an important ecological factor except to limit seedling establishment (Myers 1987, 1990).

MEMBERSHIP

Associations:

- *Carya floridana* - *Quercus myrtifolia* - *Quercus geminata* Shrubland (CEGL007997, G1)
- *Ceratiola ericoides* - *Quercus geminata* - (*Quercus inopina*) - *Serenoa repens* / *Cladonia* spp. - *Cladina* spp. Shrubland (CEGL003863, G2G3)
- *Pinus clausa* / *Ceratiola ericoides* - *Sabal etonia* / *Cladonia* spp. Woodland (CEGL003553, G1)
- *Pinus clausa* / *Quercus geminata* - *Quercus myrtifolia* - (*Quercus laevis*) / *Garberia heterophylla* Forest (CEGL007074, G2)
- *Pinus clausa* / *Quercus inopina* Woodland (CEGL003555, G1G2)
- *Pinus clausa* / *Quercus myrtifolia* - *Quercus geminata* Woodland (CEGL003556, G2)
- *Quercus inopina* - *Quercus geminata* - *Quercus chapmanii* Shrubland (CEGL003823, G2)
- *Quercus myrtifolia* - *Quercus geminata* - *Lyonia lucida* - *Lyonia ferruginea* Shrubland (CEGL008593, G1?)
- *Quercus myrtifolia* - *Quercus geminata* - *Quercus chapmanii* Shrubland (CEGL003825, G3)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Pinus clausa* Forest Alliance (A.117)
- *Pinus clausa* Woodland Alliance (A.511)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Florida Longleaf Pine Sandhill (CES203.284)

DISTRIBUTION

Range: This system is endemic to the Florida Peninsula. It is most common in two discrete islands or patches, the Big Scrub of Ocala and the Lake Wales Ridge.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

USFS Ecomap Regions: 232D:CC, 232G:CC, 232K:CC

TNC Ecoregions: 55:C

SOURCES

References: Abrahamson 1984, Comer et al. 2003, Harper 1914, Harper 1927, Johnson 1982, Kurz 1942, Laessle 1958, Laessle 1968, Lugo and Zucca 1983, Menges 1994, Menges 1999, Menges et al. 1993, Monk 1966, Mulvania 1931, Myers 1987, Myers 1990, Schmalzer and Hinkle 1992b, Schmalzer and Hinkle 1996, Vignoles 1823

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723253#references

Description Author: R. Evans, mod. C.W. Nordman

Version: 08 Jun 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1019 GREAT BASIN PINYON-JUNIPER WOODLAND (CES304.773)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Foothill(s); Lowland [Foothill]; Piedmont; Plateau; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Aridic; *Pinus monophylla*, *Juniperus osteosperma*

Non-Diagnostic Classifiers: Sideslope; Temperate [Temperate Continental]; Alkaline Soil; Long Disturbance Interval; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2019; ESLF 4206; ESP 1019

CONCEPT

Summary: This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada south in scattered locations throughout southern California. It is typically found at lower elevations ranging from 1600-2600 m. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Woodlands dominated by a mix of *Pinus monophylla* and *Juniperus osteosperma*, pure or nearly pure occurrences of *Pinus monophylla*, or woodlands dominated solely by *Juniperus osteosperma* comprise this system, but in some regions of southern California, *Juniperus osteosperma* is replaced by *Juniperus californica*. *Cercocarpus ledifolius* is a common associate. On the east slope of the Sierras in California, *Pinus jeffreyi* and *Juniperus occidentalis* var. *australis* may be components of these woodlands. Understory layers are variable. Associated species include shrubs such as *Arctostaphylos patula*, *Artemisia arbuscula*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Cercocarpus intricatus*, *Coleogyne ramosissima*, *Yucca brevifolia*, *Quercus gambelii*, *Quercus turbinella*, *Quercus john-tuckeri*, *Juniperus californica*, *Quercus chrysolepis*, and bunch grasses *Hesperostipa comata*, *Festuca idahoensis*, *Pseudoroegneria spicata*, *Leymus cinereus* (= *Elymus cinereus*), and *Poa fendleriana*. This system occurs at lower elevations than Colorado Plateau Pinyon-Juniper Woodland (CES304.767) where sympatric.

Similar Ecological Systems:

- Colorado Plateau Pinyon-Juniper Woodland (CES304.767)
- Inter-Mountain Basins Juniper Savanna (CES304.782)

Related Concepts:

- Juniper - Pinyon Woodland (412) (Shiflet 1994) Broader
- Pinyon - Juniper: 239 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Juniperus osteosperma* / *Artemisia arbuscula* Woodland (CEGL002757, G5)
- *Juniperus osteosperma* / *Artemisia nova* / Rock Woodland (CEGL000729, G5)
- *Juniperus osteosperma* / *Artemisia nova* Woodland (CEGL000728, G5?)
- *Juniperus osteosperma* / *Artemisia tridentata* / *Achnatherum hymenoides* Woodland (CEGL000731, G4G5)
- *Juniperus osteosperma* / *Bromus tectorum* Semi-natural Woodland (CEGL002817, GNA)
- *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Juniperus osteosperma* / *Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus osteosperma* / Sparse Understory Woodland (CEGL000732, GNRQ)
- *Juniperus scopulorum* Temporarily Flooded Woodland [Placeholder] (CEGL002777, G1)
- *Pinus edulis* - *Juniperus osteosperma* / *Atriplex* spp. Woodland [Provisional] (CEGL002366, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Bromus tectorum* Semi-natural Woodland (CEGL002367, GNA)
- *Pinus edulis* - *Juniperus osteosperma* / Sparse Understory Woodland (CEGL002148, G5)
- *Pinus monophylla* - *Juniperus osteosperma* - *Quercus gambelii* / *Artemisia tridentata* Woodland (CEGL000837, G4?)
- *Pinus monophylla* - *Juniperus osteosperma* / (*Shepherdia rotundifolia*, *Amelanchier utahensis*) Woodland (CEGL002942, GNR)
- *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia arbuscula* Woodland (CEGL000830, G5)
- *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia nova* Woodland (CEGL000831, G5?)
- *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia tridentata* ssp. *vaseyana* / *Pseudoroegneria spicata* Woodland (CEGL000833, G1)
- *Pinus monophylla* - *Juniperus osteosperma* / *Artemisia tridentata* Woodland (CEGL000832, G5?)
- *Pinus monophylla* - *Juniperus osteosperma* / *Cercocarpus ledifolius* / *Pseudoroegneria spicata* Woodland (CEGL000834, G1)
- *Pinus monophylla* - *Juniperus osteosperma* / *Cercocarpus montanus* - *Quercus gambelii* Woodland [Provisional] (CEGL002968, GNR)
- *Pinus monophylla* - *Juniperus osteosperma* / *Coleogyne ramosissima* Woodland [Provisional] (CEGL002971, GNR)

- *Pinus monophylla* - *Juniperus osteosperma* / *Gutierrezia sarothrae* / *Pleuraphis jamesii* Woodland [Provisional] (CEGL002970, GNR)
- *Pinus monophylla* - *Juniperus osteosperma* / *Hesperostipa comata* Woodland (CEGL002969, GNR)
- *Pinus monophylla* - *Juniperus osteosperma* / *Leymus cinereus* Wooded Herbaceous Vegetation (CEGL000835, G1Q)
- *Pinus monophylla* - *Juniperus osteosperma* / *Prunus virginiana* Woodland (CEGL000836, G1Q)
- *Pinus monophylla* - *Juniperus osteosperma* / *Quercus turbinella* Woodland (CEGL002941, GNR)
- *Pinus monophylla* - *Quercus gambelii* / *Artemisia tridentata* Woodland (CEGL000838, G4?)
- *Pinus monophylla* / *Amelanchier alnifolia* / *Arctostaphylos patula* Woodland (CEGL000826, G3G4)
- *Pinus monophylla* / *Artemisia tridentata* / *Elymus elymoides* Woodland [Provisional] (CEGL003154, GNR)
- *Pinus monophylla* / *Artemisia tridentata* Woodland (CEGL000827, G5)
- *Pinus monophylla* / *Cercocarpus ledifolius* / *Artemisia tridentata* - *Purshia tridentata* Woodland [Provisional] (CEGL003152, GNR)
- *Pinus monophylla* / *Cercocarpus ledifolius* Woodland (CEGL000828, G5)
- *Pinus monophylla* / *Ribes velutinum* Woodland [Provisional] (CEGL003153, GNR)
- *Pinus monophylla* / *Symphoricarpos oreophilus* - *Artemisia tridentata* Woodland (CEGL000839, G5)
- *Pinus monophylla* Woodland (CEGL000825, G5)
- *Quercus turbinella* - *Juniperus osteosperma* Shrubland (CEGL000981, G4?)

Alliances:

- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Juniperus scopulorum* Temporarily Flooded Woodland Alliance (A.563)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus monophylla* - (*Juniperus osteosperma*) Woodland Alliance (A.543)
- *Pinus monophylla* Wooded Tall Herbaceous Alliance (A.1487)
- *Quercus turbinella* Shrubland Alliance (A.793)

DISTRIBUTION

Range: This system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada, typically at lower elevations ranging from 1600-2600 m. It extends southwest in California to the northern Transverse Ranges (Ventura County) and San Jacinto Mountains (Riverside County).

Divisions: 206:C; 304:C

Nations: US

Subnations: CA, ID, NV, UT

Map Zones: 4:C, 6:C, 7:?, 9:C, 12:C, 13:C, 14:C, 15:C, 16:C, 17:C, 18:C, 23:C

USFS Ecomap Regions: 313A:CC, 322A:CC, 322B:CC, 341A:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342J:CC, M242C:??, M261D:C?, M261E:CC, M261G:CC, M331D:CC, M341A:CC, M341C:CC, M341D:CC

TNC Ecoregions: 6:C, 11:C, 12:C, 18:C

SOURCES

References: Barbour and Major 1977, Comer et al. 2003, Holland and Keil 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722899#references

Description Author: T. Keeler-Wolf and M.S. Reid

Version: 16 Jan 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1061 INTER-MOUNTAIN BASINS ASPEN-MIXED CONIFER FOREST AND WOODLAND (CES304.776)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Aspen - Conifer Mix

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Sideslope;

Toeslope/Valley Bottom; Temperate [Temperate Continental]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2061; ESLF 4302; ESP 1061

CONCEPT

Summary: This ecological system occurs on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho, western Wyoming, and in north-central Montana in the Big Snowy Mountains. It also occurs in localized settings in the Klamath Mountains of California, as well as in the Sierra Nevada and adjacent Great Basin mountains (Inyo, White, Warner, and Modoc Plateau). Elevations range from 1700 to 2800 m. Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials but most typically occur on sedimentary rocks. The tree canopy is composed of a mix of deciduous and coniferous species, codominated by *Populus tremuloides* and conifers, including *Pseudotsuga menziesii*, *Abies concolor*, *Abies lasiocarpa*, *Abies magnifica*, *Picea engelmannii*, *Picea glauca* X *engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus flexilis*, *Pinus jeffreyi*, *Pinus contorta* var. *murrayana*, and *Pinus ponderosa*. As the occurrences age, *Populus tremuloides* is slowly reduced until the conifer species become dominant. Common shrubs include *Amelanchier alnifolia*, *Prunus virginiana*, *Acer grandidentatum*, *Symphoricarpos oreophilus*, *Juniperus communis*, *Paxistima myrsinites*, *Rosa woodsii*, *Spiraea betulifolia*, *Symphoricarpos albus*, or *Mahonia repens*. Herbaceous species include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Elymus glaucus*, *Poa* spp., and *Achnatherum*, *Hesperostipa*, *Nassella*, and/or *Piptochaetium* spp. (= *Stipa* spp.), *Achillea millefolium*, *Arnica cordifolia*, *Asteraceae* spp., *Erigeron* spp., *Galium boreale*, *Geranium viscosissimum*, *Lathyrus* spp., *Lupinus argenteus*, *Mertensia arizonica*, *Mertensia lanceolata*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), and *Thalictrum fendleri*. Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system. This is the typical meadow edge aspen-conifer setting in the Sierra Nevada where frequently, due to fire suppression, the conifers are replacing aspens.

Related Concepts:

- Aspen Woodland (411) (Shiflet 1994) Intersecting
- Aspen: 217 (Eyre 1980) Intersecting

DESCRIPTION

Environment: The aspen-conifer forest and woodland ecological system is very similar to the aspen forest ecological system with regards to environmental characteristics. It is usually found on montane slopes and plateaus in western Wyoming, Idaho, Utah, and eastern Nevada. Elevations range from 1700 to 2800 m. Climate is temperate with cold winters. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. Occurrences are typically on gentle to steep slopes on any aspect. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials, but most typically occur on sedimentary rocks.

Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondly, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable; sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations aspen is restricted by lack of moisture and is found on cooler north aspects and mesic microsites. The soils are typically deep and well-developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loam. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Vegetation: The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees and is codominated by *Populus tremuloides* and conifers, including *Pseudotsuga menziesii*, *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Picea pungens*, *Pinus contorta*, *Pinus flexilis*, and *Pinus ponderosa*. As the occurrences age, *Populus tremuloides* is slowly reduced until the conifer species becomes dominant (Mueggler 1988). The sparse to moderately dense understory may be structurally complex and includes tall-shrub, short-shrub and herbaceous layers, or it may be simple with just an herbaceous layer. Because of the open growth form of *Populus tremuloides*, more light can penetrate the canopy than in a pure conifer occurrence. Typically the understory is denser in younger occurrences that are dominated by *Populus tremuloides* and in more mesic sites with open canopies. If present, the tall-shrub layer may be dominated by *Amelanchier alnifolia*, *Prunus virginiana*, or *Acer grandidentatum*, and short-shrub layer by *Symphoricarpos oreophilus*, *Juniperus communis*, or *Mahonia*

repens. Other common shrubs include *Paxistima myrsinites*, *Rosa woodsii*, *Spiraea betulifolia*, *Symphoricarpos albus*, and in wet areas *Salix scouleriana*. Where dense, the herbaceous layer is often dominated by graminoids such as *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Elymus glaucus*, *Poa* spp., and *Achnatherum*, *Hesperostipa*, *Nassella*, and/or *Piptochaetium* spp. (= *Stipa* spp.). More sparse herbaceous layers are generally a more even mixture of forbs such as *Achillea millefolium*, *Arnica cordifolia*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Erigeron speciosus*, *Fragaria vesca*, *Galium boreale*, *Geranium viscosissimum*, *Lathyrus* spp., *Lupinus argenteus*, *Mertensia arizonica*, *Mertensia lanceolata*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), and *Thalictrum fendleri*. Annuals are typically uncommon. The exotic species *Poa pratensis* and *Taraxacum officinale* are more common in livestock-impacted occurrences (Mueggler 1988).

Dynamics: *Populus tremuloides* is thin-barked and readily killed by fire. It is a fire-adapted species that generally needs a large disturbance to establish and maintain dominance in a forest. These mixed forests are generally seral and, in the absence of stand-replacing disturbance such as fire, will slowly convert to a conifer-dominated forest (Mueggler 1988). The natural fire-return interval is approximately 20 to 50 years for seral occurrences (Hardy and Arno 1996). Intervals that approach 100 years are typical of late-seral occurrences (Hardy and Arno 1996). Although the young conifer trees in these occurrences are susceptible to fire, older individuals develop self-pruned lower branches and develop a thick corky bark that makes them resistant to ground fires. Most of the occurrences sampled by Mueggler (1988) had a history of livestock grazing, as evidenced by relative abundance of the exotics *Taraxacum officinale*, *Poa pratensis*, and other grazing-tolerant plants, and the scarcity of grazing-susceptible plants (Mueggler 1988). Most occurrences that we see today represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system.

MEMBERSHIP

Associations:

- *Pinus contorta* var. *murrayana* - *Populus tremuloides* / *Artemisia tridentata* / *Poa pratensis* Forest (CEGL008669, GNR)
- *Pinus ponderosa* - *Populus tremuloides* / *Carex* spp. - (*Poa* spp.) Forest (CEGL000191, G2G3)
- *Populus tremuloides* - *Abies concolor* / *Arctostaphylos patula* Forest (CEGL000522, G4)
- *Populus tremuloides* - *Abies concolor* / *Poa pratensis* Semi-natural Forest (CEGL002947, GNA)
- *Populus tremuloides* - *Abies concolor* / *Symphoricarpos oreophilus* Forest (CEGL000523, G4G5)
- *Populus tremuloides* - *Abies lasiocarpa* / *Amelanchier alnifolia* Forest (CEGL000524, G3?)
- *Populus tremuloides* - *Abies lasiocarpa* / *Carex geyeri* - *Calamagrostis rubescens* Forest (CEGL000525, G3?)
- *Populus tremuloides* - *Abies lasiocarpa* / *Carex rossii* Forest (CEGL000526, G5)
- *Populus tremuloides* - *Abies lasiocarpa* / *Juniperus communis* Forest (CEGL000527, G3G4)
- *Populus tremuloides* - *Abies lasiocarpa* / *Pedicularis racemosa* Forest (CEGL000528, G2)
- *Populus tremuloides* - *Abies lasiocarpa* / *Shepherdia canadensis* Forest (CEGL000529, G3?)
- *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / *Bromus carinatus* Forest (CEGL000530, G3G4)
- *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000531, G4G5)
- *Populus tremuloides* - *Abies lasiocarpa* / *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest (CEGL000532, G3?)
- *Populus tremuloides* - *Abies lasiocarpa* / Tall Forbs Forest (CEGL000533, G5)
- *Populus tremuloides* - *Abies lasiocarpa* / *Thalictrum fendleri* Forest (CEGL000534, G4G5)
- *Populus tremuloides* - *Picea pungens* Forest (CEGL000535, G3G4)
- *Populus tremuloides* - *Pinus contorta* / *Carex geyeri* - *Calamagrostis rubescens* Forest (CEGL000536, G3?)
- *Populus tremuloides* - *Pinus contorta* / *Juniperus communis* Forest (CEGL000537, G4G5)
- *Populus tremuloides* - *Pinus contorta* / *Symphoricarpos oreophilus* Forest (CEGL000538, G3G4)
- *Populus tremuloides* - *Pinus contorta* / *Thalictrum fendleri* Forest (CEGL000539, G3?)
- *Populus tremuloides* - *Pinus flexilis* Forest (CEGL000540, G2G3)
- *Populus tremuloides* - *Pinus jeffreyi* Forest (CEGL003147, GNR)
- *Populus tremuloides* - *Pinus ponderosa* Rocky Mountain Forest (CEGL000541, G3G4)
- *Populus tremuloides* - *Pseudotsuga menziesii* / *Amelanchier alnifolia* Forest (CEGL000543, G3?)
- *Populus tremuloides* - *Pseudotsuga menziesii* / *Calamagrostis rubescens* Forest (CEGL000544, G3?)
- *Populus tremuloides* - *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000545, G3G4)
- *Populus tremuloides* - *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Forest (CEGL000546, G4)

Alliances:

- *Abies concolor* - *Populus tremuloides* Forest Alliance (A.419)
- *Abies lasiocarpa* - *Populus tremuloides* Forest Alliance (A.422)
- *Picea pungens* - *Populus tremuloides* Forest Alliance (A.423)
- *Pinus contorta* - *Populus tremuloides* Forest Alliance (A.424)
- *Pinus contorta* Forest Alliance (A.118)
- *Pinus flexilis* - *Populus tremuloides* Forest Alliance (A.425)
- *Pinus ponderosa* - *Populus tremuloides* Forest Alliance (A.399)
- *Populus tremuloides* - *Pseudotsuga menziesii* Forest Alliance (A.426)
- *Populus tremuloides* Forest Alliance (A.274)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Adjacent occurrences above or beside these mixed forests are typically pure aspen forest

or mixed-conifer forest, or subalpine spruce-fir forest and woodlands, while lower elevations may include grasslands and shrublands.

DISTRIBUTION

Range: This system occurs on montane slopes and plateaus in Utah, eastern Nevada, southern Idaho, western and central Wyoming (in the Bighorn Mountains), and in north-central Montana in the Big Snowy Mountains. Elevations range from 1700 to 2800 m.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, ID, MT, NV, UT, WY

Map Zones: 3:C, 6:C, 8:?, 9:C, 10:C, 12:C, 15:C, 16:C, 17:P, 18:C, 19:C, 20:C, 21:C, 22:P, 23:C, 24:C, 25:?, 27:P, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 315H:??, 331D:C?, 331J:CC, 341A:CC, 341B:CC, 341F:CC, 341G:CP, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342G:CP, 342J:CC, M242C:??, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CP, M332A:CP, M332B:C?, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:C?, M333D:C?, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 6:C, 9:C, 11:C, 18:C, 19:P, 26:C

SOURCES

References: Bartos and Campbell 1998, Comer et al. 2003, DeByle and Winokur 1985, DeVelice et al. 1986, Hardy and Arno 1996, Henderson et al. 1977, Mueggler 1988, Tuhy et al. 2002, Youngblood and Mauk 1985, Youngblood and Mueggler 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722896#references

Description Author: K.A. Schulz, mod. M.S. Reid and G. Kittel

Version: 20 Apr 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1062 INTER-MOUNTAIN BASINS CURL-LEAF MOUNTAIN-MAHOGANY WOODLAND AND SHRUBLAND (CES304.772)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Aridic; *Cercocarpus ledifolius*

Non-Diagnostic Classifiers: Foothill(s); Piedmont; Plateau; Forest and Woodland (Treed); Shrubland (Shrub-dominated);

Ridge/Summit/Upper Slope; Sideslope; Temperate [Temperate Continental]; Long Disturbance Interval; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2062; ESLF 4303; ESP 1062

CONCEPT

Summary: This ecological system occurs in hills and mountain ranges of the Intermountain West basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains. It typically occurs from 600 m to over 2650 m in elevation on rocky outcrops or escarpments and forms small- to large-patch stands in forested areas. Most stands occur as shrublands on ridges and steep rimrock slopes, but they may be composed of small trees in steppe areas. Scattered junipers or pines may also occur. This system includes both woodlands and shrublands dominated by *Cercocarpus ledifolius*. *Artemisia tridentata ssp. vaseyana*, *Purshia tridentata*, with species of *Arctostaphylos*, *Ribes*, or *Symphoricarpos* are often present. Undergrowth is often very sparse and dominated by bunch grasses, usually *Pseudoroegneria spicata* and *Festuca idahoensis*. *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species that generally does not resprout after burning and needs the protection from fire that rocky sites provide.

Related Concepts:

- Curleaf Mountain-Mahogany (415) (Shiflet 1994) Finer
- Curleaf Mountain-Mahogany - Bluebunch Wheatgrass (322) (Shiflet 1994) Finer

MEMBERSHIP

Associations:

- *Artemisia arbuscula* - *Cercocarpus ledifolius* / *Pseudoroegneria spicata* - *Poa secunda* Shrubland (CEGL001487, G4Q)
- *Cercocarpus ledifolius* / *Artemisia tridentata ssp. vaseyana* Woodland (CEGL001022, G3)
- *Cercocarpus ledifolius* / *Artemisia tridentata* Woodland (CEGL000960, G3G4)
- *Cercocarpus ledifolius* / *Calamagrostis rubescens* Woodland (CEGL000961, G2)
- *Cercocarpus ledifolius* / *Festuca idahoensis* Woodland (CEGL000962, G3)
- *Cercocarpus ledifolius* / *Holodiscus dumosus* Woodland (CEGL000963, G1G2)
- *Cercocarpus ledifolius* / *Leymus salinus ssp. salmonis* Woodland (CEGL000964, G2Q)
- *Cercocarpus ledifolius* / *Mahonia repens* Shrubland (CEGL000965, GNR)
- *Cercocarpus ledifolius* / *Prunus virginiana* Shrubland (CEGL000966, G4)
- *Cercocarpus ledifolius* / *Pseudoroegneria spicata* - *Festuca idahoensis* Woodland (CEGL000968, G3G4)
- *Cercocarpus ledifolius* / *Pseudoroegneria spicata* Shrubland (CEGL000967, G4Q)
- *Cercocarpus ledifolius* / *Symphoricarpos longiflorus* Shrubland (CEGL000969, G4)
- *Cercocarpus ledifolius* / *Symphoricarpos oreophilus* Woodland (CEGL000970, G2)
- *Cercocarpus ledifolius* Woodland [Placeholder] (CEGL003038, G4?)

Alliances:

- *Cercocarpus ledifolius* Shrubland Alliance (A.828)
- *Cercocarpus ledifolius* Woodland Alliance (A.586)

DISTRIBUTION

Range: This system occurs in hills and mountain ranges of the Intermountain West basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Bighorn Mountains.

Divisions: 206:?: 304:C; 306:C

Nations: US

Subnations: CA, CO, ID, MT, NV, OR, UT, WY

Map Zones: 6:P, 7:C, 8:C, 9:C, 10:C, 12:C, 16:C, 17:C, 18:C, 19:C, 21:C, 22:C, 23:?, 29:C, 30:?

USFS Ecomap Regions: 313A:CC, 331A:CC, 331G:CC, 341A:CC, 341B:CP, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242C:CC, M261E:CC, M261G:CC, M331A:C?, M331B:CC, M331D:CC, M331E:CC, M331J:C?, M332A:CC, M332B:C?, M332D:C?, M332E:CC, M332F:CC, M332G:CC, M333D:PP, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 6:P, 9:C, 10:P, 11:C, 12:C

SOURCES

References: Comer et al. 2003, Dealy 1975, Dealy 1978, Knight 1994, Knight et al. 1987, Lewis 1975b, Mueggler and Stewart 1980

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722900#references

Description Author: NatureServe Western Ecology Team

Version: 25 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1020 INTER-MOUNTAIN BASINS SUBALPINE LIMBER-BRISTLECONE PINE WOODLAND (CES304.790)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Forest and Woodland (Treed); Ridge; Ridge/Summit/Upper Slope; Temperate [Temperate Continental]; Xeric; *Pinus longaeva*, *P. flexilis*

Non-Diagnostic Classifiers: Calcareous

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2020; ESLF 4207; ESP 1020

CONCEPT

Summary: This ecological system extends from the Mojave Desert and Sierra Nevada across the central Great Basin to the central Wasatch and western Uinta mountains. These open woodlands are typically found on high-elevation ridges and rocky slopes above subalpine forests and woodlands. Sites are harsh, exposed to desiccating winds with rocky substrates and a short growing season that limit plant growth. Parent materials include dolomitic, limestone or granitic rocks. Occurrences can be found on all aspects but are more common on southwestern exposures on steep convex slopes and ridges between 2530 and 3600 m (8300-12,000 feet). Stands are strongly dominated by *Pinus flexilis* and/or *Pinus longaeva*. *Pinus monophylla* may be present in lower-elevation stands. If present, shrub and herbaceous layers are generally sparse and composed of xeric shrubs, graminoids and cushion plants. Associated species may include *Antennaria rosea*, *Arenaria kingii*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Chamaebatiaria millefolium*, *Cymopterus cinerarius*, *Elymus elymoides*, *Erigeron pygmaeus*, *Eriogonum ovalifolium*, *Festuca brachyphylla*, *Koeleria macrantha*, *Leptodactylon pungens*, *Ribes cereum*, or *Ribes montigenum*.

Related Concepts:

- Bristlecone Pine: 209 (Eyre 1980) Broader
- Limber Pine: 219 (Eyre 1980) Intersecting

DESCRIPTION

Environment: The bristlecone pine-limber pine woodland ecological system denotes some of the driest and windiest sites capable of supporting trees other than *Juniperus*. Sites are typically xeric on exposed, windswept rocky slopes and ridges. It can be found on all aspects but is more common on southwestern exposures on steep convex slopes and ridges between 2530 and 3600 m (8300-12,000 feet). It commonly represents a topographic or edaphic climax within the *Abies lasiocarpa* and upper *Pseudotsuga menziesii* zones.

This system occurs on a variety of substrates but is best represented on colluvium derived from limestone and dolomite or Tertiary and Cretaceous sandstone. A characteristic feature is the predominance of bare soil; almost all sites have between 25 and 50% bare ground. Consequently, litter accumulations are slight and intermittent. Most sites are droughty, with gravel in the shallow subsurface horizons. Surface textures vary depending upon parent material. Steep slopes, high-intensity summer convection storms, and only partial ground cover for interception often result in severe sheet erosion of fine particles. This usually leads to the development of gravel pavements. Additional erosion can be expected from wind action. High insolation and wind during the winter usually result in reduced snowpack accumulations. However, soils can be expected to freeze.

The sparsity of shrubs, forbs, grasses, and litter in addition to the widely spaced trees usually means that fire does not carry easily. Individual trees may be ignited from lightning, but seldom is an entire occurrence burned.

Dynamics: Natural regeneration of *Pinus flexilis* appears to be closely associated with caching of the large wingless seeds, primarily by Clark's nutcracker (*Nucifraga columbiana*) (Lanner and Vander Wall 1980). Germination of cached seeds often results in the multi-stemmed clumps characteristic of these sites, although the species may produce multiple stems from boles damaged near the ground. Germination and rooting will sometimes be restricted to crevices in rock. *Pinus longaeva* has smaller winged seeds and should be wind disseminated. However, caching by nutcrackers does take place, especially when other *Pinus* species are also available (Dr. R. Lanner pers. comm.). Fires seldom destroy this system due to the sparse nature of the canopy cover of trees and abundant bare ground.

MEMBERSHIP

Associations:

- *Abies concolor* var. *concolor* - *Pinus ponderosa* - *Pinus longaeva* Forest (CEGL002736, GNR)
- *Pinus flexilis* / *Cercocarpus ledifolius* Woodland (CEGL000804, G4)
- *Pinus flexilis* / *Festuca idahoensis* Woodland (CEGL000805, G5)
- *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807, G5)
- *Pinus flexilis* / *Juniperus osteosperma* Woodland (CEGL000808, G3)
- *Pinus flexilis* / *Mahonia repens* Woodland (CEGL000811, G3?)
- *Pinus longaeva* - *Pinus flexilis* Woodland [Placeholder] (CEGL003073, G4)
- *Pinus longaeva* Woodland (CEGL002380, GNR)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus longaeva* Woodland Alliance (A.518)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Adjacent vegetation at high elevations includes alpine meadows and shrublands and subalpine forests dominated by *Picea*, *Abies*, or *Pseudotsuga*. Adjacent montane occurrences are dominated by *Pinus ponderosa*, *Pinus contorta*, or *Pseudotsuga menziesii*. At lower elevations adjacent vegetation may include *Juniperus*-dominated woodland and savannas; shrublands dominated by species of *Artemisia*, *Cercocarpus*, or *Purshia tridentata*.

DISTRIBUTION

Range: This system extends from the Mojave Desert and Sierra Nevada across the Great Basin to the central Wasatch and extreme western Uinta mountains.

Divisions: 304:C; 306:?

Nations: US

Subnations: CA, NV, UT

Map Zones: 6:P, 7:?, 9:?, 12:C, 13:C, 16:C, 17:C, 18:P

USFS Ecomap Regions: 322A:CC, 331J:CC, 341A:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342J:C?, M261E:CC, M331D:PP, M341A:CC, M341D:CC

TNC Ecoregions: 9:?, 11:C, 12:C, 18:C, 19:C

SOURCES

References: Comer et al. 2003, Graybosch and Buchanan 1983, Holland and Keil 1995, Lanner and Vander Wall 1980, Lanner pers. comm., Nachlinger and Reese 1996

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722882#references

Description Author: NatureServe Western Ecology Team

Version: 05 Oct 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1021 KLAMATH-SISKIYOU LOWER MONTANE SERPENTINE MIXED CONIFER WOODLAND (CES206.917)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Serpentine; Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Ultramafic with low Ca:Mg ratio

Non-Diagnostic Classifiers: Montane [Lower Montane]; Xeric

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2021; ESLF 4208; ESP 1021

CONCEPT

Summary: This system occurs throughout the Klamath - Siskiyou region below 1500 m (4550 feet) elevation on thin, rocky, ultramafic (gabbro, peridotite, serpentinite) soils below winter snow accumulations and typically experiences hot and dry summers. Soils are not always rocky; they can be loamy, up to 76 cm (30 inches) in depth, and can be heavy clay. Not all ultramafic outcrops support distinct vegetation; only those with very low Ca:Mg ratios impact biotic composition. These systems are highly variable and spotty in distribution. These sites are more productive and can support large-statured (dbh, height) trees, although they tend to be widely spaced. Common species include *Pseudotsuga menziesii*, *Pinus sabiniana*, *Pinus lambertiana*, *Pinus jeffreyi*, *Pinus attenuata*, *Lithocarpus densiflorus* var. *echinoides*, *Calocedrus decurrens*, *Arctostaphylos* spp., *Quercus vaccinifolia*, and *Xerophyllum tenax*. Perennial grasses such as *Festuca idahoensis* may also be characteristic. *Chamaecyparis lawsoniana* communities can occur within occurrences of this system in mesic and linear riparian zones. Herbaceous-dominated serpentine fens (and bogs) are treated in Mediterranean California Serpentine Fen (CES206.953).

Classification Comments: It has been proposed to merge this system with the similar Klamath-Siskiyou Upper Montane Serpentine Mixed Conifer Woodland (CES206.914), as they are similar in composition and structure. For now, they are kept as separate systems pending further review and comment from California ecologists.

Similar Ecological Systems:

- Klamath-Siskiyou Xeromorphic Serpentine Savanna and Chaparral (CES206.150)

Related Concepts:

- Knobcone Pine: 248 (Eyre 1980) Intersecting
- Port Orford-Cedar: 231 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Abies concolor* - *Chamaecyparis lawsoniana* - *Picea breweriana* / *Quercus vaccinifolia* Forest (CEGL000049, G1)
- *Abies concolor* - *Chamaecyparis lawsoniana* / *Quercus sadleriana* / *Leucothoe davisiae* - *Rhododendron macrophyllum* Forest (CEGL000042, G2)
- *Chamaecyparis lawsoniana* - *Pseudotsuga menziesii* / (*Rhododendron macrophyllum*) / *Xerophyllum tenax* Forest (CEGL000044, G1)
- *Chamaecyparis lawsoniana* - *Pseudotsuga menziesii* / *Lithocarpus densiflorus* / *Gaultheria shallon* Forest (CEGL000043, G2)
- *Pinus attenuata* / *Arctostaphylos nevadensis* Woodland (CEGL000763, G2)
- *Pinus jeffreyi* / *Quercus vaccinifolia* - *Arctostaphylos nevadensis* Woodland (CEGL003448, G2)
- *Pinus jeffreyi* / *Quercus vaccinifolia* - *Garrya buxifolia* Woodland (CEGL003447, G2G3)

Alliances:

- *Chamaecyparis lawsoniana* Forest Alliance (A.104)
- *Picea breweriana* Forest Alliance (A.156)
- *Pinus attenuata* Woodland Alliance (A.508)
- *Pinus jeffreyi* Woodland Alliance (A.541)

DISTRIBUTION

Range: This system occurs throughout the Klamath - Siskiyou region below 1500 m (4550 feet) elevation.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 7:?

USFS Ecomap Regions: 263A:CC, M242A:CP, M242B:CC, M242C:C?, M261A:CC, M261B:CC, M261C:CP, M261D:CC

TNC Ecoregions: 5:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Jimerson 1993, Jimerson 1994, Jimerson and

Daniel 1999, Jimerson et al. 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722764#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1022 KLAMATH-SISKIYOU UPPER MONTANE SERPENTINE MIXED CONIFER WOODLAND (CES206.914)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Ultramafic with low Ca:Mg ratio; Very Shallow Soil; Ustic

Non-Diagnostic Classifiers: Serpentine; Needle-Leaved Tree; Broad-Leaved Evergreen Tree; Broad-Leaved Evergreen Shrub

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2022; ESLF 4209; ESP 1022

CONCEPT

Summary: This system occurs throughout the Klamath - Siskiyou region above 1500 m (4550 feet) elevation on thin, rocky, ultramafic (gabbro, peridotite, serpentinite) soils in dry-mesic conditions. Not all ultramafic outcrops support distinct vegetation; only those with very low Ca:Mg ratios impact biotic composition. Although ultramafics may be relatively dry and have a moderate to high grass component, they do not burn often where the serpentine syndrome [see Kruckeberg (1984)] is severe. The problem is not just the calcium:magnesium ratio, but heavy metals and sometimes high clay content limit biomass production. These systems are highly variable and spotty in distribution. Common species include *Pinus monticola*, *Pinus balfouriana*, *Quercus vacciniifolia*, *Pinus jeffreyi*, *Ceanothus pumilus*, *Arctostaphylos* spp., *Lithocarpus densiflorus* var. *echinoides*, *Abies X shastensis* (= *Abies magnifica* var. *shastensis*), and *Chamaecyparis nootkatensis*. Stands of stunted (up to 12 m [40 feet]) but straight *Pinus contorta* are also possible. *Chamaecyparis lawsoniana* communities can occur in this system in mesic and linear riparian zones. Herbaceous-dominated serpentine fens (and bogs) are treated in Mediterranean California Serpentine Fen (CES206.953).

Classification Comments: It has been proposed to merge this system with the similar Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland (CES206.917), as they are similar in composition and structure. For now, they are kept as separate systems pending further review and comment from California ecologists.

Related Concepts:

- Knobcone Pine: 248 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Pinus balfouriana* Woodland [Placeholder] (CEGL003068, G3?)
- *Pinus monticola* - *Pseudotsuga menziesii* / *Quercus vacciniifolia* - *Lithocarpus densiflorus* Woodland (CEGL003449, G2)

Alliances:

- *Pinus balfouriana* Woodland Alliance (A.509)
- *Pinus monticola* Woodland Alliance (A.532)

DISTRIBUTION

Range: This system occurs throughout the Klamath - Siskiyou region above 1500 m (4550 feet) elevation.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 7:?

USFS Ecomap Regions: M242A:??, M261A:CC, M261B:CC, M261C:CP, M261D:CC

TNC Ecoregions: 5:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Jimerson 1993, Jimerson 1994, Jimerson and Daniel 1999, Jimerson et al. 1995, Kruckeberg 1984, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722767#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid, G. Kittel

Version: 25 Apr 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1302 LAURENTIAN-ACADIAN NORTHERN HARDWOODS FOREST (CES201.564)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Eutrophic Soil; Mesotrophic Soil; Broad-Leaved Tree; *Acer saccharum* - *Betula* spp.

Non-Diagnostic Classifiers: Lowland; Ridge/Summit/Upper Slope; Sideslope; Glaciated; Circumneutral Soil; Acidic Soil; Shallow Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Udic; Long Disturbance Interval; W-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2302; ESLF 4108; ESP 1302

CONCEPT

Summary: These northern hardwood forests range across New England and adjacent Canada, south to northern Pennsylvania and west to Minnesota. They occur in various dry-mesic to wet-mesic settings at low to moderate elevations (generally <610 m [2000 feet]) throughout the Laurentian-Acadian Division. *Acer saccharum*, *Betula alleghaniensis*, and *Fagus grandifolia* are the dominant trees (the latter only east of northern Wisconsin). *Tsuga canadensis* or, in the Northeast, *Picea rubens* are common minor canopy associates. *Ostrya virginiana* is frequent but not dominant. Oak is a minor component and absent from northern regions. Successional stands may be dominated by *Populus tremuloides*, *Betula papyrifera*, *Acer rubrum*, *Fraxinus americana*, *Prunus serotina*, sometimes with scattered *Pinus strobus*. Soils range from moderately nutrient-poor to quite enriched, with associated shifts in the herb flora. This system can include large expanses of rich forest in areas of limestone or similar bedrock, as well as forests that are relatively poor floristically in areas of granitic (or similar) bedrock or acidic till. Blowdowns or snow and ice loading, with subsequent gap regeneration, are the most frequent form of natural disturbance.

Classification Comments: An east-west separation between the Laurentian and Acadian regions was considered, but the hardwoods component is essentially similar (though beech drops out in the most western part of this system). It appears to be more of a gradient, with beech and hobblebush dropping out and fire frequency probably a little greater in the western portion. A possible split at Lake Michigan could be considered if one could make a better case than just beech. Hemlock-hardwood inclusions in the East may be part of this system where the matrix and surroundings are predominantly hardwood, but where hemlock and pine are prevalent, as in ravines or cool slopes, Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563) is the appropriate system.

Similar Ecological Systems:

- Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565)--is primarily coniferous though portions may have hardwoods present or codominant; *Picea rubens* is characteristic in the Acadian region and *Picea mariana* associations are also attributed.
- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)--occurs southward of this type; the two overlap in parts of New York and the Connecticut Valley.
- Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563)--is primarily coniferous and often on lower slopes or ravines.
- North-Central Interior Beech-Maple Forest (CES202.693)

MEMBERSHIP

Associations:

- *Acer saccharum* - (*Fraxinus americana*) / *Arisaema triphyllum* Forest (CEGL006211, G4)
- *Acer saccharum* - *Betula alleghaniensis* - (*Tilia americana*) Forest (CEGL002457, G3G4)
- *Acer saccharum* - *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* Forest (CEGL006252, G5)
- *Acer saccharum* - *Fagus grandifolia* - *Betula* spp. / *Maianthemum canadense* Forest (CEGL005004, G4G5)
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* / *Acer spicatum* / *Caulophyllum thalictroides* Forest (CEGL005008, G4?)
- *Acer saccharum* - *Tilia americana* / *Ostrya virginiana* / *Lonicera canadensis* Forest (CEGL002458, G3?)
- *Betula papyrifera* / *Acer saccharum* - Mixed Hardwoods Forest (CEGL002464, G4?)
- *Onoclea sensibilis* - (*Adiantum pedatum*) - *Impatiens capensis* - *Carex plantaginea* Herbaceous Vegetation [Provisional] (CEGL006409, G4?)
- *Populus (tremuloides, grandidentata)* - *Betula (populifolia, papyrifera)* Woodland (CEGL006303, G5)
- *Populus tremuloides* - *Betula papyrifera* - (*Acer rubrum*, *Populus grandidentata*) Forest (CEGL002467, G5)
- *Symplocarpus foetidus* Herbaceous Vegetation (CEGL002385, G4?)
- *Thuja occidentalis* - *Betula alleghaniensis* Forest (CEGL002450, G2Q)
- *Thuja occidentalis* / *Abies balsamea* - *Acer spicatum* Forest (CEGL002449, G4)
- *Tsuga canadensis* - (*Betula alleghaniensis*) - *Picea rubens* / *Cornus canadensis* Forest (CEGL006129, GNR)

Alliances:

- *Acer saccharum* - *Betula alleghaniensis* - (*Fagus grandifolia*) Forest Alliance (A.216)
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Acer saccharum* - *Tilia americana* - (*Quercus rubra*) Forest Alliance (A.220)

- *Betula papyrifera* Forest Alliance (A.267)
- *Populus tremuloides* - *Betula papyrifera* Forest Alliance (A.269)
- *Populus tremuloides* Woodland Alliance (A.610)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)
- *Thuja occidentalis* - *Betula alleghaniensis* Forest Alliance (A.417)
- *Thuja occidentalis* Forest Alliance (A.142)
- *Tsuga canadensis* - *Betula alleghaniensis* Forest Alliance (A.412)

DISTRIBUTION

Range: This system occurs in northern New England and northern New York west across the upper Great Lakes to northern Minnesota, and adjacent Canada; occasional southwards.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: MA, ME, MI, MN, NB, NH, NS, NY, ON, PA, QC, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 211E:CC, 211F:CC, 211I:CC, 211J:CC, 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Q:CC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212S:CC, 212T:CC, 212X:CC, 212Y:CC, 212Z:CC, 221B:CC, 222I:CC, 222Ja:CCC, 222Jf:CCC, 222Ud:CCC, 222Ue:CCC, M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 47:C, 48:C, 60:C, 61:C, 63:C, 64:C

SOURCES

References: Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723040#references

Description Author: S.C. Gawler

Version: 04 Feb 2009

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: East

1362 LAURENTIAN-ACADIAN NORTHERN PINE-(OAK) FOREST (CES201.719)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2362; ESLF 4265; ESP 1362

CONCEPT

Summary: This is a pine-dominated, or occasionally pine-oak, forest system that is typically found on nutrient-poor soils, or on moderately rich soils in the Midwest, in a variety of topographic settings. Soils are loamy to sandy, varying from thin soil over bedrock to deeper soils, sometimes sandy. Sites are xeric to subxeric, but less strongly than barrens and sandplains. The dominant fire regime varies from 100-200 years for *Pinus strobus* and *Pinus resinosa*. Other boreal conifers, or in the East *Picea rubens*, may occasionally be present. Canopy structure is mostly closed but can be partially open. Conifers typically dominate the canopy, but codominates may include hardwoods, especially *Quercus rubra* or *Acer rubrum*, but also *Populus tremuloides* or *Betula papyrifera*. The shrub and field layers can be somewhat dense to sparse.

Classification Comments: This system is dominated by white pine and red pine forests, which are found primarily in the Great Lakes and sub-boreal region, but extend eastward to Acadia. Where *Pinus strobus* is a codominant with *Tsuga canadensis*, stands most typically are placed within Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563).

Similar Ecological Systems:

- Central Appalachian Dry Oak-Pine Forest (CES202.591)
- Laurentian Pine-Oak Barrens (CES201.718)
- Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563)--is more mesic; red pine and jack pine are good differential species for CES201.719 versus CES201.563.

MEMBERSHIP

Associations:

- *Pinus resinosa* - *Populus tremuloides* / *Diervilla lonicera* - *Vaccinium* spp. Forest (CEGL002520, GNR)
- *Pinus resinosa* / *Vaccinium* spp. Forest (CEGL002443, G3)
- *Pinus strobus* - (*Pinus resinosa*) - *Quercus rubra* Forest (CEGL002480, G4)
- *Pinus strobus* - *Pinus resinosa* / *Cornus canadensis* Forest (CEGL006253, GNR)
- *Pinus strobus* - *Populus tremuloides* / *Corylus cornuta* Forest (CEGL002479, G4?)
- *Pinus strobus* / *Acer spicatum* - *Corylus cornuta* Forest (CEGL002445, G3G4)
- *Pinus strobus* / *Vaccinium* spp. Forest (CEGL002444, G3G4)
- *Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Forest (CEGL006506, GNR)

Alliances:

- *Pinus resinosa* Forest Alliance (A.126)
- *Pinus strobus* - (*Pinus resinosa*) - *Populus tremuloides* Forest Alliance (A.400)
- *Pinus strobus* - *Quercus (alba, rubra, velutina)* Forest Alliance (A.401)
- *Pinus strobus* Forest Alliance (A.128)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

DISTRIBUTION

Divisions: 102:?: 103:?: 201:C

Nations: CA, US

Subnations: MB, ME, MI, MN, NB, NH, NS, NY, ON, PA?, PE?, QC, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CP, 211B:CC, 211C:CC, 211D:CC, 211E:CC, 211J:CP, 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212Jb:CCC, 212Jc:CCC, 212Jo:CCC, 212Ka:CCC, 212Kb:CCC, 212La:CCC, 212Lb:CCC, 212Lc:CCC, 212Ld:CCC, 212Le:CCC, 212Ma:CCC, 212Mb:CCC, 212Na:CCC, 212Nb:CCC, 212Nc:CCC, 212Nd:CCC, 212Qa:CCC, 212Qb:CCC, 212Qc:CCC, 212Qd:CCC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212Sb:CCC, 212Sc:CCC, 212Sn:CCC, 212Sq:CCC, 212Ta:CCC, 212Tb:CCC, 212Tc:CCC, 212Te:CCC, 212Tf:CCC, 212Xa:CCC, 212Xb:CCC, 212Xc:CCC, 212Xd:CCC, 212Xe:CCC, 212Xf:CCC, 212Ya:CCC, 212Za:CCC, 212Zb:CCC, 212Zc:CCC, 221Ai:CCC, 221Al:CCC, 222I:CP, 222Ja:CCC, 222Ud:CCC, 222Ue:CCC, M211A:CC, M211Bd:CCC, M211C:CP, M211D:CP

TNC Ecoregions: 46:?, 47:C, 48:C, 61:C, 63:C

SOURCES

References: Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003, Frelich 1992, Heinselman 1973, Whitney 1986, Whitney 1987

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722950#references

Description Author: D. Faber-Langendoen

Version: 04 Mar 2004

Concept Author: D. Faber-Langendoen and S.C. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

1366 LAURENTIAN-ACADIAN PINE-HEMLOCK-HARDWOOD FOREST (CES201.563)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); *Pinus* spp. - *Tsuga canadensis*

Non-Diagnostic Classifiers: Sideslope; Glaciated; Mesotrophic Soil; Acidic Soil; Shallow Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Sand Soil Texture; Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; W-Patch/Medium Intensity; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2366; ESLF 4308; ESP 1366

CONCEPT

Summary: This north-temperate forest system ranges from the northeastern U.S. and adjacent Canada west to the Great Lakes and upper Midwest. The mesic to dry-mesic forests usually occur on low-nutrient soils at low elevations, mostly less than 610 m (2000 feet). Canopy dominants include *Pinus strobus*, *Tsuga canadensis*, and *Quercus rubra* in varying percentages. *Acer rubrum* is also quite common; *Betula lenta* may be common at the southern periphery of this system's range. *Quercus velutina* and *Quercus alba* are essentially absent from this system, being more representative of systems in the Central Interior-Appalachian Division to the south. This is a widespread, matrix forest type for the more temperate portions of this division. Gap replacement and infrequent fire are the major natural regeneration modes.

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)--is the counterpart to this system as one moves southward; also can have more northern hardwood species than usually seen in this system.
- Laurentian-Acadian Northern Hardwoods Forest (CES201.564)
- Laurentian-Acadian Northern Pine-(Oak) Forest (CES201.719)--occurs in slightly to considerably drier settings and rarely has hemlock. Fire return interval is shorter too. May have red pine.

MEMBERSHIP

Associations:

- (*Pinus strobus*, *Quercus rubra*) / *Danthonia spicata* Acidic Bedrock Wooded Herbaceous Vegetation (CEGL005101, G3G4)
- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014, GNR)
- *Acer saccharum* - *Pinus strobus* / *Acer pensylvanicum* Forest (CEGL005005, GNR)
- *Betula alleghaniensis* - *Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Forest (CEGL006380, G4?)
- *Pinus strobus* - (*Pinus resinosa*) - *Quercus rubra* Forest (CEGL002480, G4)
- *Pinus strobus* - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest (CEGL006293, G5)
- *Pinus strobus* - *Quercus alba* / (*Corylus americana*, *Gaylussacia baccata*) Forest (CEGL002481, G3)
- *Pinus strobus* - *Tsuga canadensis* - *Picea rubens* Forest (CEGL006324, GNR)
- *Pinus strobus* - *Tsuga canadensis* Great Lakes Forest (CEGL002590, G3)
- *Pinus strobus* / *Acer spicatum* - *Corylus cornuta* Forest (CEGL002445, G3G4)
- *Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Forest (CEGL006506, GNR)
- *Quercus rubra* - *Acer saccharum* - *Fagus grandifolia* / *Viburnum acerifolium* Forest (CEGL006173, G4G5)
- *Quercus rubra* - *Acer saccharum* Forest (CEGL002461, G4G5)
- *Quercus rubra* - *Quercus alba* - (*Quercus velutina*, *Acer rubrum*) / *Viburnum acerifolium* Forest (CEGL002462, GNR)
- *Symplocarpus foetidus* Herbaceous Vegetation (CEGL002385, G4?)
- *Thuja occidentalis* - (*Betula alleghaniensis*, *Tsuga canadensis*) Forest (CEGL002595, G3?)
- *Tsuga canadensis* - (*Betula alleghaniensis*) - *Picea rubens* / *Cornus canadensis* Forest (CEGL006129, GNR)
- *Tsuga canadensis* - (*Betula alleghaniensis*) Forest (CEGL002598, G3G4)
- *Tsuga canadensis* - *Acer saccharum* - *Betula alleghaniensis* Forest (CEGL005044, G4?)
- *Tsuga canadensis* - *Fagus grandifolia* - (*Acer saccharum*) Great Lakes Forest (CEGL005042, G4G5)
- *Tsuga canadensis* - *Fagus grandifolia* - *Acer saccharum* / (*Hamamelis virginiana*, *Kalmia latifolia*) Forest (CEGL005043, G3?)
- *Tsuga canadensis* - *Fagus grandifolia* - *Quercus rubra* Forest (CEGL006088, G4G5)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Danthonia spicata* Herbaceous Alliance (A.1281)
- *Pinus strobus* - *Acer saccharum* Forest Alliance (A.3012)
- *Pinus strobus* - *Quercus* (*alba*, *rubra*, *velutina*) Forest Alliance (A.401)
- *Pinus strobus* - *Tsuga canadensis* Forest Alliance (A.127)
- *Pinus strobus* Forest Alliance (A.128)

- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)
- *Thuja occidentalis* Forest Alliance (A.142)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)
- *Tsuga canadensis* - *Betula alleghaniensis* Forest Alliance (A.412)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

DISTRIBUTION

Range: New England west to the Great Lakes and northern Minnesota.

Divisions: 201:C

Nations: CA, US

Subnations: MA, ME, MI, MN, NB, NH, NS, NY, ON, PA, QC, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 211E:CC, 211Fa:CCC, 211Fb:CCC, 211Ff:CCC, 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212S:CC, 212T:CC, 212X:CC, 212Y:CC, 212Z:CC, 221A1:CCC, 222Ja:CCC, 222Jf:CCC, 222L:CC, 222Ud:CC?, 222Ue:CCC, M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 47:C, 48:C, 60:C, 61:C, 63:C, 64:C

SOURCES

References: Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003, Whitney 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723041#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest
ClassifResp: East

LOWER MISSISSIPPI RIVER DUNE POND (CES203.189)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Forest and Woodland (Treed); Dune (Substrate); Sand Soil Texture

National Mapping Codes: ESLF 4151

CONCEPT

Summary: This system represents distinctive wetlands that are called "sand ponds" in Arkansas. They occur in isolated depressions in the context of sand dunes and related eolian features of the lower Mississippi River Alluvial Valley in Missouri and Arkansas. These depressions have silty bottoms and may be connected to the local aquifer or have a perched water table. The margins of these ponds are rimmed by *Quercus phellos* and also have *Quercus lyrata*. These Pleistocene dunes were overlooked or unrecognized until the late 1970s (Saucier 1978). These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared.

Classification Comments: These depressions in the dune fields are one of the principal habitats for the rare shrub *Lindera melissifolia* (Heineke 1987). The dunes consist of a layer of sand or sandy loam over an impervious sublayer. This large area of eolian sand dunes occurs "mainly in a long band to the west of Crowley's Ridge" and occupies approximately 1000 square kilometers (400 square miles) in discrete fields of up to 78 square kilometers (30 square miles) each (Heineke 1987).

Quercus lyrata - *Quercus palustris* / *Acer rubrum* var. *drummondii* / *Itea virginica* - *Cornus foemina* - (*Lindera melissifolia*) Forest (CEGL004778), a wetland type, occurs in isolated depressions in the dunes that may be connected to the local aquifer or have a perched water table (T. Foti pers. comm.).

DESCRIPTION

Environment: This system occurs in isolated depressions in the context of sand dunes and related eolian features of the lower Mississippi River Alluvial Valley in Missouri and Arkansas. These depressions have silty bottoms and may be connected to the local aquifer or have a perched water table (T. Foti pers. comm.). These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared.

Vegetation: The margins of these ponds are rimmed by *Quercus phellos* and also have *Quercus lyrata* (Heineke 1987).

MEMBERSHIP

Associations:

- *Quercus lyrata* - *Quercus palustris* / *Acer rubrum* var. *drummondii* / *Itea virginica* - *Cornus foemina* - (*Lindera melissifolia*) Forest (CEGL004778, G2?)

Alliances:

- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Lower Mississippi River Dune Woodland and Forest (CES203.531)

DISTRIBUTION

Range: This system is found in the Lower Mississippi River Alluvial Valley in Missouri (Ripley County, Sand Ponds Natural Area) and Arkansas. In Arkansas, examples occur in Clay, Jackson, Lawrence, and Woodruff counties.

Divisions: 202:?, 203:C

Nations: US

Subnations: AR, MO

Map Zones: 45:C

TNC Ecoregions: 42:C

SOURCES

References: Foti pers. comm., Heineke 1987, Saucier 1978, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.759075#references

Description Author: T. Foti and M. Pyne

Version: 27 Jan 2005

Concept Author: T. Foti and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1381 LOWER MISSISSIPPI RIVER DUNE WOODLAND AND FOREST (CES203.531)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Dune (Substrate); Sand Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2381; ESLF 4324; ESP 1381

CONCEPT

Summary: This system represents the vegetation of sand dunes and related eolian features of the lower Mississippi River Alluvial Valley in Missouri and Arkansas. These Pleistocene dunes were overlooked or unrecognized until the late 1970s (Saucier 1978). This fact coupled with long periods of weathering and human disturbance, as well as proximity to a terrace mapped as "prairie" in General Land Office records, has led to considerable confusion regarding this type (T. Foti pers. comm.). These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared. The uppermost portions of the dunes support a xeric community similar to sandhills of the West Gulf Coastal Plain (WGCP), but are outside the natural range of *Quercus incana*, a diagnostic species typical of the WGCP examples. Instead the dunes support very open *Quercus stellata* woodlands with *Schizachyrium scoparium* and abundant lichen cover (presumably *Cladonia* spp.), along with *Opuntia* sp. Less edaphically extreme slopes support more closed-canopied forests in which *Quercus stellata* is still important, along with *Quercus falcata* and possibly other species. In many instances, distinctive wetlands imbedded within this system are also present (Lower Mississippi River Dune Pond (CES203.189)). Called "sand ponds" in Arkansas, these depressions have silty bottoms and perched water tables. The margins of these ponds are rimmed by *Quercus phellos* and have *Quercus lyrata* (Heineke 1987).

Classification Comments: Heineke (1987) states that this large area of eolian sand dunes occurs "mainly in a long band to the west of Crowley's Ridge," and occupies approximately 1000 square kilometers (400 square miles) in discrete fields of up to 78 square kilometers (30 square miles) each. The dunes consist of a layer of sand or sandy loam over an impervious sublayer (Heineke 1987). Depressions in the dune fields (e.g., Lower Mississippi River Dune Pond (CES203.189)) are one of the principal habitats for the rare shrub *Lindera melissifolia*.

DESCRIPTION

Environment: These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared. The uppermost portions of the dunes support a xeric community similar to sandhills of the West Gulf Coastal Plain.

Vegetation: The uppermost portions of the dunes support a xeric community of very open *Quercus stellata* woodlands with *Schizachyrium scoparium* and abundant lichen cover (presumably *Cladonia* spp.), along with *Opuntia* sp. Less edaphically extreme slopes support more closed-canopied forests in which *Quercus stellata* is still important, along with *Quercus falcata* and possibly other species.

MEMBERSHIP

Associations:

- *Quercus stellata* - *Quercus marilandica* - *Quercus falcata* / *Schizachyrium scoparium* Sand Woodland (CEGL002417, G2)
- *Quercus stellata* - *Quercus velutina* - *Quercus alba* - (*Quercus falcata*) / *Croton michauxii* Sand Woodland (CEGL002396, G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Aristida lanosa* - *Polypremum procumbens* Herbaceous Vegetation (CEGL002397, G1Q)

Alliances:

- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Lower Mississippi River Dune Pond (CES203.189)

DISTRIBUTION

Range: Lower Mississippi River Alluvial Valley in Missouri (Ripley County, Sand Ponds Natural Area) and Arkansas. In Arkansas, examples occur in Clay, Jackson, Lawrence, and Woodruff counties.

Divisions: 202:?: 203:C

Nations: US

Subnations: AR, MO
Map Zones: 45:C
USFS Ecomap Regions: 234D:CC
TNC Ecoregions: 42:C

SOURCES

References: Comer et al. 2003, Heineke 1987, Saucier 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723069#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 26 Jan 2005

Concept Author: T. Foti and R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1023 MADREAN ENCINAL (CES305.795)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Sierra Madre (305)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Tropical/Subtropical [Tropical Xeric]; Xeric; F-Patch/Medium Intensity; Broad-Leaved Evergreen Tree; Graminoid; *Quercus arizonica*, *Q. emoryi*, *Q. grisea*, *Q. oblongifolia* *Q. toumeyii*

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Sideslope; Intermediate Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2023; ESLF 4210; ESP 1023

CONCEPT

Summary: Madrean Encinal occurs on foothills, canyons, bajadas and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, extending north into Trans-Pecos Texas, southern New Mexico and sub-Mogollon Arizona. These woodlands are dominated by Madrean evergreen oaks along a low-slope transition below Madrean Lower Montane Pine-Oak Forest and Woodland (CES305.796) and Madrean Pinyon-Juniper Woodland (CES305.797). Lower elevation stands are typically open woodlands or savannas where they transition into desert grasslands, chaparral or in some cases desertscrub. Common evergreen oak species include *Quercus arizonica*, *Quercus emoryi*, *Quercus intricata*, *Quercus grisea*, *Quercus oblongifolia*, *Quercus toumeyii*, and in Mexico *Quercus chihuahuensis* and *Quercus albocincta*. Madrean pine, Arizona cypress, pinyon and juniper trees may be present but do not codominate. Chaparral species such as *Arctostaphylos pungens*, *Cercocarpus montanus*, *Purshia* spp., *Garrya wrightii*, *Quercus turbinella*, *Frangula betulifolia* (= *Rhamnus betulifolia*), or *Rhus* spp. may be present but do not dominate. The graminoid layer is usually prominent between trees in grassland or steppe that is dominated by warm-season grasses such as *Aristida* spp., *Bouteloua gracilis*, *Bouteloua curtipendula*, *Bouteloua rothrockii*, *Digitaria californica*, *Eragrostis intermedia*, *Hilaria belangeri*, *Leptochloa dubia*, *Muhlenbergia* spp., *Pleuraphis jamesii*, or *Schizachyrium cirratum*, species typical of Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735). This system includes seral stands dominated by shrubby Madrean oaks typically with a strong graminoid layer. In transition areas with drier chaparral systems, stands of chaparral are not dominated by Madrean oaks; however, Madrean Encinal may extend down along drainages.

Classification Comments: Although some stands may be shrubby especially in the north, E. Muldavin (pers. comm.) says encinal is considered woodland in Mexico.

Similar Ecological Systems:

- Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735)

Related Concepts:

- Arizona Cypress: 240 (Eyre 1980) Intersecting
- Oak - Juniper Woodland and Mahogany - Oak (509) (Shiflet 1994) Broader
- Western Live Oak: 241 (Eyre 1980) Broader

DESCRIPTION

Vegetation: Stands of this system are dominated by evergreen oak species including *Quercus arizonica*, *Quercus emoryi*, *Quercus intricata*, *Quercus grisea*, *Quercus oblongifolia*, *Quercus toumeyii*, and in Mexico *Quercus chihuahuensis* and *Quercus albocincta*. Madrean pine, Arizona cypress, pinyon and juniper trees may be present but do not codominate. Chaparral species such as *Arctostaphylos pungens*, *Cercocarpus montanus*, *Purshia* spp., *Garrya wrightii*, *Quercus turbinella*, *Frangula betulifolia* (= *Rhamnus betulifolia*), or *Rhus* spp. may be present but do not dominate. The graminoid layer is usually prominent between trees in grassland or steppe that is dominated by warm-season grasses such as *Aristida* spp., *Bouteloua gracilis*, *Bouteloua curtipendula*, *Bouteloua rothrockii*, *Digitaria californica*, *Eragrostis intermedia*, *Hilaria belangeri*, *Leptochloa dubia*, *Muhlenbergia* spp., *Pleuraphis jamesii*, or *Schizachyrium cirratum*. These species are also typical of Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735).

MEMBERSHIP

Associations:

- *Cupressus arizonica* / *Quercus hypoleucooides* Forest (CEGL000352, G2)
- *Cupressus arizonica* / *Quercus turbinella* Forest (CEGL000353, G2G3)
- *Quercus arizonica* / *Bouteloua curtipendula* Woodland (CEGL000680, G3)
- *Quercus arizonica* / *Muhlenbergia emersleyi* Woodland (CEGL000681, G4)
- *Quercus emoryi* / *Arctostaphylos pungens* Woodland (CEGL000682, GNR)
- *Quercus emoryi* / *Bouteloua curtipendula* Woodland (CEGL000683, G3)
- *Quercus emoryi* / *Dasyllirion wheeleri* Woodland (CEGL000684, G3)
- *Quercus emoryi* / *Muhlenbergia emersleyi* Woodland (CEGL000685, G4)

- *Quercus emoryi* / *Piptochaetium fimbriatum* Woodland (CEGL000686, G2)
- *Quercus emoryi* / *Schizachyrium cirratum* Woodland (CEGL000687, GNR)
- *Quercus emoryi* / *Sporobolus flexuosus* Woodland (CEGL000688, G1)
- *Quercus grisea* / *Bouteloua curtipendula* Woodland (CEGL000689, G5)
- *Quercus grisea* / *Cercocarpus montanus* Woodland (CEGL000690, G5?)
- *Quercus grisea* / *Juniperus deppeana* Woodland (CEGL003521, GNR)
- *Quercus grisea* / *Rhus trilobata* Woodland (CEGL000691, GNR)
- *Quercus intricata* - *Dasyllirion leiophyllum* Shrubland (CEGL004530, GNR)
- *Quercus oblongifolia* / *Bouteloua curtipendula* Shrubland (CEGL000973, G4)
- *Quercus oblongifolia* / *Dasyllirion wheeleri* Shrubland (CEGL000974, G4)
- *Quercus toumeyi* / *Bouteloua curtipendula* Shrubland (CEGL000975, G1)
- *Quercus toumeyi* / *Muhlenbergia emersleyi* Shrubland (CEGL000976, G1)

Alliances:

- *Cupressus arizonica* Forest Alliance (A.163)
- *Quercus arizonica* Woodland Alliance (A.482)
- *Quercus emoryi* Woodland Alliance (A.483)
- *Quercus grisea* Woodland Alliance (A.478)
- *Quercus intricata* Shrubland Alliance (A.781)
- *Quercus oblongifolia* Shrubland Alliance (A.791)
- *Quercus toumeyi* Shrubland Alliance (A.792)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Madrean Lower Montane Pine-Oak Forest and Woodland (CES305.796)
- Madrean Pinyon-Juniper Woodland (CES305.797)

Adjacent Ecological System Comments: This system occurs along a low-slope transition from Madrean Pinyon-Juniper Woodland (CES305.797) or Madrean Lower Montane Pine-Oak Forest and Woodland (CES305.796).

DISTRIBUTION

Range: This system is found in the Sierra Madre Occidentale and Sierra Madre Orientale of Mexico, Trans-Pecos Texas, southern New Mexico and southeastern Arizona.

Divisions: 305:C

Nations: MX, US

Subnations: AZ, NM, TX

Map Zones: 14:P, 15:C, 24:C, 25:C, 26:C, 27:P

USFS Ecomap Regions: 313C:CC, 315A:CC, 321A:CC, 322A:CP, 322B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 23:C, 24:C, 30:P

SOURCES

References: Barbour and Billings 2000, Brown 1982, Brown et al. 1980, Brown et al. 1998, Comer et al. 2003, Muldavin pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722878#references

Description Author: NatureServe Western Ecology Team

Version: 11 Nov 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1024 MADREAN LOWER MONTANE PINE-OAK FOREST AND WOODLAND (CES305.796)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Sierra Madre (305)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Montane]; Tropical/Subtropical [Tropical Xeric]; Shallow Soil; Xeric; F-Patch/High Intensity; Needle-Leaved Tree; Evergreen Sclerophyllous Shrub; *Quercus arizonica*, *Q. emoryi*, *Q. grisea*, *Q. oblongifolia*, *Q. toumeyii*; *Pinus discolor*, *P. leiophylla*, *P. engelmannii*

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Sideslope; Intermediate Disturbance Interval; Xeromorphic Shrub

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2024; ESLF 4211; ESP 1024

CONCEPT

Summary: This system occurs on mountains and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim. These forests and woodlands are composed of Madrean pines (*Pinus arizonica*, *Pinus engelmannii*, *Pinus leiophylla*, or *Pinus strobiformis*) and evergreen oaks (*Quercus arizonica*, *Quercus emoryi*, or *Quercus grisea*) intermingled with patchy shrublands on most mid-elevation slopes (1500-2300 m elevation). Other tree species include *Cupressus arizonica*, *Juniperus deppeana*, *Pinus cembroides*, *Pinus discolor*, *Pinus ponderosa* (with Madrean pines or oaks), and *Pseudotsuga menziesii*. Subcanopy and shrub layers may include typical encinal and chaparral species such as *Agave* spp., *Arbutus arizonica*, *Arctostaphylos pringlei*, *Arctostaphylos pungens*, *Garrya wrightii*, *Nolina* spp., *Quercus hypoleucoides*, *Quercus rugosa*, and *Quercus turbinella*. Some stands have moderate cover of perennial graminoids such as *Muhlenbergia emersleyi*, *Muhlenbergia longiligula*, *Muhlenbergia virescens*, and *Schizachyrium cirratum*. Fires are frequent with perhaps more crown fires than ponderosa pine woodlands, which tend to have more frequent ground fires on gentle slopes.

Related Concepts:

- Western Live Oak: 241 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Arbutus xalapensis* - *Quercus grisea* - *Juniperus deppeana* - *Acer grandidentatum* - *Quercus muehlenbergii* Forest (CEGL004504, G2?)
- *Arbutus xalapensis* - *Quercus grisea* - *Juniperus flaccida* - *Acer grandidentatum* - *Quercus gravesii* Forest (CEGL004553, G1)
- *Arctostaphylos pungens* Shrubland (CEGL000958, G4)
- *Juniperus deppeana* - *Quercus X pauciloba* Woodland (CEGL005370, GNR)
- *Pinus (discolor, cembroides) / Quercus arizonica / Muhlenbergia emersleyi* Woodland (CEGL000769, G3)
- *Pinus engelmannii / Muhlenbergia longiligula* Woodland (CEGL000799, G3)
- *Pinus engelmannii / Quercus gambelii* Woodland (CEGL000800, G1)
- *Pinus engelmannii / Quercus hypoleucoides* Woodland (CEGL000801, G3)
- *Pinus leiophylla / Piptochaetium fimbriatum* Woodland (CEGL000821, G2)
- *Pinus leiophylla / Quercus arizonica* Woodland (CEGL000822, G3)
- *Pinus leiophylla / Quercus emoryi* Woodland (CEGL000823, G3)
- *Pinus leiophylla / Quercus hypoleucoides* Woodland (CEGL000824, G3)
- *Pinus ponderosa / Quercus arizonica* Woodland (CEGL000868, G4)
- *Pinus ponderosa / Quercus emoryi* Woodland (CEGL000869, G4)
- *Pinus ponderosa / Quercus grisea* Woodland (CEGL000871, G4)
- *Pinus ponderosa / Quercus hypoleucoides* Woodland (CEGL000872, G3)
- *Quercus arizonica / Bouteloua curtipendula* Woodland (CEGL000680, G3)
- *Quercus arizonica / Muhlenbergia emersleyi* Woodland (CEGL000681, G4)
- *Quercus gambelii / Robinia neomexicana / Symphoricarpos rotundifolius* Shrubland (CEGL001116, GU)
- *Quercus gambelii / Symphoricarpos oreophilus* Shrubland (CEGL001117, G5)
- *Quercus grisea / Bouteloua curtipendula* Woodland (CEGL000689, G5)
- *Quercus X pauciloba / Cercocarpus montanus* Shrubland (CEGL001118, G4)
- *Robinia neomexicana / Thalictrum fendleri* Shrubland (CEGL001125, GNR)

Alliances:

- *Arbutus xalapensis* - *Acer grandidentatum* - *Quercus* spp. Forest Alliance (A.368)
- *Arctostaphylos pungens* Shrubland Alliance (A.789)
- *Juniperus deppeana* Woodland Alliance (A.534)

- *Pinus discolor* Woodland Alliance (A.538)
- *Pinus engelmannii* Woodland Alliance (A.539)
- *Pinus leiophylla* Woodland Alliance (A.542)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Quercus arizonica* Woodland Alliance (A.482)
- *Quercus gambelii* Shrubland Alliance (A.920)
- *Quercus grisea* Woodland Alliance (A.478)
- *Quercus X pauciloba* Shrubland Alliance (A.921)
- *Robinia neomexicana* Shrubland Alliance (A.924)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Madrean Encinal (CES305.795)

DISTRIBUTION

Range: This system is found in the Sierra Madre Occidentale and Sierra Madre Orientale of Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim.

Divisions: 305:C

Nations: MX, US

Subnations: AZ, NM, TX

Map Zones: 14:C, 15:C, 24:C, 25:C, 26:C, 27:P, 28:?

USFS Ecomap Regions: 313B:CC, 313C:CC, 313D:C?, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, M313A:CC, M313B:CC, M331F:??, M331G:??

TNC Ecoregions: 22:C

SOURCES

References: Barbour and Billings 2000, Brown 1982, Brown et al. 1998, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722877#references

Description Author: NatureServe Western Ecology Team

Version: 11 Nov 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1025 MADREAN PINYON-JUNIPER WOODLAND (CES305.797)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Sierra Madre (305)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Tropical/Subtropical [Tropical Xeric]; Shallow Soil; Xeric; F-Patch/Medium Intensity; Needle-Leaved Tree; Evergreen Sclerophyllous Shrub; *Pinus cembroides*, *Juniperus deppeana*

Non-Diagnostic Classifiers: Forest and Woodland (Treedy); Shrubland (Shrub-dominated); Sideslope; Intermediate Disturbance Interval; Broad-Leaved Evergreen Tree; Xeromorphic Shrub

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2025; ESLF 4212; ESP 1025

CONCEPT

Summary: This system occurs on foothills, mountains and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim. Substrates are variable, but soils are generally dry and rocky. The presence of *Pinus cembroides*, *Pinus discolor*, or other Madrean trees and shrubs is diagnostic of this woodland system. *Juniperus coahuilensis*, *Juniperus deppeana*, *Juniperus pinchotii*, *Juniperus monosperma*, and/or *Pinus edulis* may be present to dominant. Madrean oaks such as *Quercus arizonica*, *Quercus emoryi*, *Quercus grisea*, or *Quercus mohriana* may be codominant. *Pinus ponderosa* is absent or sparse. If present, understory layers are variable and may be dominated by shrubs or graminoids.

Classification Comments: According to USFS TES mapping (USDA 2001), *Quercus grisea* woodlands (Madrean Encinal) occur on both sides of the Guadalupe Mountains and in the southeastern portion of the Sacramento Mountains. This suggests that the associated pinyon and juniper woodlands are Madrean Pinyon-Juniper Woodland (CES305.797).

Related Concepts:

- Juniper - Pinyon Pine Woodland (504) (Shiflet 1994) Broader
- Oak - Juniper Woodland and Mahogany - Oak (509) (Shiflet 1994) Intersecting
- Pinyon - Juniper: 239 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Juniperus coahuilensis* / *Bouteloua curtipendula* - *Bouteloua gracilis* Woodland (CEGL004584, G3?)
- *Juniperus coahuilensis* / *Bouteloua eriopoda* Woodland (CEGL000700, GU)
- *Juniperus coahuilensis* / *Canotia holacantha* Woodland (CEGL000701, G3)
- *Juniperus coahuilensis* / *Quercus turbinella* Woodland (CEGL000702, G4)
- *Juniperus deppeana* - *Juniperus monosperma* - *Quercus grisea* / *Rhus trilobata* Woodland (CEGL000696, G5)
- *Juniperus deppeana* - *Juniperus monosperma* / *Cercocarpus montanus* - *Ceanothus greggii* Woodland (CEGL000695, G5)
- *Juniperus deppeana* - *Quercus X pauciloba* Woodland (CEGL005370, GNR)
- *Juniperus deppeana* / *Arctostaphylos pungens* Woodland (CEGL000692, G4)
- *Juniperus deppeana* / *Muhlenbergia emersleyi* Woodland (CEGL000697, G4)
- *Juniperus deppeana* / *Panicum obtusum* Woodland (CEGL000698, GNR)
- *Juniperus monosperma* - *Quercus mohriana* Woodland (CEGL002120, GNR)
- *Juniperus monosperma* / *Agave lechuguilla* Woodland (CEGL000703, G4)
- *Juniperus monosperma* / *Larrea tridentata* Woodland (CEGL000717, G5)
- *Juniperus monosperma* / *Nolina microcarpa* - *Agave lechuguilla* Woodland (CEGL000718, G4)
- *Juniperus monosperma* / *Prosopis glandulosa* Woodland (CEGL000719, G5)
- *Juniperus pinchotii* / *Bouteloua curtipendula* - *Bouteloua hirsuta* Woodland (CEGL004940, GNR)
- *Juniperus pinchotii* / *Bouteloua gracilis* Woodland (CEGL002122, G4)
- *Pinus (discolor, cembroides)* / *Quercus arizonica* / *Muhlenbergia emersleyi* Woodland (CEGL000769, G3)
- *Pinus cembroides* - *Quercus gravesii* - *Juniperus flaccida* / *Salvia regla* / *Piptochaetium fimbriatum* Forest (CEGL004600, G2?)
- *Pinus cembroides* - *Quercus grisea* - *Juniperus flaccida* / *Salvia regla* / *Muhlenbergia emersleyi* Woodland (CEGL004596, G2?)
- *Pinus cembroides* - *Quercus grisea* - *Quercus emoryi* - *Juniperus flaccida* / *Salvia regla* / *Bouteloua curtipendula* Woodland (CEGL004597, G2?)
- *Pinus cembroides* - *Quercus grisea* - *Quercus emoryi* / *Mimosa dysocarpa* / *Bouteloua gracilis* Woodland (CEGL004598, G2?)
- *Pinus cembroides* - *Quercus grisea* / *Agave lechuguilla* / *Bouteloua curtipendula* Woodland (CEGL003551, G2?)
- *Pinus cembroides* - *Quercus grisea* / *Muhlenbergia montana* - *Piptochaetium pringlei* Woodland (CEGL004599, G2?)
- *Pinus discolor* / *Muhlenbergia emersleyi* Woodland (CEGL000767, G5)
- *Pinus discolor* / *Piptochaetium fimbriatum* Woodland (CEGL000768, G2)
- *Pinus discolor* / *Quercus gambelii* Woodland (CEGL000770, G1)

- *Pinus discolor* / *Quercus hypoleucooides* Woodland (CEGL000771, G2)
- *Pinus discolor* / *Quercus rugosa* Woodland (CEGL000772, G1)
- *Pinus discolor* / *Quercus toumeyii* Woodland (CEGL000773, G2)
- *Pinus edulis* - *Quercus arizonica* / *Rhus trilobata* Woodland (CEGL000790, G5?)
- *Pinus remota* / *Juniperus pinchotii* - *Quercus mohriana* Woodland (CEGL004585, G2G3)
- *Quercus grisea* / *Juniperus deppeana* Woodland (CEGL003521, GNR)

Alliances:

- *Juniperus coahuilensis* Woodland Alliance (A.503)
- *Juniperus deppeana* Woodland Alliance (A.534)
- *Juniperus monosperma* Woodland Alliance (A.504)
- *Juniperus pinchotii* Woodland Alliance (A.505)
- *Pinus cembroides* - *Quercus gravesii* Forest Alliance (A.392)
- *Pinus cembroides* Woodland Alliance (A.510)
- *Pinus discolor* Woodland Alliance (A.538)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus remota* Woodland Alliance (A.523)
- *Quercus grisea* Woodland Alliance (A.478)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Madrean Encinal (CES305.795)

DISTRIBUTION

Range: This system occurs in the Sierra Madre Occidentale and Sierra Madre Orientale of Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim. It occurs on the west side of the Sacramento Mountains but may transition into Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835) or Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834) on the eastern side.

Divisions: 305:C

Nations: MX, US

Subnations: AZ, NM, TX

Map Zones: 14:C, 15:C, 24:C, 25:C, 26:C, 27:C, 28:?

USFS Ecomap Regions: 313B:CC, 313C:CC, 313D:CP, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, 331I:??, M313A:CC, M313B:CC, M331F:??

TNC Ecoregions: 22:C, 24:C, 30:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722876#references

Description Author: NatureServe Western Ecology Team

Version: 05 Oct 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1026 MADREAN UPPER MONTANE CONIFER-OAK FOREST AND WOODLAND (CES305.798)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Sierra Madre (305)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Montane]; Forest and Woodland (Treed); Tropical/Subtropical [Tropical Xeric]; Xeric; F-Patch/Medium Intensity; *Abies coahuilensis*, *Quercus hypoleuroides*, *Q. rugosa*

Non-Diagnostic Classifiers: Sideslope; Toeslope/Valley Bottom; Mesotrophic Soil; Deep Soil; Sand Soil Texture; Long Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2026; ESLF 4213; ESP 1026

CONCEPT

Summary: This ecological system occurs at the upper elevations in the Sierra Madre Occidentale and Sierra Madre Orientale of Mexico. In the U.S., it is restricted to north and east aspects at high elevations (1980-2440 m) in the Sky Islands (Chiricahua, Huachuca, Pinaleno, Santa Catalina, and Santa Rita mountains) and along the Nantanes Rim. It is more common in Mexico and does not occur north of the Mogollon Rim. The vegetation is characterized by large- and small-patch forests and woodlands dominated by *Pseudotsuga menziesii*, *Abies coahuilensis*, or *Abies concolor* and Madrean oaks such as *Quercus arizonica*, *Quercus emoryi*, *Quercus grisea*, *Quercus hypoleuroides*, *Quercus rugosa*, and *Quercus toumeyi*. If *Quercus gambelii* is prominent in the shrub layer, then other Madrean elements are present. This system may include stands of *Quercus gravesii* woodlands. It is similar to Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823) which typically lacks Madrean elements.

Classification Comments: Texas experts for mapzone 26 feel that this system does not occur in that zone.

Similar Ecological Systems:

- Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

MEMBERSHIP

Associations:

- *Juniperus deppeana* - *Quercus X pauciloba* Woodland (CEGL005370, GNR)
- *Pseudotsuga menziesii* / *Quercus hypoleuroides* Forest (CEGL000453, G3)
- *Pseudotsuga menziesii* / *Quercus rugosa* Forest (CEGL000454, G2)

Alliances:

- *Juniperus deppeana* Woodland Alliance (A.534)
- *Pseudotsuga menziesii* Forest Alliance (A.157)

DISTRIBUTION

Range: This system is found in the Sierra Madre Occidentale and Sierra Madre Orientale of Mexico. In the U.S., it is restricted to north and east aspects at high elevations (1980-2440 m) in the Sky Islands (Chiricahua, Huachuca, Pinaleno, Santa Catalina, and Santa Rita mountains) and along the Nantanes Rim.

Divisions: 305:C

Nations: MX, US

Subnations: AZ, NM

Map Zones: 15:C, 24:?, 25:C, 27:?, 28:?

USFS Ecomap Regions: 313D:??, 321A:CC, 322B:??, M313A:CC, M313B:CC

TNC Ecoregions: 22:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722875#references

Description Author: NatureServe Western Ecology Team

Version: 22 Dec 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1027 MEDITERRANEAN CALIFORNIA DRY-MESIC MIXED CONIFER FOREST AND WOODLAND (CES206.916)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Forest and Woodland (Treed); Mediterranean [Mediterranean Xeric-Oceanic]; Ustic; Needle-Leaved Tree

Non-Diagnostic Classifiers: F-Patch/Low Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2027; ESLF 4214; ESP 1027

CONCEPT

Summary: These mixed-conifer forests, always with at least two conifer species codominating, occur on all aspects in lower montane zones (600-1800 m elevation in northern California; 1200-2150 m in southern California). This system occurs in a variety of topo-edaphic positions, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and south- and west-facing slopes which burn relatively frequently. Often, several conifer species co-occur in individual stands. *Pseudotsuga menziesii*, *Pinus ponderosa*, and *Calocedrus decurrens* are the most common conifers. Other conifers that can occasionally be present include *Pinus jeffreyi*, *Pinus attenuata*, and *Pinus lambertiana* (not as common in this as in Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915)). Common subcanopy trees include *Quercus chrysolepis* and *Quercus kelloggii*. *Arbutus menziesii* and *Lithocarpus densiflorus* may be common with the oaks in northern areas. *Pseudotsuga macrocarpa* and *Pinus coulteri* can be present but are not dominant species in this system in the Transverse Ranges of southern California. Codominant *Abies concolor* - *Calocedrus decurrens* communities in southern California are also included in this system. In the Transverse Ranges, where Great Basin and Mojavean elements are transitioning into the montane zones, *Juniperus californica* and *Pinus monophylla* can be mixed with the other conifers. Understories are variable, except in the Sierra Nevada, where in some stands there can be dense understory mats of *Chamaebatia foliolosa* (and other low, spreading shrubs) which foster relatively high-frequency, low-intensity ground fires. In Oregon, shrubs such as *Holodiscus discolor*, *Toxicodendron rydbergii*, *Mahonia nervosa*, *Mahonia aquifolium*, and *Symphoricarpos mollis* are common in addition to graminoids such as *Festuca californica*, *Elymus glaucus*, and *Danthonia californica*. In the north, where *Calocedrus decurrens* and *Pinus ponderosa* drop out, this system shifts to North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845).

Classification Comments: This forest is more dense, with a greater richness of canopy tree species than Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923).

Similar Ecological Systems:

- Sierran-Intermontane Desert Western White Pine-White Fir Woodland (CES204.101)

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting
- Pacific Douglas-fir: 229 (Eyre 1980) Intersecting
- Pacific Ponderosa Pine - Douglas-fir: 244 (Eyre 1980) Intersecting
- Pacific Ponderosa Pine: 245 (Eyre 1980) Intersecting
- Sierra Nevada Mixed Conifer: 243 (Eyre 1980) Intersecting
- White Fir: 211 (Eyre 1980) Intersecting

DESCRIPTION

Dynamics: Historically, frequent and low-intensity fires maintained these woodlands. Due to fire suppression, the majority of these forests now have closed canopies, whereas in the past, a moderately high fire frequency (every 20-30 years) formerly maintained an open forest of many conifers.

MEMBERSHIP

Associations:

- *Pinus ponderosa* - *Calocedrus decurrens* - *Quercus chrysolepis* / *Chamaebatia foliolosa* Forest (CEGL008674, G4?)
- *Pinus ponderosa* - *Calocedrus decurrens* - *Quercus kelloggii* Forest (CEGL008673, G4?)
- *Pinus ponderosa* - *Calocedrus decurrens* / *Chamaebatia foliolosa* Forest (CEGL008672, G4?)
- *Pinus ponderosa* - *Quercus kelloggii* / *Arctostaphylos viscida* Woodland (CEGL008694, G4?)
- *Pseudotsuga menziesii* - *Abies concolor* - *Calocedrus decurrens* Forest (CEGL005813, G3?)
- *Pseudotsuga menziesii* - *Pinus ponderosa* - *Calocedrus decurrens* Forest (CEGL008684, G3?)
- *Pseudotsuga menziesii* - *Quercus chrysolepis* Forest (CEGL005814, G3?)

Alliances:

- *Pinus ponderosa* - *Calocedrus decurrens* Forest Alliance (A.2559)
- *Pinus ponderosa* - *Pseudotsuga menziesii* Forest Alliance (A.134)
- *Pinus ponderosa* Woodland Alliance (A.530)

- *Pseudotsuga menziesii* Forest Alliance (A.157)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915)

Adjacent Ecological System Comments: This system occurs sympatrically with Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915) but is found on lower, drier, warmer, or more exposed sites in comparison to the mesic system.

DISTRIBUTION

Range: This system occurs in lower montane zones (600-1800 m elevation in northern California; 1200-2150 m in southern California), including the eastern Klamath-Siskiyou, interior Coast Ranges, Transverse Ranges and Sierra Nevada.

Divisions: 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 2:C, 3:C, 4:C, 6:C, 7:C, 12:P, 13:?

USFS Ecomap Regions: 263A:PP, 322A:PP, 341D:CC, 342B:CC, M242A:CC, M242B:CC, M242C:CC, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 5:C, 12:C, 14:C, 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Fites 1994, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722765#references

Description Author: P. Comer, T. Keeler-Wolf, mod. G. Kittel, M.S. Reid

Version: 16 Jan 2009

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1030 MEDITERRANEAN CALIFORNIA LOWER MONTANE BLACK OAK-CONIFER FOREST AND WOODLAND (CES206.923)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Toeslope/Valley Bottom; Franciscan Formation Soils; Deep Soil; Mineral: W/A-Horizon >10 cm

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Ustic; Short Disturbance Interval; F-Patch/Low Intensity; *Quercus kelloggii*

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2030; ESLF 4217; ESP 1030

CONCEPT

Summary: This ecological system is found throughout California's middle and inner North Coast Ranges, as well as the southern and eastern Klamath Mountains from 600-1600 m (1800-4850 feet) elevation, and the lower slopes of the western Sierra Nevada. It occurs in valleys and lower slopes on a variety of parent materials, including granitics, metamorphic and Franciscan metasedimentary parent material and deep, well-developed soils. It is characterized by woodlands or forests of *Pinus ponderosa* with one or more oaks, including *Quercus kelloggii*, *Quercus garryana*, *Quercus wislizeni*, or *Quercus chrysolepis*. *Pseudotsuga menziesii* may co-occur with *Pinus ponderosa*, particularly in the North Coast Ranges and Klamath Mountains. On most sites, the oaks are dominant, forming a dense subcanopy under a more open canopy of the conifers. On many sites, *Quercus kelloggii* is the dominant; in late-seral stands on more mesic sites, conifers such as *Pinus ponderosa* or *Pseudotsuga menziesii* will form a persistent emergent canopy over the oak. Stands may have shrubby understories (in the Klamath Mountains and Sierra Nevada) and, more rarely, grassy understories (in North Coast Ranges). Common shrubs include *Arctostaphylos viscida*, *Arctostaphylos manzanita*, *Ceanothus integerrimus*, and *Toxicodendron diversilobum*. Grasses can include *Festuca californica*, *Festuca idahoensis*, and *Melica* spp. Historical fire in this system was likely high frequency but of low intensity. Conifer species, such as *Pseudotsuga menziesii*, become more abundant with wildfire suppression.

Classification Comments: The floristic and geographic transition from this system to North Pacific Oak Woodland (CES204.852) needs to be further detailed. This system generally has lower tree species richness in the canopy and a lower canopy density than Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916), although the oaks can form a dense subcanopy in the mixed conifer system.

Similar Ecological Systems:

- California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna (CES206.936)
- Mediterranean California Mixed Evergreen Forest (CES206.919)

Related Concepts:

- California Black Oak: 246 (Eyre 1980) Intersecting
- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting
- Pacific Ponderosa Pine - Douglas-fir: 244 (Eyre 1980) Intersecting. Douglas-fir and/or Ponderosa over oaks in the Klamaths and south are included in this ecological system.
- Pacific Ponderosa Pine: 245 (Eyre 1980) Intersecting. Ponderosa over oaks in the Klamaths and south are included in this ecological system.

MEMBERSHIP

Associations:

- *Pinus ponderosa* - *Calocedrus decurrens* - *Quercus chrysolepis* / *Chamaebatia foliolosa* Forest (CEGL008674, G4?)
- *Pinus ponderosa* - *Quercus kelloggii* / *Arctostaphylos viscida* Woodland (CEGL008694, G4?)

Alliances:

- *Pinus ponderosa* - *Calocedrus decurrens* Forest Alliance (A.2559)
- *Pinus ponderosa* Woodland Alliance (A.530)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North Pacific Oak Woodland (CES204.852)

DISTRIBUTION

Range: This system is found throughout California's middle and inner North Coast Ranges, as well as the Klamath Mountains from 600-1600 m (1800-4850 feet) elevation, and the lower slopes of the western Sierra Nevada.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C, 5:P, 6:C, 7:C, 13:?

USFS Ecomap Regions: 261B:CC, 262A:CC, 263A:CC, 322A:CC, 341D:PP, 342B:PP, M242A:P?, M242B:PP, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 5:C, 14:C, 15:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722758#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1028 MEDITERRANEAN CALIFORNIA MESIC MIXED CONIFER FOREST AND WOODLAND (CES206.915)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Toeslope/Valley Bottom; Mediterranean [Mediterranean Xeric-Oceanic]; Udic

Non-Diagnostic Classifiers: Long (>500 yrs) Persistence; Forest and Woodland (Treed); F-Patch/Low Intensity; Sequoiadendron giganteum

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2028; ESLF 4215; ESP 1028

CONCEPT

Summary: This ecological system occurs in cool ravines and north-facing slopes (typically with 100-150 cm annual precipitation; 50% as snow). It is found from 800-1000 m (2400-3000 feet) elevation in the Sierra Nevada and 1250-2200 m (3800-6700 feet) in the Klamath Mountains. The most characteristically co-occurring conifers are *Abies concolor* var. *lowiana*, *Calocedrus decurrens*, and *Pinus lambertiana*. *Pinus jeffreyi*, *Pinus ponderosa*, and *Pseudotsuga menziesii* occur frequently but are not dominant. In limited locations in the central Sierra Nevada, *Sequoiadendron giganteum* dominates, usually with *Abies concolor*, and at the highest elevations also with *Abies magnifica*. *Acer macrophyllum* is common in lower elevation mesic pockets; *Chrysolepis chrysophylla* also occurs in the western Klamaths. Common understory species include *Corylus cornuta*, *Cornus nuttallii*, and at higher elevations *Chrysolepis sempervirens*. In areas of recent fire or other disturbance, *Arctostaphylos patula*, *Ceanothus integerrimus*, *Ceanothus cordulatus*, *Ceanothus parvifolius*, and *Ribes* spp. are more common. Fire of highly variable patch size and return interval maintains the structure of these woodlands

Classification Comments: The presence of *Abies concolor* with other conifers is a strong indicator for this system in central California's Coast and Transverse ranges.

Similar Ecological Systems:

- Sierran-Intermontane Desert Western White Pine-White Fir Woodland (CES204.101)

Related Concepts:

- Pacific Ponderosa Pine: 245 (Eyre 1980) Intersecting
- Sierra Nevada Mixed Conifer: 243 (Eyre 1980) Intersecting
- White Fir: 211 (Eyre 1980) Intersecting. White fir (*Abies concolor* ssp. *lowiana*) is a major component of this ecological system.

MEMBERSHIP

Associations:

- *Abies concolor* - *Calocedrus decurrens* - *Pinus lambertiana* / *Adenocaulon bicolor* Forest (CEGL008678, G3?)
- *Abies concolor* - *Calocedrus decurrens* - *Pinus lambertiana* / *Chrysolepis sempervirens* / *Carex multicaulis* Forest (CEGL008675, G3?)
- *Abies concolor* - *Calocedrus decurrens* - *Pinus lambertiana* / *Cornus nuttallii* / *Corylus cornuta* var. *californica* Forest (CEGL008677, GNR)
- *Abies concolor* - *Pinus lambertiana* - *Calocedrus decurrens* / *Symphoricarpos mollis* / *Kelloggia galioides* Forest (CEGL008676, GNR)
- *Abies concolor* - *Pinus lambertiana* - *Pinus jeffreyi* / Sparse Understory Forest (CEGL003155, GNR)
- *Abies concolor* - *Pinus lambertiana* / *Maianthemum racemosum* - *Prosartes hookeri* Forest (CEGL008680, G3?)
- *Abies concolor* - *Pinus lambertiana* Forest (CEGL008679, G3)
- *Abies concolor* / *Ceanothus cordulatus* Forest (CEGL008608, GNR)
- *Pinus jeffreyi* - *Abies concolor* Woodland (CEGL008630, G4?)
- *Pinus jeffreyi* - *Abies magnifica* Woodland (CEGL008632, G3?)
- *Sequoiadendron giganteum* - *Pinus lambertiana* / *Cornus nuttallii* Forest (CEGL008607, GNR)
- *Sequoiadendron giganteum* Forest [Provisional] (CEGL003108, G3)

Alliances:

- *Abies concolor* - *Pinus lambertiana* Forest Alliance (A.2560)
- *Abies concolor* Forest Alliance (A.152)
- *Pinus jeffreyi* Woodland Alliance (A.541)
- *Sequoiadendron giganteum* Forest Alliance (A.101)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916)

DISTRIBUTION

Range: This system is found from 800-1000 m (2400-3000 feet) elevation in the Sierra Nevada and 1250-2200 m (3800-6700 feet) in the Klamath Mountains.

Divisions: 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 2:C, 3:C, 4:?, 6:C, 7:C, 12:?

USFS Ecomap Regions: 263A:CC, 342B:PP, M242A:CC, M242B:CC, M242C:CC, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CP, M261G:CC

TNC Ecoregions: 5:C, 12:C, 14:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722766#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1034 MEDITERRANEAN CALIFORNIA MESIC SERPENTINE WOODLAND AND CHAPARRAL (CES206.928)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Mediterranean [Mediterranean Xeric-Oceanic]; Ultramafic with low Ca:Mg ratio; Shallow Soil; Udic; Broad-Leaved Evergreen Shrub; *Cupressus sargentii*

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Sideslope; Toeslope/Valley Bottom; Serpentine

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2034; ESLF 4221; ESP 1034

CONCEPT

Summary: This ecological system occurs in Mediterranean California in the north and south Coast Ranges and the northern Sierra Nevada, on cool northerly and concave slopes and toeslopes with thin, rocky, ultramafic (gabbro, peridotite, serpentinite) soils. Not all ultramafic outcrops support distinct vegetation; only those with very low Ca:Mg ratios impact biotic composition. These systems are highly variable and spotty in distribution, and the composition of individual stands can be very diverse, especially the shrubs (often individual species have low cover). *Cupressus sargentii*, *Pinus sabiniana*, *Garrya congdonii*, *Quercus durata*, *Umbellularia californica*, and *Frangula californica* ssp. *tomentella* (= *Rhamnus tomentella* ssp. *tomentella*) are characteristic. Common associates include *Heteromeles arbutifolia*, *Adenostoma fasciculatum*, and the California endemics *Arctostaphylos viscida* ssp. *pulchella* and *Ceanothus jepsonii*. In some settings *Arctostaphylos glauca*, *Styrax rediviva* (= *Styrax officinalis*), or *Cercocarpus montanus* var. *glaber* (= *Cercocarpus betuloides*) can be common. Occasionally, *Chamaecyparis lawsoniana* may be present. Common grasses and forbs can include *Melica torreyana*, *Festuca idahoensis*, *Iris* spp., and locally endemic serpentine forbs (*Senecio* spp. and others). Structurally, this system is sometimes woodland in character, but it can also be an arborescent chaparral, depending on fire history. Herbaceous-dominated serpentine fens (and bogs) are treated in Mediterranean California Serpentine Fen (CES206.953).

Related Concepts:

- Knobcone Pine: 248 (Eyre 1980) Intersecting
- Pacific Ponderosa Pine: 245 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Cupressus sargentii* Woodland (CEGL003044, G2)
- *Quercus durata* - *Arctostaphylos glandulosa* Shrubland (CEGL003351, G3)
- *Quercus durata* Shrubland [Placeholder] (CEGL003089, G3?)
- *Umbellularia californica* - *Quercus agrifolia* / *Toxicodendron diversilobum* Forest (CEGL003175, G4)
- *Umbellularia californica* / *Polystichum munitum* Forest (CEGL003174, G4)
- *Umbellularia californica* Forest [Placeholder] (CEGL003115, G3?)

Alliances:

- *Cupressus sargentii* Woodland Alliance (A.500)
- *Quercus durata* Shrubland Alliance (A.778)
- *Umbellularia californica* Forest Alliance (A.87)

DISTRIBUTION

Range: This system occurs throughout Mediterranean California except in the Klamath Mountains and possibly into Oregon.

Divisions: 206:C

Nations: US

Subnations: CA, OR?

Map Zones: 2:C, 3:C, 4:C, 6:C, 7:P

USFS Ecomap Regions: M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC

TNC Ecoregions: 5:C, 12:P, 14:C, 15:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722753#references

Description Author: P. Comer, T. Keeler-Wolf, mod. G. Kittel

Version: 25 Apr 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1043 MEDITERRANEAN CALIFORNIA MIXED EVERGREEN FOREST (CES206.919)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Franciscan Formation Soils; Broad-Leaved Evergreen Tree

Non-Diagnostic Classifiers: Montane [Lower Montane]; Ustic; F-Patch/Low Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2043; ESLF 4230; ESP 1043

CONCEPT

Summary: This ecological system occurs from the Santa Cruz Mountains (and locally in the Santa Lucia Mountains), California, north into southwestern Oregon throughout the outer and middle Coast Ranges on Franciscan Formation soils (metasedimentary sandstones, schists, and shales) with moderate to high rainfall. This system occurs just inland from the redwood belt of this region. It also occurs in southern California in more mesic, protected, cooler sites of the Transverse and Peninsular ranges. Historic fire frequency in this system was higher than for redwood-dominated systems (every 50-100 years). It is characterized by mixes of coniferous and broad-leaved evergreen trees. Characteristic trees include *Pseudotsuga menziesii*, *Quercus chrysolepis*, *Lithocarpus densiflorus*, *Arbutus menziesii*, *Umbellularia californica*, and *Chrysolepis chrysophylla*. On the eastern fringe of this system, in the western Siskiyou, other conifers occur such as *Pinus ponderosa* and *Chamaecyparis lawsoniana*. In southern California (Transverse and Peninsular ranges), *Pseudotsuga macrocarpa* replaces *Pseudotsuga menziesii* but co-occurs with *Quercus chrysolepis* and sometimes *Quercus agrifolia*. *Calocedrus decurrens* is occasional. In the southern portion of the range, *Lithocarpus densiflorus*, *Arbutus menziesii*, *Umbellularia californica*, and *Chrysolepis chrysophylla* become less important or are absent. In the Santa Lucia Mountains, stands of *Abies bracteata* are included in this system and are an unusual and unique component. These stands are a mixture of *Abies bracteata* and *Quercus chrysolepis*. The more northerly stands tend to have dense or diverse shrub understories, with *Corylus cornuta*, *Vaccinium ovatum*, *Rhododendron macrophyllum*, *Gaultheria shallon*, *Quercus sadleriana*, *Mahonia nervosa*, and *Toxicodendron diversilobum* being common. Southern stands are less diverse and more sparse; *Toxicodendron diversilobum* is the most constant shrub, with *Ribes* spp. occasionally present, along with much *Polystichum munitum*. Especially in the south, stands are restricted to fire-protected sites (extremely steep, northerly, mesic slopes and coves) where fires from adjacent chaparral systems do not carry.

Classification Comments: In northern California, especially around Point Reyes, there are stands dominated by *Umbellularia californica*. These nearly pure stands are a part of this system, as it is a disturbance-driven species and grows rapidly with full sunlight. With time and succession, other trees will succeed into the canopy. This is in contrast to small patches or individuals of *Umbellularia californica* in some of the various chaparral systems. Here there are no chaparral shrubs in the understory. The presence of *Lithocarpus densiflorus* in mixed stands of pine and oak is the indicator species for this system in many places in the Coast Ranges throughout northern and central California.

Similar Ecological Systems:

- Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923)

Related Concepts:

- Douglas-fir - Tanoak - Pacific Madrone: 234 (Eyre 1980) Finer
- Pacific Douglas-fir: 229 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Chamaecyparis lawsoniana* - *Pseudotsuga menziesii* / (*Rhododendron macrophyllum*) / *Xerophyllum tenax* Forest (CEGL000044, G1)
- *Pseudotsuga menziesii* - *Quercus chrysolepis* Forest (CEGL005814, G3?)
- *Pseudotsuga menziesii* / *Quercus agrifolia* Forest (CEGL003166, G3?)
- *Pseudotsuga menziesii* / *Umbellularia californica* / *Frangula californica* ssp. *californica* Forest (CEGL003167, G4)
- *Pseudotsuga menziesii* / *Umbellularia californica* / *Polystichum munitum* Forest (CEGL003168, G4)

Alliances:

- *Chamaecyparis lawsoniana* Forest Alliance (A.104)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Giant Forest Alliance (A.108)

DISTRIBUTION

Range: This system occurs from the Santa Lucia and Santa Cruz mountains of California north into southwestern Oregon throughout the outer and middle Coast Ranges and in southern California (Transverse and Peninsular ranges). It occurs in localized areas of the central to northern Sierra Nevada and southern and eastern Klamath Mountains.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C, 5:?, 6:C, 7:C

USFS Ecomap Regions: 263A:CC, M242A:CC, M242B:C?, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC

TNC Ecoregions: 5:C, 14:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722762#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1029 MEDITERRANEAN CALIFORNIA MIXED OAK WOODLAND (CES206.909)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Sideslope; Mediterranean [Mediterranean Xeric-Oceanic]; Shallow Soil; F-Patch/Medium Intensity; *Quercus kelloggii*; *Quercus garryana* var. *breweri*

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Xeric; Intermediate Disturbance Interval; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2029; ESLF 4216; ESP 1029

CONCEPT

Summary: This ecological system is found throughout the Sierra Nevada and Coast Range foothills and lower montane elevations from 600-1600 m (1800-4850 feet) on steep, rocky slopes where snow and cold temperatures occur. Fire frequency and intensity drive composition of this system, with *Quercus chrysolepis* dominant with less frequent fires. With frequent annual burning (at lower elevations and on warmer sites), this system is an open to dense woodland of large oaks with well-developed grassy understories of native perennial bunchgrass. The predominant oaks with the higher frequency fires include *Quercus kelloggii* and *Quercus garryana*, with *Quercus garryana* var. *garryana* codominant in the central and northern Coast Ranges and *Quercus garryana* var. *breweri* often codominant in the northwestern Coast Ranges as well as portions of the Sierra Nevada. *Quercus chrysolepis* becomes dominant with less frequent fires (but in Oregon this species is not important and occurs in a different system, either Mediterranean California Mixed Evergreen Forest (CES206.919) or Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916)). The perennial bunchgrass component includes *Festuca idahoensis*, *Festuca californica*, *Elymus glaucus*, and *Danthonia californica* (close to the coast). A variety of native forbs also occur. Other characteristic species include *Toxicodendron diversilobum*, *Juniperus occidentalis*, and *Ceanothus cuneatus*. This system is similar to North Pacific Oak Woodland (CES204.852) but does not include a conifer component, and *Quercus garryana* is not the only oak.

Similar Ecological Systems:

- North Pacific Oak Woodland (CES204.852)

Related Concepts:

- California Black Oak: 246 (Eyre 1980) Broader
- Canyon Live Oak: 249 (Eyre 1980) Undetermined
- Oregon White Oak: 233 (Eyre 1980) Intersecting. Oregon white oak does occur occasionally as a dominant in this ecological system.

MEMBERSHIP

Associations:

- *Quercus chrysolepis* - *Umbellularia californica* Forest (CEGL008604, G4?)
- *Quercus chrysolepis* / *Arctostaphylos patula* Forest (CEGL008601, G3?)
- *Quercus chrysolepis* / *Arctostaphylos viscida* Forest (CEGL008602, G4?)
- *Quercus chrysolepis* / *Dryopteris arguta* Forest (CEGL008603, G3?)
- *Quercus chrysolepis* Forest [Placeholder] (CEGL003086, G4?)
- *Quercus chrysolepis* Shrubland [Placeholder] (CEGL003087, G3?)
- *Quercus garryana* - *Quercus kelloggii* / *Toxicodendron diversilobum* Woodland (CEGL000931, G2)
- *Quercus kelloggii* - *Calocedrus decurrens* Forest (CEGL008618, G4?)
- *Quercus kelloggii* / *Arctostaphylos mewukka* - *Chamaebatia foliolosa* Forest (CEGL008619, G3?)
- *Quercus kelloggii* / *Arctostaphylos patula* Forest (CEGL008617, G3?)
- *Quercus kelloggii* Temporarily Flooded Woodland [Placeholder] (CEGL003092, G4?)

Alliances:

- *Quercus chrysolepis* Forest Alliance (A.85)
- *Quercus chrysolepis* Shrubland Alliance (A.776)
- *Quercus garryana* Woodland Alliance (A.630)
- *Quercus kelloggii* Forest Alliance (A.2558)
- *Quercus kelloggii* Temporarily Flooded Woodland Alliance (A.638)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North Pacific Oak Woodland (CES204.852)

DISTRIBUTION

Range: This system is found throughout the Sierra Nevada and Coast Range foothills and lower montane of California and Oregon at

elevations from 600-1600 m (1800-4850 feet).

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C, 5:C, 6:C, 7:C, 13:?

USFS Ecomap Regions: 261B:CC, 262A:CC, 263A:CC, 322A:CC, 341D:PP, 342B:CC, M242A:??, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 12:C, 13:C, 14:C, 16:P

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722772#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1032 MEDITERRANEAN CALIFORNIA RED FIR FOREST (CES206.913)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Deep Soil; Ustic; Long Disturbance Interval; *Abies magnifica* (= var. *magnifica*)

Non-Diagnostic Classifiers: Sideslope; Toeslope/Valley Bottom; Sand Soil Texture; F-Patch/High Intensity; W-Patch/High Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2032; ESLF 4219; ESP 1032

CONCEPT

Summary: This ecological system includes high-elevation (1600-2700 m [4850-9000 feet]) forests and woodlands dominated by *Abies magnifica* (= var. *magnifica*), *Abies X shastensis* (= *Abies magnifica* var. *shastensis*), and/or *Abies procera*. This system is typically found on deep, well-drained soils throughout this elevation zone from the central Sierra Nevada north and west into southern Oregon. Heavy snowpack is a major source of soil moisture throughout the growing season. The limiting factors can be either cold-air drainages or ponding, or coarser soils (pumice versus ash, for example). Other conifers that can occur in varying mixtures with *Abies magnifica* include *Pinus contorta* var. *murrayana*, *Pinus monticola*, *Tsuga mertensiana*, *Pinus jeffreyi*, and *Abies concolor*. At warmer and lower sites of the North Coast Ranges and Sierra Nevada, *Abies concolor* can codominate with *Abies magnifica*. *Pinus contorta* in Oregon indicates lower productivity where it intergrades with *Abies X shastensis*. This system ranges from dry to moist, and some sites have mesic indicator species, such as *Ligusticum grayi* or *Thalictrum fendleri*. Common understory species include *Quercus vacciniifolia*, *Ribes viscosissimum*, *Chrysolepis sempervirens*, *Ceanothus cordulatus* (in seral stands), *Vaccinium membranaceum*, *Symphoricarpos mollis*, and *Symphoricarpos rotundifolius*. Characteristic forbs include *Eucephalus breweri*, *Pedicularis semibarbata*, and *Hieracium albiflorum*. This system commonly occurs above mixed conifer forests with *Abies concolor* and overlaps in elevation with forests and woodlands of *Pinus contorta* var. *murrayana*. On volcanic sites of lower productivity, stands may be more open woodland in structure and with poor-site understory species such as *Wyethia mollis*. Driving ecological processes include occasional blow-down, insect outbreaks and stand-replacing fire.

Related Concepts:

- Red Fir: 207 (Eyre 1980) Equivalent

DESCRIPTION

Dynamics: Stand-replacing fire is important but so are moderately frequent (about once every 40 years) low- to moderate-severity fires. The whole system is characterized by a "moderate-severity fire regime" (Agee 1993), i.e., high variability in severity and moderate frequency of fires. See also Chappell and Agee (1996), Pitcher (1987), and Taylor and Halpern (1991) for documentation of fire regime in these forests.

MEMBERSHIP

Associations:

- (*Abies concolor*) - *Abies X shastensis* / *Symphoricarpos mollis* Forest (CEGL000033, GU)
- *Abies concolor* - *Abies X shastensis* / *Rosa gymnocarpa* Forest (CEGL000032, GU)
- *Abies magnifica* - *Abies concolor* - *Pinus jeffreyi* Sierran Montane Chaparral Forest (CEGL008682, G3)
- *Abies magnifica* - *Abies concolor* - *Pinus lambertiana* / Sparse Understory Forest (CEGL008683, G3)
- *Abies magnifica* - *Abies concolor* / Sparse Understory Forest (CEGL008681, G3)
- *Abies magnifica* - *Pinus contorta* var. *murrayana* / *Hieracium albiflorum* Forest (CEGL008612, G3?)
- *Abies magnifica* - *Pinus monticola* - *Pinus contorta* var. *murrayana* Forest (CEGL008616, G3)
- *Abies magnifica* - *Pinus monticola* / *Arctostaphylos nevadensis* Forest (CEGL008615, G3)
- *Abies magnifica* - *Pinus monticola* / *Chrysolepis sempervirens* Forest (CEGL008614, G3)
- *Abies magnifica* - *Pinus monticola* Forest (CEGL008613, G3)
- *Abies magnifica* / *Arctostaphylos nevadensis* Forest (CEGL008611, G3)
- *Abies magnifica* / Sparse Understory Forest (CEGL008609, G4)
- *Abies magnifica* / *Wyethia mollis* Forest (CEGL008610, G3?)
- *Abies magnifica* Forest [Placeholder] (CEGL002738, GNR)
- *Abies X shastensis* - *Tsuga mertensiana* / *Arctostaphylos nevadensis* Forest (CEGL000035, G4)
- *Abies X shastensis* / *Carex inops* ssp. *inops* Forest (CEGL000348, G4)
- *Abies X shastensis* / *Polemonium pulcherrimum* Forest (CEGL000036, G3)
- *Abies X shastensis* / *Quercus sadleriana* Forest (CEGL000034, G4)
- *Abies X shastensis* / *Vaccinium membranaceum* / *Chimaphila umbellata* Forest (CEGL000037, G4)

Alliances:

- *Abies concolor* - *Abies X shastensis* Forest Alliance (A.151)

- *Abies magnifica* - *Abies concolor* Forest Alliance (A.2561)
- *Abies magnifica* Forest Alliance (A.161)
- *Abies X shastensis* Forest Alliance (A.154)

DISTRIBUTION

Range: This system is typically found on deep, well-drained soils throughout the high-elevation zone (1600-2700 m [4850-8200 feet]) from the central Sierra Nevada north and west into southern Oregon.

Divisions: 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 2:C, 3:C, 6:C, 7:C, 12:?

USFS Ecomap Regions: 341D:CC, M242B:CC, M242C:CC, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 5:C, 12:C

SOURCES

References: Agee 1993, Barbour and Billings 2000, Barbour and Major 1988, Chappell and Agee 1996, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722768#references

Description Author: P. Comer, T. Keeler-Wolf, mod. G. Kittel

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1033 MEDITERRANEAN CALIFORNIA SUBALPINE WOODLAND (CES206.910)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Very Shallow Soil; W-Landscape/High Intensity; Krummholz

Non-Diagnostic Classifiers: Montane [Upper Montane]; Ridge/Summit/Upper Slope

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2033; ESLF 4220; ESP 1033

CONCEPT

Summary: This ecological system occurs on ridges and rocky slopes around timberline at 2900 m (9500 feet) elevation in the southern Sierra Nevada and Transverse and Peninsular ranges, up to 3500 m (11,500 feet) in the Sierra Nevada, and 2450 m (8000 feet) in the southern Cascades. Tree species often occur as krummholz growth forms with a wind-pruned, prostrate, and/or shrublike appearance, but in more protected sites they form true woodland physiognomy. Stands are dominated by *Pinus albicaulis* and/or *Pinus contorta* var. *murrayana*; other important conifers and locally dominant species include *Pinus balfouriana* (only in the Klamath Mountains and southern Sierra Nevada where it may replace *Pinus albicaulis*), *Pinus flexilis* (but only in small patches on the eastern flank of the Sierra Nevada escarpment when it does occur), *Pinus monticola* (not in Transverse or Peninsular ranges), and *Juniperus occidentalis* var. *australis* (mostly in the central and southern Sierra Nevada but not in the Klamath Mountains). Important shrubs include *Arctostaphylos nevadensis*, *Chrysolepis sempervirens*, and *Holodiscus discolor* (= *Holodiscus microphyllus*). Grasses and forbs include *Carex rossii*, *Carex filifolia*, *Poa wheeleri*, *Eriogonum incanum*, *Penstemon newberryi*, and *Penstemon davidsonii*. Due to landscape position and very thin soils, these are harsh sites exposed to desiccating winds with ice and snow blasts, and rocky substrates. In addition, a short growing season limits plant growth. The highest tree diversity occurs in the Klamath Mountains, with sometimes five or more conifers sharing codominance in one stand.

Similar Ecological Systems:

- Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland (CES206.912)

Related Concepts:

- California Mixed Subalpine: 256 (Eyre 1980) Intersecting
- Western Juniper - Big Sagebrush - Bluebunch Wheatgrass (107) (Shiflet 1994) Intersecting. *Juniperus occidentalis* var. *australis* woodlands are included in this ecological system of the Sierras.
- Western Juniper: 238 (Eyre 1980) Intersecting. *Juniperus occidentalis* var. *australis* stands are an important component of this ecological system.
- Whitebark Pine: 208 (Eyre 1980) Intersecting. Whitebark pine stands are a component of this ecological system.

MEMBERSHIP

Associations:

- *Juniperus occidentalis* var. *australis* - *Cercocarpus ledifolius* / *Artemisia tridentata* Woodland (CEGL003150, G3?)
- *Juniperus occidentalis* var. *australis* / *Artemisia tridentata* Woodland (CEGL003151, G3?)
- *Juniperus occidentalis* var. *australis* / *Holodiscus discolor* Woodland (CEGL003137, GNR)
- *Juniperus occidentalis* var. *australis* / Sparse Understory Woodland (CEGL003136, GNR)
- *Pinus albicaulis* / *Carex filifolia* Woodland (CEGL003133, G3G4)
- *Pinus albicaulis* / *Carex rossii* Woodland (CEGL003135, G3?)
- *Pinus contorta* var. *murrayana* - *Pinus albicaulis* / *Carex filifolia* Forest (CEGL008671, G3?)
- *Pinus contorta* var. *murrayana* - *Pinus albicaulis* / *Carex rossii* Forest (CEGL008670, G4)
- *Pinus monticola* - *Pinus contorta* var. *murrayana* / Sparse Understory Woodland (CEGL003157, GNR)
- *Pinus monticola* / *Achnatherum occidentale* Woodland (CEGL008622, G3)

Alliances:

- *Juniperus occidentalis* Woodland Alliance (A.535)
- *Pinus albicaulis* Woodland Alliance (A.531)
- *Pinus contorta* Forest Alliance (A.118)
- *Pinus monticola* Woodland Alliance (A.532)

DISTRIBUTION

Range: This system occurs on ridges and rocky slopes around timberline at 2900 m (9500 feet) elevation in the southern Sierra Nevada and Transverse and Peninsular ranges and 2450 m (8000 feet) in the southern Cascades.

Divisions: 204:P; 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), NV, OR

Map Zones: 2:C, 3:C, 4:C, 6:C, 7:C, 12:C, 13:P

USFS Ecomap Regions: 322A:??, 341D:CC, 341F:CC, M242B:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC

TNC Ecoregions: 4:C, 5:C, 12:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722771#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

1166 MIDDLE ROCKY MOUNTAIN MONTANE DOUGLAS-FIR FOREST AND WOODLAND (CES306.959)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: RM Montane Mesic Mixed Conifer; Moderate (100-500 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Forest and Woodland (Treed); Aridic; Intermediate Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2166; ESLF 4266; ESP 1166

CONCEPT

Summary: This ecological system occurs throughout the middle Rocky Mountains of central and southern Idaho (Lemhi, Beaverhead and Lost River ranges), south and east into the greater Yellowstone region, and south and east into the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide, north to about the McDonald Pass area, and also into the Rocky Mountain Front region of Montana. This is a *Pseudotsuga menziesii*-dominated system without the maritime floristic composition; these are forests and woodlands occurring in the central Rockies where the southern monsoon influence is less and maritime climate regime is not important. This system includes extensive *Pseudotsuga menziesii* forests, occasionally with *Pinus flexilis* on calcareous substrates, and *Pinus contorta* at higher elevations. True firs, such as *Abies concolor*, *Abies grandis*, and *Abies lasiocarpa*, are absent in these occurrences, but *Picea engelmannii* can occur in some stands. Understory components include shrubs such as *Physocarpus malvaceus*, *Juniperus communis*, *Symphoricarpos oreophilus*, and *Mahonia repens*, and graminoids such as *Calamagrostis rubescens*, *Carex rossii*, and *Leucopoa kingii*. The fire regime is of mixed severity with moderate frequency. This system often occurs at the lower treeline immediately above valley grasslands, or sagebrush steppe and shrublands. Sometimes there may be a "bath-tub ring" of *Pinus ponderosa* at lower elevations or *Pinus flexilis* between the valley non-forested and the solid *Pseudotsuga menziesii* forest. In the Wyoming Basins, this system occurs as isolated stands of *Pseudotsuga menziesii*, with *Artemisia tridentata*, *Pseudoroegneria spicata*, *Leucopoa kingii*, and *Carex rossii*.

Related Concepts:

- Interior Douglas-fir: 210 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Abies concolor* - *Pseudotsuga menziesii* / *Carex rossii* Forest (CEGL000431, G2?)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000210, G2Q)
- *Pseudotsuga menziesii* - *Pinus flexilis* / *Leucopoa kingii* Woodland (CEGL000906, G4Q)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429, G5)
- *Pseudotsuga menziesii* / *Festuca idahoensis* Woodland (CEGL000900, G4)
- *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000439, G4)
- *Pseudotsuga menziesii* / *Juniperus osteosperma* Forest (CEGL000440, G2?)
- *Pseudotsuga menziesii* / *Juniperus scopulorum* Woodland (CEGL000903, G3)
- *Pseudotsuga menziesii* / *Leucopoa kingii* Woodland (CEGL000904, G3G4)
- *Pseudotsuga menziesii* / *Linnaea borealis* Forest (CEGL000441, G4)
- *Pseudotsuga menziesii* / *Mahonia repens* Forest (CEGL000442, G5)
- *Pseudotsuga menziesii* / *Osmorhiza berteroi* Forest (CEGL000445, G4G5)
- *Pseudotsuga menziesii* / *Physocarpus malvaceus* Forest (CEGL000447, G5)
- *Pseudotsuga menziesii* / *Pseudoroegneria spicata* Woodland (CEGL000908, G4)
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Forest (CEGL000457, G5)
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest (CEGL000459, G5)
- *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Forest (CEGL000462, G5)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Pinus ponderosa* - *Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

DISTRIBUTION

Range: This system occurs throughout the middle Rocky Mountains of central and southern Idaho (Lemhi, Beaverhead and Lost River ranges), south and east into the greater Yellowstone region, and south and east into the Wind River, Gros Ventre and Bighorn ranges of Wyoming. It extends north into Montana on the east side of the Continental Divide to the Rocky Mountain Front and includes all of the Beaverhead Mountains Section (M332E) (Bailey et al. 1994). It may also occur in scattered patches in southeastern

Oregon.

Divisions: 304:C; 306:C

Nations: US

Subnations: ID, MT, OR?, WY

Map Zones: 9:?, 10:C, 18:?, 19:C, 20:?, 21:C, 22:C, 29:C

USFS Ecomap Regions: 342A:CC, 342C:CP, 342D:CP, 342J:CP, M331A:CC, M331B:CC, M331D:CP, M331J:CC, M332A:CC, M332B:CC, M332E:CC, M332F:CC

TNC Ecoregions: 6:P, 7:?, 8:C, 9:C, 10:C

SOURCES

References: Bailey et al. 1994, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.786427#references

Description Author: M.S. Reid

Version: 23 Jan 2006

Concept Author: M.S. Reid

Stakeholders: West

ClassifResp: West

1384 MISSISSIPPI DELTA MARITIME FOREST (CES203.513)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2384; ESLF 4327; ESP 1384

CONCEPT

Summary: This system includes forests on barrier islands and spits formed during the deltaic shifts of the Mississippi River. It also includes the woody vegetation of salt domes in the Mississippi River deltaic plain. Since natural deltaic processes have been altered, barrier island are no longer being formed in the Mississippi Delta region and existing barrier islands are undergoing subsidence and beach erosion. This system currently includes one forested beach ridge located at Grande Isle in Louisiana.

MEMBERSHIP

Associations:

- *Quercus virginiana* - *Magnolia grandiflora* - *Quercus pagoda* - *Celtis laevigata* / *Sabal minor* Forest (CEGL007467, G1)
- *Quercus virginiana* Forest (CEGL007831, G1Q)

Alliances:

- *Quercus virginiana* - *Celtis laevigata* Forest Alliance (A.374)

DISTRIBUTION

Range: This system is found on barrier islands and spits formed during the deltaic shifts of the Mississippi River, including one forested beach ridge located at Grande Isle in Louisiana. It is apparently restricted to Louisiana.

Divisions: 203:C

Nations: US

Subnations: LA

Map Zones: 98:C

USFS Ecomap Regions: 232E:CC

TNC Ecoregions: 31:C, 42:?

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723076#references

Description Author: J. Teague

Version: 06 Feb 2003

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

1509 MISSISSIPPI RIVER ALLUVIAL PLAIN DRY-MESIC LOESS SLOPE FOREST (CES203.071)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Unglaciaded

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Loess; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2509; ESLF 4155; ESP 1509

CONCEPT

Summary: This system of dry-mesic upland forests occurs most extensively on west-facing loess slopes on southern Crowley's Ridge, with more limited occurrences on northern Crowley's Ridge and in the erosional slopes and hills that bound the Grand Prairie terrace of Arkansas and Macon Ridge in Louisiana and Arkansas. The vegetation is very distinctive from that of the adjacent alluvial plain, and the sites themselves, which occur on distinct slopes that rise above the alluvial plain surface, also contrast sharply with it. Occurrences of this system generally comprise dry-mesic forests that occupy west-facing slopes and narrow, "finger" ridgetops in a highly dissected landscape. In many cases, these slopes provide habitat for plant species that are uncommon in other parts of the alluvial plain. Forests on the ridgetops are dominated by *Quercus alba*, *Quercus rubra* (Crowley's Ridge only), *Quercus falcata*, *Quercus pagoda*, *Quercus stellata*, *Carya texana*, *Quercus shumardii*, and *Quercus velutina*.

Classification Comments: This system is best developed on southern Crowley's Ridge where loess is most pronounced and is more isolated and less extensive elsewhere.

Similar Ecological Systems:

- Crowley's Ridge Mesic Loess Slope Forest (CES203.079)
- Crowley's Ridge Sand Forest (CES203.072)

Related Concepts:

- Dry-mesic Loess/Glacial Till Forest (Nelson 2005) Broader

DESCRIPTION

Environment: These forests occur on narrow ridgetops and slopes in a highly dissected environment. The system is best documented from southern Crowley's Ridge, Arkansas (Cross County south through Phillips County), with additional occurrences on the northern ridge, on the eastern border of the Grand Prairie terrace in Arkansas, on Macon Ridge (Louisiana/Arkansas) and probably on other upland sites within the alluvial plain, including Missouri and extreme western Kentucky and Tennessee. Loess soil is a characteristic and diagnostic component of the environment of this system.

Vegetation: This system consists of forests that are typically dominated by oaks and other hardwoods. Depending upon local soil moisture and other factors, canopy composition can vary from *Quercus stellata*- and *Quercus falcata*-dominated on the driest sites to *Quercus alba* and other oaks on more mesic sites. Associated species in the subcanopy and understory vary along this moisture gradient.

Dynamics: These are fire-maintained forests. In Arkansas, they generally lie to the east of hydroxeric Pleistocene terrace flatwoods or prairies (now usually converted to cropland) that burned frequently. Those fires would have continued into these dry to dry-mesic forests. There is presumably also some natural disturbance from the effects of windstorms and collapse of the fragile loess.

MEMBERSHIP

Associations:

- *Pinus echinata* Crowley's Ridge Forest [Provisional] (CEGL007919, G3G4)
- *Quercus alba* - *Quercus falcata* - *Quercus velutina* / *Ostrya virginiana* Forest (CEGL004068, G1G2)
- *Quercus stellata* - *Quercus falcata* / *Ostrya virginiana* Forest (CEGL004064, G1)

Alliances:

- *Pinus echinata* Forest Alliance (A.119)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)

DISTRIBUTION

Range: This system is endemic to well-drained sites on Crowley's Ridge (Arkansas, Missouri) and Macon Ridge (Louisiana/Arkansas), along the eastern slopes of the Grand Prairie terrace in Arkansas, and perhaps other such sites in the Mississippi River Alluvial Plain, including Missouri and extreme western Kentucky and Tennessee.

Divisions: 203:C

Nations: US

Subnations: AR, KY, LA, MO, TN

Map Zones: 45:C, 47:C

USFS Ecomap Regions: 234A:CC, 234D:CC, 234E:CC
TNC Ecoregions: 42:C

SOURCES

References: Clark 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 2005, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798104#references

Description Author: T. Foti, D. Zollner, M. Pyne

Version: 23 May 2008

Concept Author: T. Foti and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1063 NORTH PACIFIC BROADLEAF LANDSLIDE FOREST AND SHRUBLAND (CES204.846)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: Montane [Montane]; Lowland [Foothill]; Lowland [Lowland]; Temperate [Temperate Continental]

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2063; ESLF 4304; ESP 1063

CONCEPT

Summary: These forests and shrublands occur throughout the northern Pacific mountains and lowlands, becoming less prominent in the northern half of this region. They occur on steep slopes and bluffs that are subject to mass movements on a periodic basis. They are found in patches of differing age associated with different landslide events. The vegetation is deciduous broadleaf forests, woodlands, or shrublands, sometimes with varying components of conifers. *Alnus rubra* and *Acer macrophyllum* are the major tree species. *Rubus spectabilis*, *Rubus parviflorus*, *Ribes bracteosum*, and *Oplopanax horridus* are some of the major shrub species. Shrublands tend to be smaller in extent than woodlands or forests. Small patches of sparsely vegetated areas or herbaceous-dominated vegetation (especially *Petasites frigidus*) also often occur as part of this system. On earthflows, once stable, vegetation may succeed to dominance by conifers.

Classification Comments: Early-successional shrubby patches dominated by *Alnus* or *Acer* not associated with landslide disturbance are removed from this system and are placed within the forest types they are successional to, for example see North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001). More stable patches generally belong to North Pacific Montane Shrubland (CES204.087). For other disturbance driven shrublands, see North Pacific Avalanche Chute Shrubland (CES204.854). This system has not been determined to occur in Alaska, so for now that state is removed from its distribution.

Related Concepts:

- Red Alder: 221 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Acer macrophyllum* - *Alnus rubra* / *Polystichum munitum* - *Tellima grandiflora* Forest (CEGL003334, G2G3)

Alliances:

- *Acer macrophyllum* Forest Alliance (A.263)

DISTRIBUTION

Range: This system occurs throughout the northern Pacific mountains and lowlands (latter especially adjacent to coastlines), becoming less prominent in the northern half of this region.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 3:?, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 342I:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CC

TNC Ecoregions: 1:C, 3:C, 69:C, 81:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Franklin and Dyrness 1973

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722828#references

Description Author: C. Chappell, mod. G. Kittel

Version: 25 Apr 2006

Concept Author: C. Chappell

Stakeholders: Canada, West

ClassifResp: West

1035 NORTH PACIFIC DRY DOUGLAS-FIR-(MADRONE) FOREST AND WOODLAND (CES204.845)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); F-Patch/Medium Intensity; *Pseudotsuga menziesii*; *Arbutus menziesii*

Non-Diagnostic Classifiers: Lowland [Foothill]; Temperate [Temperate Oceanic]

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2035; ESLF 4222; ESP 1035

CONCEPT

Summary: This system is most common in the Puget Trough - Willamette Valley ecoregion but also occurs in adjacent ecoregions. It occupies small patches associated with dry sites or larger areas in prairie landscapes. This system historically had moderate- to low-severity fires moderately frequently. Historically, these communities were either part of larger forested landscapes or occupied sheltered topographic positions in prairie-dominated landscapes. They now also occur on some sites that formerly supported prairies or tall shrublands (*Corylus cornuta*) with scattered trees. In the mountains, this type occurs locally on dry sites within dry to mesic (for the coastal areas) climates up to about 1220 m (4000 feet) elevation. This is a forest or woodland primarily dominated by the long-lived conifer *Pseudotsuga menziesii*. The evergreen broadleaf *Arbutus menziesii*, the short-lived conifer *Pinus contorta*, the broadleaf deciduous *Acer macrophyllum*, and the shade-tolerant conifer *Abies grandis* are local dominant or codominant species. These sites are too dry and warm or have been too frequently and extensively burned for anything more than small amounts of *Tsuga heterophylla* or *Thuja plicata* to be present as regeneration. *Arbutus menziesii* dominance is favored by high-severity fires on sites where it occurs, and *Pseudotsuga menziesii* can be locally eliminated by logging and hot fire or repeated high-severity fires. *Calocedrus decurrens* is absent. *Abies grandis* can be an important subcanopy or sapling tree, especially in and around the Willamette Valley and in the driest portions of the Georgia Basin (Coastal Douglas-fir Zone).

Classification Comments: Originally named Dry Douglas-Fir and Madrone Forest and Woodland, name changed as many areas occur without madrone. However, note that the description states we can have madrone stands with no Douglas-fir; these are less common than the former.

Related Concepts:

- Grand Fir: 213 (Eyre 1980) Intersecting. Grand fir can occasionally be a dominant in occurrences of this ecological system.
- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting
- Pacific Douglas-fir: 229 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Arbutus menziesii* - *Pseudotsuga menziesii* - *Quercus* spp. / *Toxicodendron diversilobum* Woodland (CEGL000927, G3G4Q)
- *Pinus contorta* var. *contorta* - *Pseudotsuga menziesii* / *Cladina* spp. Forest (CEGL003375, G2)
- *Pinus contorta* var. *contorta* / *Gaultheria shallon* Forest (CEGL000150, G1G2)
- *Pseudotsuga menziesii* - *Abies grandis* / *Symphoricarpos albus* / *Melica subulata* Forest (CEGL003350, G1?)
- *Pseudotsuga menziesii* - *Arbutus menziesii* / *Gaultheria shallon* Forest (CEGL000421, G3)
- *Pseudotsuga menziesii* - *Arbutus menziesii* / *Vicia americana* Forest (CEGL000422, G1G2Q)
- *Pseudotsuga menziesii* / *Corylus cornuta* / *Polystichum munitum* Forest (CEGL002616, G3)
- *Pseudotsuga menziesii* / *Gaultheria shallon* - *Holodiscus discolor* Forest (CEGL000436, G2G3)
- *Pseudotsuga menziesii* / *Rosa gymnocarpa* - *Holodiscus discolor* Forest (CEGL000456, G2G3)
- *Pseudotsuga menziesii* / *Symphoricarpos albus* - *Holodiscus discolor* Forest (CEGL000460, G1)

Alliances:

- *Abies grandis* Forest Alliance (A.153)
- *Pinus contorta* Forest Alliance (A.118)
- *Pseudotsuga menziesii* - *Arbutus menziesii* Forest Alliance (A.159)
- *Pseudotsuga menziesii* - *Quercus garryana* Woodland Alliance (A.688)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Giant Forest Alliance (A.108)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)
- North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)

DISTRIBUTION

Range: This system is limited to the foothill transition zone of the Puget Trough - Willamette Valley - Georgia Basin ecoregion.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 3:?, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 263A:PP, M242A:CC, M242B:CC, M242D:CP, M261A:CC

TNC Ecoregions: 1:C, 2:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Franklin and Dyrness 1973, Green and Klinka 1994, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722829#references

Description Author: C. Chappell

Version: 02 Feb 2007

Concept Author: C. Chappell

Stakeholders: Canada, West

ClassifResp: West

1174 NORTH PACIFIC DRY-MESIC SILVER FIR-WESTERN HEMLOCK-DOUGLAS-FIR FOREST (CES204.098)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); *Tsuga heterophylla* - *Abies amabilis*

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2174; ESLF 4272; ESP 1174

CONCEPT

Summary: This forested system occurs only in the Pacific Northwest mountains, primarily west of the Cascade Crest. It generally occurs in an elevational band between *Pseudotsuga menziesii* - *Tsuga heterophylla* forests and *Tsuga mertensiana* forests. It dominates mid-montane dry to mesic maritime and some sub-maritime climatic zones from northwestern British Columbia to northwestern Oregon. In British Columbia and in the Olympic Mountains, this system occurs on the leeward side of the mountains only. In the Washington Cascades, it occurs on both windward and leeward sides of the mountains (in other words, it laps over the Cascade Crest to the "eastside"). Stand-replacement fires are regular with mean return intervals of about 200-500 years. Fire frequency tends to decrease with increasing elevation and continentality but still remains within this typical range. A somewhat variable winter snowpack that typically lasts for 2-6 months is characteristic. The climatic zone within which it occurs is sometimes referred to as the "rain-on-snow" zone because of the common occurrence of major winter rainfall on an established snowpack. *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, though *Pseudotsuga menziesii* is usually also common because of its long life span, and *Chamaecyparis nootkatensis* can be codominant, especially at higher elevations. *Abies procera* forests (usually mixed with silver fir) are included in this system and occur in the Cascades from central Washington to central Oregon and rarely in the Coast Range of Oregon. *Pseudotsuga menziesii* is a common species (unlike the mesic western hemlock-silver fir forest system) that regenerates after fires and therefore is frequent as a codominant, except at the highest elevations; the prevalence of this species is an important indicator in relation to the related climatically wetter North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097). *Abies lasiocarpa* sometimes occurs as a codominant on the east side of the Cascades and in sub-maritime British Columbia. Understory species that tend to be more common or unique in this type compared to the wetter North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097) include *Achlys triphylla*, *Mahonia nervosa*, *Xerophyllum tenax*, *Vaccinium membranaceum*, *Rhododendron macrophyllum*, and *Rhododendron albiflorum*. *Vaccinium ovalifolium*, while still common, only dominates on more moist sites within this type, unlike in the related type where it is nearly ubiquitous.

Classification Comments: Unlike North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097), the dominant natural process here is stand-replacing fires which occur on average every 200-500 years. Where old-growth does exist, it is mostly "young old-growth" 200-500 years in age. Natural-origin stands less than 200 years old are also common. More mixed-severity fires occur to the south in this system, so structure, patch size and proportions will be different; further north is more stand-replacing fires. In mapzone 7 this system will get modeled as 2 different BpS because of the differences in regimes. In Oregon there are more mixed-severity fires.

Similar Ecological Systems:

- Alaskan Pacific Maritime Western Hemlock Forest (CES204.840)
- North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)

Related Concepts:

- Coastal True Fir - Hemlock: 226 (Eyre 1980) Broader. includes wet and dry Silver fir
- Pacific Ponderosa Pine - Douglas-fir: 244 (Eyre 1980) Finer
- Western Hemlock: 224 (Eyre 1980) Intersecting. 80% W. Hemlock

DESCRIPTION

Dynamics: Landfire VDDT models: R#ABAMlo; they use *Pseudotsuga menziesii* as an indicator so some of the eastside *Abies amabilis* are included with *Picea engelmannii* or *Pinus monticola*.

MEMBERSHIP

Associations:

- *Abies amabilis* - *Abies concolor* / *Mahonia nervosa* Forest (CEGL000215, G2G3)
- *Abies amabilis* - *Abies concolor* / *Maianthemum stellatum* Forest (CEGL000216, G4)
- *Abies amabilis* / *Achlys triphylla* Forest (CEGL000003, G4)
- *Abies amabilis* / *Gaultheria shallon* Forest (CEGL000220, G4)
- *Abies amabilis* / *Mahonia nervosa* Forest (CEGL000217, G4)
- *Abies amabilis* / *Rhododendron macrophyllum* - *Gaultheria shallon* Forest (CEGL000222, G4)
- *Abies amabilis* / *Rhododendron macrophyllum* - *Mahonia nervosa* Forest (CEGL000218, G4)
- *Abies amabilis* / *Rhododendron macrophyllum* - *Vaccinium ovalifolium* Forest (CEGL000226, G4)
- *Abies amabilis* / *Rhododendron macrophyllum* / *Xerophyllum tenax* Forest (CEGL000227, G4)

- *Abies amabilis* / *Vaccinium membranaceum* - *Tiarella trifoliata* Forest (CEGL000237, G4)
- *Abies amabilis* / *Vaccinium membranaceum* - *Vaccinium ovalifolium* Forest (CEGL002610, G4G5)
- *Abies amabilis* / *Vaccinium membranaceum* / *Clintonia uniflora* Forest (CEGL002625, G4)
- *Abies amabilis* / *Vaccinium membranaceum* / *Rubus lasiococcus* Forest (CEGL000236, G4)
- *Abies amabilis* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL000239, G4)
- *Abies amabilis* / *Vaccinium membranaceum* Forest (CEGL000235, G4)
- *Abies amabilis* / *Vaccinium ovalifolium* - *Gaultheria shallon* Forest (CEGL002626, G4)
- *Abies amabilis* / *Vaccinium ovalifolium* / *Clintonia uniflora* Forest (CEGL000233, G5)
- *Abies amabilis* / *Vaccinium ovalifolium* / *Mahonia nervosa* Forest (CEGL000232, G4)
- *Abies amabilis* / *Vaccinium ovalifolium* / *Tiarella trifoliata* Forest (CEGL000009, G4)
- *Abies amabilis* / *Vaccinium ovalifolium* / *Xerophyllum tenax* Forest (CEGL002609, G4)
- *Abies amabilis* / *Vaccinium ovalifolium* Forest (CEGL000231, G4G5)
- *Abies amabilis* / *Vaccinium scoparium* Forest (CEGL000238, G4)
- *Chamaecyparis nootkatensis* / *Vaccinium ovalifolium* Forest (CEGL000351, G4Q)

Alliances:

- *Abies amabilis* - *Abies concolor* Forest Alliance (A.160)
- *Abies amabilis* Giant Forest Alliance (A.102)
- *Chamaecyparis nootkatensis* Forest Alliance (A.162)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)
- North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)

DISTRIBUTION

Range: This system only occurs in the Pacific Northwest mountains, on the leeward side of coastal mountains in both British Columbia and in the Olympic Mountains of Washington. It occurs throughout most of the Washington Cascades on both west and east sides (sporadically on the east) and in the western Cascades of northern to central Oregon. It occurs very sporadically in the Willapa Hills of southwestern Washington and in the northern Oregon Coast Range. This type may also occur on the east side of the Oregon Cascades north of 45 degrees North latitude (Mount Hood National Forest - Hood River and Barlow ranger districts, and possibly the northern edge of Warm Springs Reservation in part of the McQuinn Strip).

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 3:?, 7:C

USFS Ecomap Regions: 242A:CC, 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC

TNC Ecoregions: 1:C, 3:C, 69:C, 70:C, 81:C

SOURCES

References: DeMeo et al. 1992, DeVelice et al. 1999, Franklin and Dyrness 1973, Martin et al. 1995, Viereck et al. 1992, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769632#references

Description Author: C. Chappell

Version: 23 Jan 2006

Concept Author: C. Chappell

Stakeholders: Canada, West

ClassifResp: West

1036 NORTH PACIFIC HYPERMARITIME SEASONAL SITKA SPRUCE FOREST (CES204.841)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Hyperoceanic]; *Picea sitchensis*

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2036; ESLF 4223; ESP 1036

CONCEPT

Summary: This ecological system is restricted to the hypermaritime climatic areas near the Pacific Coast, along a fog belt from Point Arena, California, north to northern Vancouver Island, British Columbia. These forests are restricted to areas within 25 km of saltwater and are most abundant along the coast of Vancouver Island, southern portions of coastal British Columbia, and the Olympic Peninsula of Washington. Sites include the outermost coastal fringe where salt spray is prominent, riparian terraces and valley bottoms near the coast where there is major fog accumulation, and in the northern half of its range starting in central British Columbia, steep, well-drained productive slopes not directly adjacent to the outer coast but within the hypermaritime zone. Annual precipitation ranges from 65 to 550 cm, with the majority falling as rain. Winter rains can be heavy. In the southern portion of its range, summer drought does occur, but it is typically short in duration and ameliorated by frequent, dense coastal fog and cloud cover. This forest type also dominates lower elevations (to 350 m) on the leeward side of the Queen Charlotte Islands in British Columbia. In Washington and Oregon, it is found mostly below 300 m elevation. It also occurs as a very narrow strip or localized patches along the southern Washington, Oregon and northern California coasts. Stands are typically dominated or codominated by *Picea sitchensis* but often have a mixture of other conifers present, such as *Tsuga heterophylla*, *Thuja plicata*, or *Chamaecyparis nootkatensis*. *Tsuga heterophylla* is very often codominant. In the southern extent (in Oregon, but not in California), *Chamaecyparis lawsoniana*, *Abies grandis*, *Pseudotsuga menziesii*, *Acer circinatum*, *Alnus rubra*, *Acer macrophyllum*, and *Frangula purshiana* (= *Rhamnus purshiana*) are occasional associates, while *Chamaecyparis nootkatensis* is completely absent. Wet coastal environments that support stands of *Chamaecyparis lawsoniana* in the absence of *Picea sitchensis* are also part of this system. The understory is rich with shade-tolerant shrubs and ferns, including *Gaultheria shallon*, *Vaccinium ovatum*, *Polystichum munitum*, *Dryopteris* spp., and *Blechnum spicant*, as well as a high diversity of mosses and lichens. The disturbance regime is mostly small-scale windthrow or other gap mortality processes (though there are occasional widespread intense windstorms) and very few fires, the latter mainly in Oregon. This type differs from Alaskan Pacific Maritime Sitka Spruce Forest (CES204.151) by having *Pseudotsuga menziesii* and *Thuja plicata* in addition to *Picea sitchensis* and *Tsuga heterophylla*. The climate has more seasonal rainfall than coastal areas to the north, with a pronounced drought in summer months.

Classification Comments: Stands dominated or codominated with *Chamaecyparis lawsoniana* that are within 25 km (15 miles) of the coast are part of either California Coastal Redwood Forest (CES206.921) (extreme southern Oregon and northern California) or North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841) (central and northern coastal Oregon). Stands in these areas may or may not have redwood or Sitka spruce present. Stands away from the coast and not on serpentine soils are considered part of North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002).

Similar Ecological Systems:

- North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest (CES204.842)

Related Concepts:

- BaSs - Devil's club (CWHvm1/08) (Banner et al. 1993) Intersecting
- BaSs - Devil's club (CWHvm2/08) (Banner et al. 1993) Intersecting
- CwSs - Devil's club (CWHvh2/07) (Banner et al. 1993) Intersecting
- CwSs - Devil's club, Lithic (CWHvh2/07) (Banner et al. 1993) Intersecting
- CwSs - Devil's club, Mineral (CWHvh2/07) (Banner et al. 1993) Intersecting
- CwSs - Foamflower (CWHvh2/06) (Banner et al. 1993) Intersecting
- CwSs - Skunk cabbage (CWHvh2/13) (Banner et al. 1993) Intersecting
- CwSs - Skunk cabbage (CWHvm1/14) (Banner et al. 1993) Intersecting
- CwSs - Skunk cabbage, Mineral (CWHvh2/13) (Banner et al. 1993) Intersecting
- CwSs - Skunk cabbage, Peaty (CWHvh2/13) (Banner et al. 1993) Intersecting
- CwSs - Sword fern (CWHvh2/05) (Banner et al. 1993) Intersecting
- CwSs - Sword fern, Lithic (CWHvh2/05) (Banner et al. 1993) Intersecting
- CwSs - Sword fern, Mineral (CWHvh2/05) (Banner et al. 1993) Intersecting
- HwSs - Blueberry (CWHwm/01) (Banner et al. 1993) Intersecting
- HwSs - Blueberry, Lithic (CWHwm/01) (Banner et al. 1993) Intersecting
- HwSs - Blueberry, Mineral (CWHwm/01) (Banner et al. 1993) Intersecting
- HwSs - Lanky moss (CWHvh2/04) (Banner et al. 1993) Intersecting

- HwSs - Lanky moss, Lithic (CWHvh2/04) (Banner et al. 1993) Intersecting
- HwSs - Lanky moss, Mineral (CWHvh2/04) (Banner et al. 1993) Intersecting
- HwSs - Step moss (CWHwm/02) (Banner et al. 1993) Intersecting
- Port Orford-Cedar: 231 (Eyre 1980) Intersecting. Coastal Port Orford-cedar stands occur in this system.
- Red Alder: 221 (Eyre 1980) Intersecting. early-successional stage of many PNW forests.
- Sitka Spruce: 223 (Eyre 1980) Finer. 80% spruce
- Ss - Kindbergia (CWHvh2/15) (Banner et al. 1993) Intersecting
- Ss - Lily-of-the-valley (CWHvh2/08) (Banner et al. 1993) Intersecting
- Ss - Pacific crab apple (CWHvh2/19) (Banner et al. 1993) Intersecting
- Ss - Reedgrass (CWHvh2/16) (Banner et al. 1993) Intersecting
- Ss - Salal (CWHvh2/14) (Banner et al. 1993) Intersecting
- Ss - Salmonberry (CWHds1/08) (Steen and Coupe 1997) Intersecting
- Ss - Salmonberry (CWHms1/07) (Steen and Coupe 1997) Intersecting
- Ss - Salmonberry (CWHvm1/09) (Banner et al. 1993) Intersecting
- Ss - Salmonberry (CWHwm/05) (Banner et al. 1993) Intersecting
- Ss - Salmonberry (CWHws1/07) (Banner et al. 1993) Intersecting
- Ss - Salmonberry (CWHws2/07) (Banner et al. 1993) Intersecting
- Ss - Skunk cabbage (CWHwm/09) (Banner et al. 1993) Intersecting
- Ss - Slough sedge (CWHvh2/18) (Banner et al. 1993) Intersecting
- Ss - Sword fern (CWHvh2/17) (Banner et al. 1993) Intersecting
- Ss - Trisetum (CWHvh2/09) (Banner et al. 1993) Intersecting
- SsHw - Devil's club (CWHwm/04) (Banner et al. 1993) Intersecting
- SsHw - Oak fern (CWHwm/03) (Banner et al. 1993) Intersecting
- Western Hemlock - Sitka Spruce: 225 (Eyre 1980) Finer. equal cover hemlock and spruce

DESCRIPTION

Environment: From Vancouver Island south, the forest is not confined to fjords, but a marked orographic effect from the Coast and Cascade ranges limits its interior extent. At its southern extent, the zone narrows again, confined to the fog belt not by mountains but by moisture. Sitka spruce, western red-cedar, western hemlock and Douglas-fir characterize the seasonal zone.

Dynamics: Landfire VDDT models: R#SSHE Sitka spruce - hemlock.

MEMBERSHIP

Associations:

- *Chamaecyparis lawsoniana* - *Picea sitchensis* / *Vaccinium ovatum* - *Rhododendron macrophyllum* Forest (CEGL000054, G1)
- *Picea sitchensis* - *Tsuga heterophylla* / *Rhododendron macrophyllum* - *Vaccinium ovatum* Forest (CEGL002603, G1)
- *Picea sitchensis* / *Gaultheria shallon* - *Rubus spectabilis* Forest (CEGL000402, G3)
- *Picea sitchensis* / *Gaultheria shallon* Forest (CEGL000401, G3)
- *Picea sitchensis* / *Menziesia ferruginea* - *Vaccinium parvifolium* Forest (CEGL000056, G3)
- *Picea sitchensis* / *Oplopanax horridus* Giant Forest (CEGL000057, G4?)
- *Picea sitchensis* / *Oxalis oregana* Forest (CEGL000058, G3)
- *Picea sitchensis* / *Rubus spectabilis* Forest (CEGL000060, G3)

Alliances:

- *Chamaecyparis lawsoniana* Forest Alliance (A.104)
- *Picea sitchensis* Giant Forest Alliance (A.105)
- *Picea sitchensis* Seasonally Flooded Forest Alliance (A.182)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- California Coastal Closed-Cone Conifer Forest and Woodland (CES206.922)
- California Coastal Redwood Forest (CES206.921)
- North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest (CES204.842)

Adjacent Ecological System Comments: From Washington north, it occurs as patches within a matrix or mosaic of North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest (CES204.842) and wetlands. In California, it occurs adjacent to California Coastal Redwood Forest (CES206.921) and California Coastal Closed-Cone Conifer Forest and Woodland (CES206.922).

DISTRIBUTION

Range: This system is restricted to the outer fringe of the Pacific Coast, along a fog belt from Point Arena, California, north to the northern end of Vancouver Island, British Columbia.

Divisions: 204:C

Nations: CA, US

Subnations: BC, CA, OR, WA

Map Zones: 1:C, 2:C, 3:C

USFS Ecomap Regions: 242A:CC, M242A:CC, M242D:CC, M261A:??

TNC Ecoregions: 1:C, 69:C

SOURCES

References: Banner et al. 1993, Comer et al. 2003, Eyre 1980, Franklin and Dyrness 1973, Green and Klinka 1994, Holland and Keil 1995, Steen and Coupe 1997, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722833#references

Description Author: G. Kittel, P. Comer, D. Vanderschaaf, mod. C. Chappell, T. Keeler-Wolf, M.S. Reid

Version: 11 Dec 2008

Stakeholders: Canada, West

Concept Author: G. Kittel, P. Comer, D. Vanderschaaf

ClassifResp: West

1178 NORTH PACIFIC HYPERMARITIME WESTERN RED-CEDAR-WESTERN HEMLOCK FOREST (CES204.842)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Hyperoceanic]; *Tsuga heterophylla*, *Thuja plicata*

Non-Diagnostic Classifiers: Lowland [Lowland]

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2178; ESLF 4271; ESP 1178

CONCEPT

Summary: These forests occupy the outer coastal portions of British Columbia, southeastern Alaska, and northwestern Washington. Their center of distribution is the northern coast of British Columbia, as *Thuja plicata* approaches its northernmost limit in the southern half of southeastern Alaska. These forests occur mainly on islands but also fringe the mainland. They are never more than 25 km from saltwater; elevation ranges from 0 to 600 m, and below 245 m in Alaska (above 200 m, *Chamaecyparis nootkatensis* replaces *Thuja plicata*). The climate is hypermaritime, with cool summers, very wet winters, abundant fog, and without a major snowpack. Fire is absent from this system in Alaska and rare throughout the rest of the range. These forests are more influenced by gap disturbance processes and intense windstorms than by fire. The terrain is mostly gentle to rolling, of low topographic relief, and often rocky. Soils typically have a distinct humus layer overlying mineral horizons or bedrock; where the system is best developed in central British Columbia, the humus layers are very thick (mean 17-35 cm). Soils are often imperfectly drained, but this is not a wetland system. *Thuja plicata* and *Tsuga heterophylla* are the dominant tree species throughout, and *Chamaecyparis nootkatensis* joins them from northern Vancouver Island north. Canopy cover of trees is typically over 60%. *Pinus contorta* and *Tsuga mertensiana* can be present in some locations in the central and northern portion of the range. *Abies amabilis* occurs in British Columbia and northern Washington stands but is not typically found in southeastern Alaska. In Washington, nearly pure stands of *Tsuga heterophylla* are common and seem to be associated with microsites most exposed to intense windstorms. A shrub layer of *Gaultheria shallon*, *Vaccinium ovalifolium*, and *Menziesia ferruginea* is usually well-developed. The fern *Blechnum spicant* in great abundance is typical of hypermaritime conditions. *Oxalis oregana* (absent in Alaska) is important in the understory of moist sites in Washington. *Polystichum munitum* occurs at the northern end of its range in southeastern Alaska on well-drained sites. The abundance of *Thuja plicata* in relation to other conifers is one of the diagnostic characters of these forests; the other is the low abundance of *Pseudotsuga menziesii* (absent in Alaska) and *Picea sitchensis*. Where these forests are best developed, they occur in a mosaic with forested wetlands, bogs, and Sitka spruce forests (the latter in riparian areas and on steep, more productive soils).

Classification Comments: Yellow-cedar usually replaces western red-cedar in southern southeast Alaska at an elevation of about 152 m (500 feet). When yellow-cedar is mixed with western hemlock, and western red-cedar has dropped out, the occurrence is classified as North Pacific Mesic Western Hemlock-Yellow-cedar Forest (CES204.843). Below 152 m elevation, western red-cedar predominates; however, yellow-cedar may be present.

Similar Ecological Systems:

- North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841)
- North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)
- North Pacific Mesic Western Hemlock-Yellow-cedar Forest (CES204.843)

Related Concepts:

- Cw - Devil's club (CWHds1/07) (Steen and Coupe 1997) Intersecting
- Cw - Solomon's-seal (CWHds1/05) (Steen and Coupe 1997) Intersecting
- CwHw - Salal (CWHvh2/01) (Banner et al. 1993) Intersecting
- CwHw - Salal, Lithic (CWHvh2/01) (Banner et al. 1993) Intersecting
- CwHw - Salal, Mineral (CWHvh2/01) (Banner et al. 1993) Intersecting
- CwHw - Salal, Peaty (CWHvh2/01) (Banner et al. 1993) Intersecting
- CwHw - Sword fern (CWHvm1/04) (Banner et al. 1993) Intersecting
- CwHw - Sword fern (CWHvm2/04) (Banner et al. 1993) Intersecting
- CwSs - Skunk cabbage (CWHds1/12) (Steen and Coupe 1997) Intersecting
- CwSs - Skunk cabbage (CWHms1/11) (Steen and Coupe 1997) Intersecting
- CwSs - Skunk cabbage (CWHvm2/11) (Banner et al. 1993) Intersecting
- CwSs - Skunk cabbage (CWHws1/11) (Banner et al. 1993) Intersecting
- CwSs - Skunk cabbage (CWHws2/11) (Banner et al. 1993) Intersecting
- HwCw - Salal (CWHvm1/03) (Banner et al. 1993) Intersecting
- HwCw - Salal (CWHvm2/03) (Banner et al. 1993) Intersecting
- I.A.1.g - Western hemlock-western redcedar (Viereck et al. 1992) Equivalent
- Red Alder: 221 (Eyre 1980) Intersecting, early-successional stage of many PNW forests.
- Western Redcedar - Western Hemlock: 227 (Eyre 1980) Broader. Includes RM

- Western Redcedar: 228 (Eyre 1980) Broader. Includes RM

DESCRIPTION

Environment: This system represents the upper end of the productivity gradient within the Cedar-Hemlock Ecological Zone and the lower end of the Western Hemlock Ecological Zone (DeMeo et al. 1992).

MEMBERSHIP

Associations:

- *Abies amabilis* / *Gaultheria shallon* / *Blechnum spicant* Forest (CEGL000221, G3)
- *Tsuga heterophylla* - *Chamaecyparis nootkatensis* / *Vaccinium ovalifolium* - *Menziesia ferruginea* Forest (CEGL003242, G4)
- *Tsuga heterophylla* - *Chamaecyparis nootkatensis* / *Vaccinium ovalifolium* - *Oplopanax horridus* Forest (CEGL003241, G3)
- *Tsuga heterophylla* - *Chamaecyparis nootkatensis* / *Vaccinium ovalifolium* Forest (CEGL003239, G5)
- *Tsuga heterophylla* - *Thuja plicata* - *Chamaecyparis nootkatensis* / *Gaultheria shallon* / *Blechnum spicant* Forest (CEGL002776, GNR)
- *Tsuga heterophylla* - *Thuja plicata* / *Gaultheria shallon* Woodland (CEGL003227, G5)
- *Tsuga heterophylla* - *Thuja plicata* / *Polystichum munitum* Forest (CEGL003228, G5)
- *Tsuga heterophylla* - *Thuja plicata* / *Vaccinium (alaskaense, ovalifolium)* - *Gaultheria shallon* / *Hylocomium splendens* Forest (CEGL002778, G3)
- *Tsuga heterophylla* - *Thuja plicata* / *Vaccinium ovalifolium* - *Gaultheria shallon* Woodland (CEGL003225, G5)
- *Tsuga heterophylla* - *Thuja plicata* / *Vaccinium ovalifolium* - *Tiarella trifoliata* Forest (CEGL003224, G5)
- *Tsuga heterophylla* - *Thuja plicata* / *Vaccinium ovalifolium* / *Lysichiton americanus* Forest (CEGL003223, G5)
- *Tsuga heterophylla* - *Thuja plicata* / *Vaccinium ovalifolium* Forest (CEGL003222, G5)
- *Tsuga heterophylla* / *Oxalis oregana* - *Polystichum munitum* Forest (CEGL000106, G3)
- *Tsuga heterophylla* / *Oxalis oregana* Forest (CEGL000105, G3G4)

Alliances:

- *Abies amabilis* Giant Forest Alliance (A.102)
- *Thuja plicata* Forest Alliance (A.166)
- *Tsuga heterophylla* Forest Alliance (A.145)
- *Tsuga heterophylla* Giant Forest Alliance (A.112)
- *Tsuga heterophylla* Seasonally Flooded Forest Alliance (A.185)
- *Tsuga heterophylla* Woodland Alliance (A.549)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Alaskan Pacific Maritime Sitka Spruce Forest (CES204.151)
- North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841)

DISTRIBUTION

Range: This system is found in the outer coastal portions of British Columbia and southern southeast Alaska, as well as northwestern Washington.

Divisions: 204:C

Nations: CA, US

Subnations: AK, BC, WA

Map Zones: 1:C, 2:C, 78:C

USFS Ecomap Regions: 242A:CC, M242A:CC, M242D:CC

TNC Ecoregions: 1:C, 3:?, 69:C

SOURCES

References: Banner et al. 1993, Bigley and Hull 1995, Comer et al. 2003, DeMeo et al. 1992, DeVelice et al. 1999, Green and Klinka 1994, Martin et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722832#references

Description Author: G. Kittel, mod. C. Chappell and M.S. Reid

Version: 10 Dec 2008

Concept Author: G. Kittel and C. Chappell

Stakeholders: Canada, West

ClassifResp: West

NORTH PACIFIC LOWLAND MIXED HARDWOOD-CONIFER FOREST (CES204.073)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 4333

CONCEPT

Summary: This lowland mixed hardwood - conifer forest system occurs throughout the Pacific Northwest. It occurs on valley terraces, margins, and slopes at low elevations in the mountains of the Pacific Northwest Coast and interior valleys west of the high Cascade Mountains. These forests are composed of large conifers, including *Pseudotsuga menziesii*, *Thuja plicata*, *Abies grandis*, *Tsuga heterophylla*, and/or *Picea sitchensis*, with deciduous hardwood trees present and usually codominant. Major dominant broadleaf species are *Acer macrophyllum*, *Quercus garryana*, *Alnus rubra*, *Frangula purshiana*, and *Cornus nuttallii*. Conifers tend to increase with succession in the absence of major disturbance although the hardwoods, particularly *Acer macrophyllum*, persist in the overstory. The understory is characterized by deciduous shrubs such as *Acer circinatum*, *Corylus cornuta*, *Oemleria cerasiformis*, *Rubus ursinus*, *Symphoricarpos albus*, and *Toxicodendron diversilobum*, but evergreen shrubs, including *Gaultheria shallon* and *Mahonia nervosa* and forbs, such as *Polystichum munitum* and *Oxalis oregana*, can be dominant.

DESCRIPTION

Environment: In some places, hardwoods are truly only found in early-seral conditions. This is more true the farther north you get, so in Washington, there are a few places where hardwoods persist, outside of the dry Douglas fir - madrone forests around the Willamette Valley, Puget Trough and the western Oregon Interior Valleys. In the Coast Range and Cascades, there are hardwoods (mostly alder and bigleaf maple) found in most of the valley toeslopes. They also occur in areas with exposed talus, exposed rocks, and in dry places, and often with Oregon white oak and Oregon ash. This mix of deciduous hardwoods and conifers is a climax forest in many areas, while in others it is successional, with the conifers completely overtaking the hardwoods after 200 years or so without disturbance.

MEMBERSHIP

Associations:

- *Abies grandis* - *Acer macrophyllum* / *Symphoricarpos albus* Forest (CEGL000519, G3Q)
- *Acer macrophyllum* - *Pseudotsuga menziesii* / *Acer circinatum* / *Polystichum munitum* Forest (CEGL003394, G4)
- *Acer macrophyllum* - *Pseudotsuga menziesii* / *Corylus cornuta* / *Hydrophyllum tenuipes* Forest (CEGL000517, G3)
- *Acer macrophyllum* / *Acer circinatum* Forest (CEGL000560, G4G5)
- *Acer macrophyllum* / *Rubus spectabilis* Forest (CEGL000561, G4)
- *Acer macrophyllum* / *Rubus ursinus* Forest (CEGL003395, G3)
- *Acer macrophyllum* / *Symphoricarpos albus* / *Urtica dioica* ssp. *gracilis* Forest (CEGL003396, G3)
- *Alnus rubra* / *Acer circinatum* / *Claytonia sibirica* Forest (CEGL003298, G4G5)
- *Alnus rubra* / *Elymus glaucus* Forest (CEGL003398, G4)
- *Alnus rubra* / *Oxalis (oregana, trilliifolia)* Forest (CEGL003400, G4)
- *Alnus rubra* / *Rubus parviflorus* Forest (CEGL003402, G4)
- *Quercus garryana* - (*Fraxinus latifolia*) / *Symphoricarpos albus* Forest (CEGL003299, G2)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Oplopanax horridus* / *Polystichum munitum* Forest (CEGL000497, G4)

Alliances:

- *Acer macrophyllum* Forest Alliance (A.263)
- *Acer macrophyllum* Seasonally Flooded Forest Alliance (A.339)
- *Alnus rubra* Seasonally Flooded Forest Alliance (A.342)
- *Pseudotsuga menziesii* - *Acer macrophyllum* Forest Alliance (A.427)
- *Quercus garryana* Forest Alliance (A.262)
- *Tsuga heterophylla* Seasonally Flooded Forest Alliance (A.185)

DISTRIBUTION

Range: This system occurs throughout the Pacific Northwest elevationally below the Silver Fir Zone.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

TNC Ecoregions: 1:C, 69:C, 81:C

SOURCES

References: Chappell and Christy 2004, Franklin and Dyrness 1973, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.807316#references

Description Author: J. Kagan

Version: 29 Oct 2007

Concept Author: J. Kagan

Stakeholders: Canada, West
ClassifResp: West

1037 NORTH PACIFIC MARITIME DRY-MESIC DOUGLAS-FIR-WESTERN HEMLOCK FOREST (CES204.001)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; *Tsuga heterophylla*, *Pseudotsuga menziesii*

Non-Diagnostic Classifiers: Montane

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2037; ESLF 4224; ESP 1037

CONCEPT

Summary: This ecological system comprises much of the major lowland forests of western Washington, northwestern Oregon, eastern Vancouver Island, and the southern Coast Ranges in British Columbia. In southwestern Oregon, it becomes local and more small-patch in nature. It occurs throughout low-elevation western Washington, except on extremely dry or moist to very wet sites. In Oregon, it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, and in the Coast Ranges. These forests occur on the drier to intermediate moisture habitats and microhabitats within the Western Hemlock Zone of the Pacific Northwest. Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 20 inches in the extreme rainshadow) falling predominantly as winter rain. Snowfall ranges from rare to regular, and summers are relatively dry. Elevation ranges from sea level to 610 m (2000 feet) in northern Washington to 1067 m (3500 feet) in Oregon. Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. This is generally the most extensive forest in the lowlands on the west side of the Cascades and forms the matrix within which other systems occur as patches. Throughout its range it occurs in a mosaic with North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002); in dry areas it occurs adjacent to or in a mosaic with North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845), and at higher elevations it intermingles with either North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098) or North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097).

Overstory canopy is dominated by *Pseudotsuga menziesii*, with *Tsuga heterophylla* generally present in the subcanopy or as a canopy dominant in old-growth stands. *Abies grandis*, *Thuja plicata*, and *Acer macrophyllum* codominants are also represented. In the driest climatic areas, *Tsuga heterophylla* may be absent, and *Thuja plicata* takes its place as a late-seral or subcanopy tree species. *Gaultheria shallon*, *Mahonia nervosa*, *Rhododendron macrophyllum*, *Linnaea borealis*, *Achlys triphylla*, and *Vaccinium ovatum* typify the poorly to well-developed shrub layer. *Acer circinatum* is a common codominant with one or more of these other species. The fern *Polystichum munitum* can be codominant with one or more of the evergreen shrubs on sites with intermediate moisture availability (mesic). If *Polystichum munitum* is thoroughly dominant or greater than about 40-50% cover, then the stand is probably in the more moist North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002). Young stands may lack *Tsuga heterophylla* or *Thuja plicata*, especially in the Puget Lowland. *Tsuga heterophylla* is generally the dominant regenerating tree species. Other common associates include *Acer macrophyllum*, *Abies grandis*, and *Pinus monticola*. In southwestern Oregon, *Pinus lambertiana*, *Calocedrus decurrens*, and occasionally *Pinus ponderosa* may occur in these forests. Soils are generally well-drained and are mesic to dry for much of the year. This is in contrast to North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002), which occurs on sites where soils remain moist to subirrigated for much of the year and fires were less frequent. Fire is (or was) the major natural disturbance. In the past (pre-1880), fires were less commonly high-severity, typically mixed-severity or moderate-severity, with natural return intervals of 100 years or less in the driest areas, to a few hundred years in areas with more moderate to wet climates. In the drier climatic areas (central Oregon Cascades, Puget Lowlands, Georgia Basin), this system was typified by a (mixed) moderate-severity fire regime involving occasional stand-replacing fires and more frequent moderate-severity fires. This fire regime would create a complex mosaic of stand structures across the landscape.

Similar Ecological Systems:

- North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)

Related Concepts:

- Douglas-fir - Western Hemlock: 230 (Eyre 1980) Broader. include both wet and dry
- Grand Fir: 213 (Eyre 1980) Intersecting
- Pacific Douglas-fir: 229 (Eyre 1980) Broader. 80% Doug-fir
- Red Alder: 221 (Eyre 1980) Intersecting. early successional stage of many PNW Forests
- Western Hemlock: 224 (Eyre 1980) Broader. 80% W. Hemlock cover

DESCRIPTION

Dynamics: Fire is (or was) the major natural disturbance. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of 100 years or less in the driest areas, to a few hundred years in areas with more moderate to wet climates. In the drier climatic areas (central Oregon Cascades, Puget Lowlands, Georgia Basin), this system was typified by a moderate-severity fire regime involving occasional stand-replacement fires and more frequent moderate-severity fires. This fire regime would create a complex mosaic of stand structures across the landscape. Landfire VDDT models: #RDFHEdry

Douglas-fir Hemlock dry mesic describes general successional stage relationship with bias to OR.

MEMBERSHIP

Associations:

- *Pseudotsuga menziesii* - (*Tsuga heterophylla*) / *Rhododendron macrophyllum* Forest (CEGL000086, G3)
- *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Gaultheria shallon* Forest (CEGL000084, G3)
- *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Holodiscus discolor* Forest (CEGL000067, G3)
- *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Mahonia nervosa* Forest (CEGL000083, G2)
- *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Rhododendron macrophyllum* - *Vaccinium ovatum* - *Gaultheria shallon* Forest (CEGL002615, G2)
- *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Vaccinium ovatum* Forest (CEGL002614, G2)
- *Pseudotsuga menziesii* / *Acer circinatum* - *Holodiscus discolor* Forest (CEGL000109, G3Q)
- *Pseudotsuga menziesii* / *Gaultheria shallon* / *Polystichum munitum* Forest (CEGL000070, G4)
- *Thuja plicata* - *Tsuga heterophylla* / *Rhododendron macrophyllum* / *Linnaea borealis* Forest (CEGL000485, G3)
- *Thuja plicata* - *Tsuga heterophylla* / *Whipplea modesta* Forest (CEGL000486, G2G3)
- *Tsuga heterophylla* / *Acer glabrum* var. *douglasii* / *Linnaea borealis* Forest (CEGL002608, G3Q)
- *Tsuga heterophylla* / *Achlys triphylla* Forest (CEGL000094, G4)
- *Tsuga heterophylla* / *Chrysolepis chrysophylla* Forest (CEGL000099, G3)
- *Tsuga heterophylla* / *Gaultheria shallon* / *Polystichum munitum* Forest (CEGL000101, G4)
- *Tsuga heterophylla* / *Linnaea borealis* Forest (CEGL000104, G3)
- *Tsuga heterophylla* / *Mahonia nervosa* - *Gaultheria shallon* Forest (CEGL000096, G4)
- *Tsuga heterophylla* / *Mahonia nervosa* / *Achlys triphylla* Forest (CEGL000095, G4)
- *Tsuga heterophylla* / *Mahonia nervosa* / *Linnaea borealis* Forest (CEGL000097, G3Q)
- *Tsuga heterophylla* / *Mahonia nervosa* Forest (CEGL000492, G4)
- *Tsuga heterophylla* / *Vaccinium membranaceum* / *Linnaea borealis* Forest (CEGL000119, G4)
- *Tsuga heterophylla* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL000120, G3)
- *Tsuga heterophylla* / *Vaccinium ovatum* Forest (CEGL000121, G3)

Alliances:

- *Pseudotsuga menziesii* - *Tsuga heterophylla* Forest Alliance (A.107)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Giant Forest Alliance (A.108)
- *Thuja plicata* Forest Alliance (A.166)
- *Thuja plicata* Giant Forest Alliance (A.111)
- *Tsuga heterophylla* Giant Forest Alliance (A.112)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)
- North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845)
- North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)
- North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)
- North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)

Adjacent Ecological System Comments: In dry areas it occurs adjacent to or in a mosaic with North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845) and at higher, moister elevations intermingles with either North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098) or North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097). Throughout its range it occurs in a mosaic with North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002).

DISTRIBUTION

Range: This system comprises the major lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. In British Columbia and Washington, it is uncommon to absent on the windward side of the coastal mountains where fire is rare. It also occurs locally in far southwestern Oregon (Klamath ecoregion) as small to large patches.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC

TNC Ecoregions: 1:C, 3:C, 5:C, 69:C, 81:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.738966#references

Description Author: G. Kittel, mod. C. Chappell

Version: 31 Mar 2005
Concept Author: G. Kittel and C. Chappell

Stakeholders: Canada, West
ClassifResp: West

1038 NORTH PACIFIC MARITIME MESIC SUBALPINE PARKLAND (CES204.837)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Late-lying snowpack; Montane [Upper Montane]; *Tsuga mertensiana*

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Continental]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2038; ESLF 4225; ESP 1038

CONCEPT

Summary: This ecological system occurs throughout the mountains of the Pacific Northwest, from the southern Cascades of Oregon to the mountains of southeastern Alaska bordering British Columbia. It occurs at the transition zone of forest to alpine, forming a subalpine forest-meadow ecotone. Mountain hemlock forests, as they approach treeline, become open patches of mature-height trees surrounded by mesic and wet meadows rich in dwarf-shrubs and forbs. Clumps of trees to small patches of forest interspersed with low shrublands and meadows characterize this system. Krummholz often occurs near the upper elevational limit of this system where it grades into alpine vegetation. Associations include woodlands, forested, and subalpine meadow types. It occurs on the west side of the Cascade Mountains and is a transitional open forest into the true alpine on the interior side of the Coastal Mountains of British Columbia where deep, late-lying snowpack is the primary environmental factor. Major tree species are *Tsuga mertensiana*, *Abies amabilis*, *Chamaecyparis nootkatensis*, and *Abies lasiocarpa*. This system includes British Columbia Hypermaritime and Maritime Parkland (*Tsuga mertensiana*). Dominant dwarf-shrubs include *Phyllodoce empetriformis*, *Cassiope mertensiana*, and *Vaccinium deliciosum*. Dominant herbaceous species include *Lupinus arcticus* ssp. *subalpinus*, *Valeriana sitchensis*, *Carex spectabilis*, and *Polygonum bistortoides*. There is very little disturbance, either windthrow or fire. The major process controlling vegetation is the very deep long-lasting snowpacks (deepest in the North Pacific region) limiting tree regeneration. Trees get established only in favorable microsites (mostly adjacent to existing trees) or during drought years with low snowpack. It is distinguished from more interior dry parkland primarily by the presence of *Tsuga mertensiana* or *Abies amabilis* and absence or paucity of *Pinus albicaulis* and *Larix lyallii*.

Classification Comments: This system includes what the Alaska Natural Heritage Program called Maritime Subalpine Fir-Mountain Hemlock Forest. It is very localized in its occurrence in Alaska, occurring in the eastern portion of the panhandle at high elevations.

Related Concepts:

- II.A.1.b - Subalpine fir scrub (Viereck et al. 1992) Equivalent
- Mountain Hemlock: 205 (Eyre 1980) Intersecting. Mountain hemlock stands are a component of subalpine parklands.

MEMBERSHIP

Associations:

- *Carex spectabilis* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001828, G4)
- *Carex spectabilis* - *Potentilla flabellifolia* Herbaceous Vegetation (CEGL001829, G4Q)
- *Carex spectabilis* Herbaceous Vegetation (CEGL001827, G5)
- *Cassiope mertensiana* / *Luetkea pectinata* Dwarf-shrubland (CEGL001397, G3G4)
- *Chamaecyparis nootkatensis* Subalpine Parkland Woodland (CEGL000350, G3)
- *Luetkea pectinata* - *Saxifraga tolmiei* Herbaceous Vegetation (CEGL001918, G5)
- *Lupinus arcticus* ssp. *subalpinus* - *Carex spectabilis* Herbaceous Vegetation (CEGL001973, G4)
- *Phyllodoce empetriformis* / *Lupinus latifolius* Dwarf-shrubland (CEGL001406, G4?)
- *Phyllodoce empetriformis* / *Vaccinium deliciosum* Dwarf-shrubland (CEGL001407, G4)
- *Phyllodoce empetriformis* Parkland Dwarf-shrubland (CEGL001404, G5)
- *Potentilla flabellifolia* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001981, G4Q)
- *Saussurea americana* - *Heracleum maximum* Herbaceous Vegetation (CEGL001945, G3G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Phyllodoce empetriformis* - *Vaccinium deliciosum* Woodland (CEGL000914, G4)
- *Tsuga mertensiana* / *Cassiope mertensiana* Woodland (CEGL003251, G5)
- *Vaccinium deliciosum* Parkland Dwarf-shrubland (CEGL001427, G4G5)
- *Vaccinium membranaceum* - *Vaccinium deliciosum* Dwarf-shrubland (CEGL001428, G4?Q)
- *Valeriana sitchensis* - *Carex spectabilis* Herbaceous Vegetation (CEGL001996, G4)
- *Valeriana sitchensis* - *Ligusticum grayi* Herbaceous Vegetation (CEGL001997, G3G4Q)
- *Valeriana sitchensis* - *Veratrum viride* Herbaceous Vegetation (CEGL001998, G4)

Alliances:

- *Carex spectabilis* Herbaceous Alliance (A.1300)
- *Cassiope mertensiana* Dwarf-shrubland Alliance (A.1081)
- *Chamaecyparis nootkatensis* Woodland Alliance (A.554)

- *Luetkea pectinata* - *Saxifraga tolmiei* Herbaceous Alliance (A.1629)
- *Lupinus arcticus* Herbaceous Alliance (A.1609)
- *Phyllodoce empetriformis* Dwarf-shrubland Alliance (A.1083)
- *Potentilla flabellifolia* Herbaceous Alliance (A.1610)
- *Saussurea americana* Temporarily Flooded Herbaceous Alliance (A.1662)
- *Tsuga mertensiana* - *Abies amabilis* Woodland Alliance (A.555)
- *Tsuga mertensiana* Woodland Alliance (A.550)
- *Vaccinium deliciosum* Dwarf-shrubland Alliance (A.1115)
- *Valeriana sitchensis* Herbaceous Alliance (A.1611)

DISTRIBUTION

Range: This system occurs throughout the mountains of the Pacific Northwest, from the central Oregon Cascades (Diamond Peak, 30 miles north of Crater Lake National Park), north to the Coast Ranges of British Columbia, where it can occur on the east side, facing the interior of British Columbia, as well as north to the mountains along the border of Alaska.

Divisions: 204:C; 207:C; 306:C

Nations: CA, US

Subnations: AK, BC, OR, WA

Map Zones: 1:C, 7:P, 78:C

USFS Ecomap Regions: 242A:CC, M242A:CC, M242B:CC, M242C:CP, M242D:CC

TNC Ecoregions: 1:C, 4:C, 7:C, 69:?, 70:C, 81:C, 144:C

SOURCES

References: Banner et al. 1993, BCMF 2006, Comer et al. 2003, Franklin and Dyrness 1973, Green and Klinka 1994

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722837#references

Description Author: G. Kittel, mod. C. Chappell

Version: 06 Feb 2009

Concept Author: G. Kittel

Stakeholders: Canada, West

ClassifResp: West

1039 NORTH PACIFIC MARITIME MESIC-WET DOUGLAS-FIR-WESTERN HEMLOCK FOREST (CES204.002)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; *Tsuga heterophylla*, *Pseudotsuga menziesii*

Non-Diagnostic Classifiers: Montane

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2039; ESLF 4226; ESP 1039

CONCEPT

Summary: This ecological system is a significant component of the lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. It occurs throughout low-elevation western Washington, except on extremely dry sites and in the hypermaritime zone near the outer coast where it is rare. In Oregon, it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, and on the west side of the Coast Ranges, and is reduced to locally small patches in southwestern Oregon. In British Columbia, it occurs on the eastern (leeward) side of Vancouver Island, commonly and rarely on the windward side, and in the southern Coast Ranges. These forests occur on moist habitats and microhabitats, mainly lower slopes or valley landforms, within the Western Hemlock Zone of the Pacific Northwest. They differ from North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001) primarily in having more hydrophilic undergrowth species, moist to subirrigated soils, high abundance of shade- and moisture-tolerant canopy trees, as well as higher stand productivity, due to higher soil moisture and lower fire frequency. Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 20 inches in the extreme rainshadow) predominantly as winter rain. Snowfall ranges from rare to regular (but consistent winter snowpacks are absent or minimal), and summers are relatively dry. Elevation ranges from sea level to 610 m (2000 feet) in northern Washington to 1067 m (3500 feet) in Oregon. Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. This is an extensive forest in the lowlands on the west side of the Cascades. In some wetter climatic areas, it forms the matrix within which other systems occur as patches, especially riparian wetlands. In many rather drier climatic areas, it occurs as small to large patches within a matrix of North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001); in dry areas, it can occur adjacent to or in a mosaic with North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845), and at higher elevations it intermingles with either North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098) or North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097).

Overstory canopy is dominated by *Pseudotsuga menziesii*, *Tsuga heterophylla*, and/or *Thuja plicata*, as well as *Chamaecyparis lawsoniana* in western Oregon, away from the coast. *Pseudotsuga menziesii* is usually at least present to more typically codominant or dominant. *Acer macrophyllum* and *Alnus rubra* (the latter primarily where there has been historic logging disturbance) are commonly found as canopy or subcanopy codominants, especially at lower elevations. In a natural landscape, small patches can be dominated in the canopy by these broadleaf trees for several decades after a severe fire. *Polystichum munitum*, *Oxalis oregana*, *Rubus spectabilis*, and *Oplopanax horridus* typify the poorly to well-developed herb and shrub layers. *Gaultheria shallon*, *Mahonia nervosa*, *Rhododendron macrophyllum*, and *Vaccinium ovatum* are often present but are generally not as abundant as the aforementioned indicators; except where *Chamaecyparis lawsoniana* is a canopy codominant, they may be the dominant understory. *Acer circinatum* is a very common codominant as a tall shrub. Forested stands with abundant *Lysichiton americanus*, an indicator of seasonally flooded or saturated soils, belong in North Pacific Coniferous Swamp (CES204.867). Stands included are best represented on lower mountain slopes of the coastal ranges with high precipitation, long frost-free periods, and low fire frequencies. Young stands may lack *Tsuga heterophylla* or *Thuja plicata*, especially in the Puget Lowland. *Tsuga heterophylla* is generally the dominant regenerating tree species. Other common associates include *Abies grandis*, which can be a codominant especially in the Willamette Valley - Puget Trough - Georgia Basin ecoregion. Soils are moist to somewhat wet but not saturated for much of the year and are well-drained to somewhat poorly drained. Typical soils for *Polystichum* sites would be deep, fine- to moderately coarse-textured, and for *Oplopanax* sites, soils typically have an impermeable layer at a moderate depth. Both types of soils are well-watered from upslope sources, seeps, or hyperheic sources. This is in contrast to North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001), which occurs on well-drained soils, south-facing slopes, and dry ridges and slopes where soils remain mesic to dry for much of the year. Fire is (or was) the major natural disturbance in all but the wettest climatic areas. In the past (pre-1880), fires were less commonly high-severity, typically mixed-severity or moderate-severity, with natural return intervals of a few hundred to several hundred years. This system was formerly supported by occasional, stand-replacing fires. More frequent moderate-severity fires would generally not burn these moister microsites.

Classification Comments: Stands dominated or codominated with *Chamaecyparis lawsoniana* that are within 25 km (15 miles) of the coast are part of either California Coastal Redwood Forest (CES206.921) (extreme southern Oregon and northern California) or North Pacific Hypermaritime Seasonal Sitka Spruce Forest (CES204.841) (central and northern coastal Oregon). Stands in these areas may or may not have redwood or Sitka spruce present. Stands away from the coast and not on serpentine soils are considered part of North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002).

Similar Ecological Systems:

- North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)

Related Concepts:

- Douglas-fir - Western Hemlock: 230 (Eyre 1980) Broader. Includes both wet and dry stands
- Fd - Fairybells (CWHds1/04) (Steen and Coupe 1997) Intersecting
- FdHw - Falsebox (CWHds1/03) (Steen and Coupe 1997) Intersecting
- FdHw - Falsebox (CWHms1/03) (Steen and Coupe 1997) Intersecting
- FdPl - Kinnikinnick (CWHds1/02) (Steen and Coupe 1997) Intersecting
- FdPl - Kinnikinnick (CWHms1/02) (Steen and Coupe 1997) Intersecting
- Hw - Queen's cup (CWHds1/06) (Steen and Coupe 1997) Intersecting
- HwFd - Cat's-tail moss (CWHds1/01) (Steen and Coupe 1997) Intersecting
- no data (CWHds2/01) (BCMF 2006) Intersecting
- Pacific Douglas-fir: 229 (Eyre 1980) Broader. 80% Doug-fir
- Port Orford-Cedar: 231 (Eyre 1980) Broader. not serpentine, not in stika spruce zone, and not swamps
- Red Alder: 221 (Eyre 1980) Intersecting. early successional stage of many PNW Forests
- Western Hemlock: 224 (Eyre 1980) Broader. 80% W. Hemlock

DESCRIPTION

Dynamics: Fire is (or was) the major natural disturbance in all but the wettest climatic areas. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of a few hundred to several hundred years. This system was formerly supported by occasional, stand-replacing fires. More frequent moderate-severity fires would generally not burn these moister microsites. Wind may be equally as important as fire, and in the Bull Run Watershed more important.

MEMBERSHIP

Associations:

- *Abies grandis* - *Tsuga heterophylla* / *Polystichum munitum* Forest (CEGL000287, G2)
- *Acer macrophyllum* / *Acer circinatum* Forest (CEGL000560, G4G5)
- *Alnus rubra* / *Polystichum munitum* Forest (CEGL000638, G4)
- *Pseudotsuga menziesii* - *Tsuga heterophylla* / *Polystichum munitum* Forest (CEGL000085, G3?)
- *Pseudotsuga menziesii* / *Acer circinatum* Forest (CEGL000417, G5?)
- *Pseudotsuga menziesii* / *Polystichum munitum* Forest (CEGL000450, G4G5Q)
- *Thuja plicata* - *Tsuga heterophylla* / *Oxalis oregana* Forest (CEGL000483, G2)
- *Thuja plicata* / *Gaultheria shallon* Forest (CEGL000475, G1G2)
- *Thuja plicata* / *Linnaea borealis* Forest (CEGL000089, G2)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Oplopanax horridus* / *Polystichum munitum* Forest (CEGL000497, G4)
- *Tsuga heterophylla* / *Acer circinatum* - *Rubus spectabilis* Forest (CEGL000092, G3G4)
- *Tsuga heterophylla* / *Acer circinatum* / *Achlys triphylla* Forest (CEGL000090, G3G4)
- *Tsuga heterophylla* / *Gaultheria shallon* - *Rubus spectabilis* Forest (CEGL000102, G4)
- *Tsuga heterophylla* / *Oxalis oregana* - *Polystichum munitum* Forest (CEGL000106, G3)
- *Tsuga heterophylla* / *Polystichum munitum* - *Tiarella trifoliata* Forest (CEGL002627, G3)
- *Tsuga heterophylla* / *Polystichum munitum* Forest (CEGL000108, G4)
- *Tsuga heterophylla* / *Rubus spectabilis* Forest (CEGL000114, G4)
- *Tsuga heterophylla* / *Vaccinium ovalifolium* Forest (CEGL000118, G4)

Alliances:

- *Abies grandis* Giant Forest Alliance (A.114)
- *Acer macrophyllum* Forest Alliance (A.263)
- *Alnus rubra* Forest Alliance (A.264)
- *Pseudotsuga menziesii* - *Tsuga heterophylla* Forest Alliance (A.107)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Giant Forest Alliance (A.108)
- *Thuja plicata* Giant Forest Alliance (A.111)
- *Tsuga heterophylla* Giant Forest Alliance (A.112)
- *Tsuga heterophylla* Seasonally Flooded Forest Alliance (A.185)
- *Tsuga heterophylla* Temporarily Flooded Forest Alliance (A.174)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845)
- North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)
- North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)
- North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)

Adjacent Ecological System Comments: In some wetter climatic areas, it forms the matrix within which other systems occur as patches, especially riparian wetlands. In many rather drier climatic areas, it occurs as small to large patches within a matrix of North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001). In dry areas, it can occur adjacent to or in a mosaic with North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland (CES204.845) and at higher elevations intermingles with either

North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098) or North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097).

DISTRIBUTION

Range: This system is a significant component of the lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. This system may also occur as very small patches in northern California, in the northern Coast Ranges.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 3:?, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 263A:CC, 342I:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC

TNC Ecoregions: 1:C, 3:C, 5:C, 69:C, 81:C

SOURCES

References: BCMF 2006, Eyre 1980, Steen and Coupe 1997, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.738967#references

Description Author: G. Kittel, mod. C. Chappell and M.S. Reid

Version: 23 Jan 2006

Concept Author: G. Kittel and C. Chappell

Stakeholders: Canada, West

ClassifResp: West

1042 NORTH PACIFIC MESIC WESTERN HEMLOCK-SILVER FIR FOREST (CES204.097)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Temperate [Temperate Oceanic]; *Tsuga heterophylla* - *Abies amabilis*

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2042; ESLF 4229; ESP 1042

CONCEPT

Summary: This forested system occurs only in the Pacific Northwest mountains entirely west of the Cascade Crest from coastal British Columbia to Washington, and probably occurs in southeastern Alaska. It generally occurs in an elevational band between *Pseudotsuga menziesii* - *Tsuga heterophylla* or hypermaritime zone forests and *Tsuga mertensiana* forests. It dominates mid-montane maritime climatic zones on the windward side of Vancouver Island, the Olympic Peninsula, and the wettest portions of the North Cascades in Washington (north of Snoqualmie River). A somewhat variable winter snowpack that typically lasts for 2-6 months is characteristic. The climatic zone within which it occurs is sometimes referred to as the "rain-on-snow" zone because of the common occurrence of major winter rainfall on an established snowpack. *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, and *Chamaecyparis nootkatensis* can be codominant, especially at higher elevations. *Thuja plicata* is also common and sometimes codominates in British Columbia. In Alaska, *Abies amabilis* occurs in nearly pure stands and in mixture with *Picea sitchensis* and *Tsuga heterophylla*. *Pseudotsuga menziesii* is relatively rare to absent in this system, as opposed to the similar but drier North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098). The major understory dominant species is *Vaccinium ovalifolium*. Understory species that help distinguish this system from the drier silver fir system (they are much more common here) include *Oxalis oregana*, *Blechnum spicant*, and *Rubus pedatus*. Windthrow is a common small-scale disturbance in this system, and gap creation and succession are important processes.

Classification Comments: Jan Henderson suggests using 90 inches mean precipitation at sea level (with modification for topographic moisture) to distinguish wet and dry silver fir systems. Fire regime is significantly different at regional scale between the dry and mesic; this difference appears to be consistent throughout the range of the types. The mesic rarely, if ever, burns; it is dominated by what is sometimes called "old old-growth" stands that run from 700 to over 1000 years in age. Research in British Columbia indicates these coastal rainforests may burn an average of once every 2000 years. The major processes then are small-scale gap dynamics, not stand-replacement fires. This difference is related to climate, not site moisture, with the mesic having a very wet climate that is more coastal, less continental, with cooler summers, and warmer winters on average.

Similar Ecological Systems:

- Alaskan Pacific Maritime Western Hemlock Forest (CES204.840)
- North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)
- North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest (CES204.842)

Related Concepts:

- BaCw - Devil's club (CWHms1/06) (Steen and Coupe 1997) Intersecting
- BaCw - Devil's club (CWHws1/06) (Banner et al. 1993) Intersecting
- BaCw - Devil's club (CWHws2/06) (Banner et al. 1993) Intersecting
- BaCw - Foamflower (CWHvm1/05) (Banner et al. 1993) Intersecting
- BaCw - Foamflower (CWHvm2/05) (Banner et al. 1993) Intersecting
- BaCw - Oak fern (CWHms1/04) (Steen and Coupe 1997) Intersecting
- BaCw - Oak fern (CWHws1/04) (Banner et al. 1993) Intersecting
- BaCw - Oak fern (CWHws2/04) (Banner et al. 1993) Intersecting
- BaCw - Salmonberry (CWHvm1/07) (Banner et al. 1993) Intersecting
- BaCw - Salmonberry (CWHvm2/07) (Banner et al. 1993) Intersecting
- Coastal True Fir - Hemlock: 226 (Eyre 1980) Broader. includes moist and dry silver fir
- Douglas-fir - Western Hemlock: 230 (Eyre 1980) Intersecting
- HwBa - Blueberry (CWHvm1/01) (Banner et al. 1993) Intersecting
- HwBa - Blueberry (CWHvm2/01) (Banner et al. 1993) Intersecting
- HwBa - Blueberry, Lithic (CWHvm1/01) (Banner et al. 1993) Intersecting
- HwBa - Blueberry, Lithic (CWHvm2/01) (Banner et al. 1993) Intersecting
- HwBa - Blueberry, Mineral (CWHvm1/01) (Banner et al. 1993) Intersecting
- HwBa - Blueberry, Mineral (CWHvm2/01) (Banner et al. 1993) Intersecting
- HwBa - Bramble (CWHws1/01) (Banner et al. 1993) Intersecting
- HwBa - Bramble (CWHws2/01) (Banner et al. 1993) Intersecting
- HwBa - Bramble, Glaciofluvial (CWHws1/01) (Banner et al. 1993) Intersecting

- HwBa - Bramble, Typic (CWHws1/01) (Banner et al. 1993) Intersecting
- HwBa - Deer fern (CWHvm1/06) (Banner et al. 1993) Intersecting
- HwBa - Deer fern (CWHvm2/06) (Banner et al. 1993) Intersecting
- HwBa - Deer fern, Lithic (CWHvm1/06) (Banner et al. 1993) Intersecting
- HwBa - Deer fern, Mineral (CWHvm1/06) (Banner et al. 1993) Intersecting
- HwBa - Queen's cup (CWHms1/05) (Steen and Coupe 1997) Intersecting
- HwBa - Queen's cup (CWHws1/05) (Banner et al. 1993) Intersecting
- HwBa - Queen's cup (CWHws2/05) (Banner et al. 1993) Intersecting
- HwBa - Step moss (CWHms1/01) (Steen and Coupe 1997) Intersecting
- I.A.1.h - Silver fir-western hemlock (Viereck et al. 1992) Equivalent
- Western Hemlock: 224 (Eyre 1980) Intersecting. 80% W. Hemlock

DESCRIPTION

Dynamics: Stand-replacing fires are relatively infrequent to absent, with return intervals of several hundred or more years. More mixed-severity fires occur in the southern parts of this system, so that forest structure, patch size and proportions will be different from northern stands. Further north, stand-replacing fires are also infrequent but are a more common fire event.

MEMBERSHIP

Associations:

- *Abies amabilis* / *Menziesia ferruginea* Forest (CEGL000224, G4)
- *Abies amabilis* / *Oplopanax horridus* Forest (CEGL000004, G5)
- *Abies amabilis* / *Oxalis oregana* Forest (CEGL000005, G4)
- *Abies amabilis* / *Polystichum munitum* Forest (CEGL000006, G4)
- *Abies amabilis* / *Rhododendron albiflorum* Forest (CEGL000225, G5)
- *Abies amabilis* / *Tiarella trifoliata* Forest (CEGL000007, G4)
- *Abies amabilis* / *Vaccinium ovalifolium* / *Clintonia uniflora* Forest (CEGL000233, G5)
- *Abies amabilis* / *Vaccinium ovalifolium* / *Erythronium montanum* Forest (CEGL000234, G3)
- *Abies amabilis* / *Vaccinium ovalifolium* / *Tiarella trifoliata* Forest (CEGL000009, G4)
- *Abies amabilis* / *Vaccinium ovalifolium* Forest (CEGL000231, G4G5)
- *Tsuga heterophylla* - *Abies amabilis* - (*Chamaecyparis nootkatensis*) / *Vaccinium alaskaense* Forest (CEGL002850, G3?)

Alliances:

- *Abies amabilis* Giant Forest Alliance (A.102)
- *Abies amabilis* Seasonally Flooded Forest Alliance (A.187)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Alaskan Pacific Maritime Western Hemlock Forest (CES204.840)
- East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)
- North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)
- North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)

DISTRIBUTION

Range: This system occurs only in the Pacific Northwest mountains (Coastal and westside Cascades). It occurs on the windward side of coastal mountains in both British Columbia and in the Olympic Mountains and north Cascade Range of Washington. It may also extend north to about 56 degrees north latitude in southeastern Alaska. *Abies amabilis* has a limited distribution in Alaska, apparently confined to the extreme southern mainland and a few islands south of 56 degrees north latitude.

Divisions: 204:C

Nations: CA, US

Subnations: AK?, BC, WA

Map Zones: 1:C, 2:C, 3:?, 7:C, 78:C

USFS Ecomap Regions: 242A:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC

TNC Ecoregions: 1:C, 3:C, 69:P, 81:C

SOURCES

References: Banner et al. 1993, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Franklin and Dyrness 1973, Martin et al. 1995, Steen and Coupe 1997, Viereck et al. 1992, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769626#references

Description Author: G. Kittel, mod. C. Chappell and M.S. Reid

Version: 22 Aug 2008

Concept Author: G. Kittel, mod. C. Chappell

Stakeholders: Canada, West
ClassifResp: West

1041 NORTH PACIFIC MOUNTAIN HEMLOCK FOREST (CES204.838)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; *Tsuga mertensiana*

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2041; ESLF 4228; ESP 1041

CONCEPT

Summary: This forested ecological system occurs throughout the mountains of the North Pacific, from the southern Cascades of Oregon north to southwestern British Columbia. It is the predominant forest of subalpine elevations in the coastal mountains of British Columbia, western Washington and western Oregon. It also occurs on mountain slopes on the outer coastal islands of British Columbia. It lies between the Western Hemlock, Pacific Silver Fir, or Shasta Red Fir zones and the Subalpine Parkland or Alpine Tundra Zone, at elevations ranging from 300 to 2300 m (1000-7500 feet). The lower and upper elevational limits decrease from south to north and from east to west. The climate is generally characterized by short, cool summers, rainy autumns and long, cool, wet winters with heavy snow cover for 5-9 months. The heavy snowpack is ubiquitous, but at least in southern Oregon and perhaps the eastern Cascades, summer drought is more significant. Fire is very rare or absent across the majority of the range of the system. *Tsuga mertensiana* is one of the dominant tree species throughout, and *Abies amabilis* becomes an important associated species in the southern portion of the range (British Columbia, Washington, and northwestern Oregon). *Tsuga heterophylla* often occurs at lower elevations in this system but is much less abundant than *Tsuga mertensiana*. *Chamaecyparis nootkatensis* occurs in the more coastal portions, while *Abies lasiocarpa* is found inland and becomes increasingly common near the transition to the Subalpine Fir-Engelmann Spruce Zone in the Cascades and British Columbia. On the leeward side of the Cascades, this is usually a dense canopy composed of *Abies lasiocarpa* and *Tsuga mertensiana*, with some *Picea engelmannii* or *Abies amabilis*. In the Cascades of central to southern Oregon, *Abies X shastensis* is typically present and often codominant. *Picea sitchensis* and *Thuja plicata* are occasionally present. Deciduous trees are rare. Common understory species include *Vaccinium ovalifolium*, *Menziesia ferruginea*, *Elliottia pyroliflorus*, and *Blechnum spicant*. Parklands (open woodlands or sparse trees with dwarf-shrub or herbaceous vegetation) are not part of this system but of North Pacific Maritime Mesic Subalpine Parkland (CES204.837) or Alaskan Pacific Maritime Subalpine Mountain Hemlock Woodland (CES204.143).

Classification Comments: Farther inland, *Tsuga mertensiana* becomes limited to the coldest and wettest pockets of the more continental subalpine fir forests, described from the eastern Cascades and northern Rocky Mountains. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as patches within the matrix of Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830) only in the most maritime of environments and is included in the spruce-fir system. In the northern Rocky Mountains, this forest system is codominated by *Abies lasiocarpa* and/or *Picea engelmannii*. Mountain hemlock forests in Alaska are placed into Alaskan Pacific Maritime Mountain Hemlock Forest (CES204.142) or Alaskan Pacific Maritime Subalpine Mountain Hemlock Woodland (CES204.143).

Similar Ecological Systems:

- Alaskan Pacific Maritime Mountain Hemlock Forest (CES204.142)
- Alaskan Pacific Maritime Sitka Spruce Forest (CES204.151)
- Alaskan Pacific Maritime Subalpine Mountain Hemlock Woodland (CES204.143)

Related Concepts:

- BaHm - Oak fern (MHmm1/03) (Banner et al. 1993) Intersecting
- BaHm - Oak fern (MHmm2/03) (Banner et al. 1993) Intersecting
- BaHm - Oak fern (MHmm2/03) (Steen and Coupe 1997) Intersecting
- BaHm - Twistedstalk (MHmm1/05) (Banner et al. 1993) Intersecting
- BaHm - Twistedstalk (MHmm2/05) (Steen and Coupe 1997) Intersecting
- BaHm - Twistedstalk (MHmm2/05) (Banner et al. 1993) Intersecting
- BIHm - Cladonia (ESSFmk/03) (Banner et al. 1993) Intersecting
- BIHm - Oak fern (ESSFmk/04) (Banner et al. 1993) Intersecting
- BIHm - Twistedstalk (ESSFmk/01) (Banner et al. 1993) Intersecting
- CwYc - Goldthread (CWHvm2/09) (Banner et al. 1993) Intersecting
- EW Subalpine Fir - Mountain Hemlock Wet Forested (Ecosystems Working Group 1998) Broader
- HmBa - Blueberry (MHmm1/01) (Banner et al. 1993) Intersecting
- HmBa - Blueberry (MHmm2/01) (Banner et al. 1993) Intersecting
- HmBa - Blueberry (MHmm2/01) (Steen and Coupe 1997) Intersecting
- HmBa - Bramble (MHmm1/04) (Banner et al. 1993) Intersecting
- HmBa - Bramble (MHmm2/04) (Banner et al. 1993) Intersecting

- HmBa - Bramble (MHmm2/04) (Steen and Coupe 1997) Intersecting
- HmBa - Mountain-heather (MHmm1/02) (Banner et al. 1993) Intersecting
- HmBa - Mountain-heather (MHmm2/02) (Banner et al. 1993) Intersecting
- HmBa - Mountain-heather (MHmm2/02) (Steen and Coupe 1997) Intersecting
- HmSs - Blueberry (MHwh1/01) (Banner et al. 1993) Intersecting
- Hw - Sphagnum (CWHwm/08) (Banner et al. 1993) Intersecting
- MF Mountain Hemlock - Amabilis fir Forested (Ecosystems Working Group 1998) Broader
- Mountain Hemlock: 205 (Eyre 1980) Broader
- SsHm - Reedgrass (MHwh1/03) (Banner et al. 1993) Intersecting

DESCRIPTION

Dynamics: In the more summer-dry climatic areas (Cascades), occasional high-severity fires occur, with return intervals of 400-600 years (J. Kertis pers. comm. 2006, K. Kopper pers. comm. 2006). On drier sites, *Abies lasiocarpa* and *Pinus contorta* can be the first forests to develop after stand-replacing fire. These early-seral stages, with lodgepole pine dominant in the upper canopy, could be classified and mapped as Rocky Mountain Lodgepole Pine Forest (CES306.820) but should be considered part of this system if other tree species listed above are present, as it will succeed as a mixed pine type, then mountain hemlock becomes characteristic. Landfire VDDT models: R#ABAMup.

MEMBERSHIP

Associations:

- *Tsuga mertensiana* - *Abies amabilis* / *Caltha leptosepala* ssp. *howellii* Forest (CEGL000501, G3)
- *Tsuga mertensiana* - *Abies amabilis* / *Elliottia pyroliflorus* Woodland (CEGL000503, G3G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Oplapanax horridus* Forest (CEGL000507, G3G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Rhododendron albiflorum* Forest (CEGL002632, G5)
- *Tsuga mertensiana* - *Abies amabilis* / *Rhododendron macrophyllum* Forest (CEGL000124, G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Rubus lasiococcus* Forest (CEGL000509, G3)
- *Tsuga mertensiana* - *Abies amabilis* / *Tiarella trifoliata* var. *unifoliata* - *Streptopus lanceolatus* Forest (CEGL000125, G3G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Vaccinium membranaceum* - *Vaccinium ovalifolium* Forest (CEGL002620, G4G5)
- *Tsuga mertensiana* - *Abies amabilis* / *Vaccinium membranaceum* - *Valeriana sitchensis* Forest (CEGL002619, G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Vaccinium membranaceum* - *Xerophyllum tenax* Forest (CEGL000515, G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Vaccinium membranaceum* Forest (CEGL002618, G4?)
- *Tsuga mertensiana* - *Abies amabilis* / *Vaccinium ovalifolium* - *Clintonia uniflora* Forest (CEGL000512, G4G5)
- *Tsuga mertensiana* - *Abies amabilis* / *Vaccinium ovalifolium* - *Erythronium montanum* Forest (CEGL000513, G3G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Vaccinium ovalifolium* - *Maianthemum dilatatum* Forest (CEGL002617, G3G4)
- *Tsuga mertensiana* - *Abies amabilis* / *Xerophyllum tenax* Forest (CEGL000500, G3)
- *Tsuga mertensiana* / *Chimaphila umbellata* Forest (CEGL000502, G4)
- *Tsuga mertensiana* / *Luzula glabrata* var. *hitchcockii* Forest (CEGL000505, G5)
- *Tsuga mertensiana* / *Quercus sadleriana* / *Orthilia secunda* Forest (CEGL000123, G3G4)
- *Tsuga mertensiana* / Sparse Understory Forest (CEGL008685, G3G4)
- *Tsuga mertensiana* / *Vaccinium scoparium* Forest (CEGL000126, G4)

Alliances:

- *Tsuga mertensiana* - *Abies amabilis* Forest Alliance (A.158)
- *Tsuga mertensiana* - *Abies amabilis* Giant Forest Alliance (A.113)
- *Tsuga mertensiana* - *Abies amabilis* Saturated Forest Alliance (A.207)
- *Tsuga mertensiana* - *Abies amabilis* Woodland Alliance (A.555)
- *Tsuga mertensiana* Forest Alliance (A.146)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)

DISTRIBUTION

Range: This system occurs from coastal British Columbia to the southern Cascades of Oregon.

Divisions: 204:C; 306:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 3:?, 7:C

USFS Ecomap Regions: 242A:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:C?, M261G:C?

TNC Ecoregions: 1:C, 3:C, 69:C, 81:C

SOURCES

References: Banner et al. 1993, Comer et al. 2003, Eyre 1980, Franklin 1988, Kertis pers. comm., Klinka and Chourmouzis 2002, Kopper pers. comm., Steen and Coupe 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722836#references

Description Author: G. Kittel, mod. C. Chappell and M.S. Reid
Version: 08 Dec 2008
Concept Author: G. Kittel and C. Chappell

Stakeholders: Canada, West
ClassifResp: West

1008 NORTH PACIFIC OAK WOODLAND (CES204.852)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; *Quercus garryana*

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2008; ESLF 4101; ESP 1008

CONCEPT

Summary: This ecological system is limited to the southern portions of the North Pacific region. It occurs primarily in the Puget Trough and Willamette Valley but trickles down into the Klamath ecoregion and into California. This system is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires. In the Willamette Valley, soils are mesic yet well-drained, and the type is clearly large patch in nature. In the Puget Lowland and Georgia Basin, this system is primarily found on dry sites, typically either shallow bedrock soils or deep gravelly glacial outwash soils. It occurs on various soils in the interior valleys of the Klamath Mountains, and on shallow soils of "bald hill" toward the coast. Even where more environmentally limited, the system is strongly associated with a pre-European settlement, low-severity fire regime. Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. The vegetation ranges from savanna and woodland to forest dominated by deciduous broadleaf trees, mostly *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* is important in some stands. In the south, common associates also include *Quercus kelloggii* and *Arbutus menziesii*. This system merges into Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923) on sites that support more conifer cover, and into Mediterranean California Mixed Oak Woodland (CES206.909) in the southern portion of its distribution. This system is borderline between small patch and large patch in its dynamics.

Classification Comments: East of the Cascade Crest is a different system dominated by Oregon white oak (i.e., East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085)). While *Quercus garryana* does occur in California, it is uncertain that this system (a Garry oak-dominated woodland) does not occur that far south. Garry oak in California may be mostly shrubby form around the edges of balds or else mixed into woodlands dominated by other species; this needs further review.

Similar Ecological Systems:

- Mediterranean California Mixed Oak Woodland (CES206.909)

Related Concepts:

- Oregon White Oak: 233 (Eyre 1980) Equivalent

DESCRIPTION

Dynamics: Landfire VDDT models: #R OWOA Oregon White Oak applies to southern occurrences.

MEMBERSHIP

Associations:

- *Pseudotsuga menziesii* - *Quercus garryana* / *Melica subulata* Forest (CEGL003355, G1)
- *Quercus garryana* / *Carex inops* - *Camassia quamash* Woodland (CEGL000548, G1)
- *Quercus garryana* / *Ceanothus cuneatus* / *Festuca idahoensis* Woodland (CEGL000930, G2)
- *Quercus garryana* / *Symphoricarpos albus* / *Carex inops* Woodland (CEGL003358, G2)
- *Quercus garryana* / *Symphoricarpos albus* / *Polystichum munitum* Forest (CEGL003353, G2)
- *Quercus garryana* / *Toxicodendron diversilobum* / *Elymus glaucus* Woodland (CEGL000932, G2)
- *Quercus garryana* / *Viburnum ellipticum* - *Toxicodendron diversilobum* Woodland (CEGL003354, G1)
- *Quercus garryana* Forest [Placeholder] (CEGL000547, G2Q)

Alliances:

- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Quercus garryana* Forest Alliance (A.262)
- *Quercus garryana* Woodland Alliance (A.630)

SPATIAL CHARACTERISTICS

Spatial Summary: This system is borderline between small patch and large patch in its dynamics.

Adjacent Ecological Systems:

- Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923)
- Mediterranean California Mixed Oak Woodland (CES206.909)

Adjacent Ecological System Comments: This system merges into Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923) on sites that support more conifer cover, and into Mediterranean California Mixed Oak

Woodland (CES206.909) in the southern portion of its distribution.

DISTRIBUTION

Range: This system occurs primarily in the Puget Trough and Willamette Valley and extends southward at low elevations in the Klamath Mountains on both sides of the Oregon/California stateline.

Divisions: 204:C

Nations: CA, US

Subnations: BC, CA, OR, WA

Map Zones: 1:C, 2:C, 3:C, 6:?, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 263A:??, M242A:CC, M242B:CC, M242C:CP, M242D:CP, M261A:CC, M261D:CC

TNC Ecoregions: 1:C, 2:C, 5:C, 14:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Franklin and Dyrness 1973

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722822#references

Description Author: C. Chappell, mod. G. Kittel and M.S. Reid

Version: 23 Jan 2006

Concept Author: C. Chappell

Stakeholders: Canada, West
ClassifResp: West

1173 NORTH PACIFIC WOODED VOLCANIC FLOWAGE (CES204.883)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades; Very Shallow Soil; Lava Flow

Non-Diagnostic Classifiers: Escarpment; Long (>500 yrs) Persistence; Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Temperate [Temperate Continental]; Butte

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2173; ESLF 4329; ESP 1173

CONCEPT

Summary: This ecological system is found from foothill to subalpine elevations and includes woodland to sparsely vegetated landscapes (generally >10% plant cover) on recent lava flows, excessively well-drained lahars, debris avalanches and pyroclastic flows. The characteristic feature of this system is the substrate limiting characteristic that creates an environment for a more open vegetation than the surrounding closed matrix forest. Examples are recent lava flows (3500-8200 years ago) on the north side of Mount Adams (andecite) and the big lava beds (basalt) south of Indian Heaven west of Mount Adams, Washington, and lahars (200-2000 years old) at Old Maid Flat west of Mount Hood, Oregon. These areas support open to sparse tree cover; characteristic species include *Pseudotsuga menziesii*, *Pinus contorta*, *Pinus monticola*, and *Abies lasiocarpa*. Tree cover can range from scattered (5%) up to 70% or occasionally even more. There may be scattered dense shrubs present, such as *Acer circinatum*, *Vaccinium membranaceum*, *Arctostaphylos uva-ursi* (very characteristic), *Mahonia nervosa*, *Amelanchier alnifolia*, and *Xerophyllum tenax*. Soil development is limited, and mosses and lichens often cover the soil or rock surface.

Classification Comments: This system will include areas that fit the sparsely vegetated system type definition but are included here and delineated by the boundary of lava or other volcanic flowage. Elevation range (>3350 m) for this system is great, but the specialized substrate is the overriding factor defining it. These are mid-stages of primary succession that differ in degree of forest cover, soil development and productivity. Early primary succession on these substrates are included in North Pacific Active Volcanic Rock and Cinder Land (CES204.092). Later primary succession stages (increased soil development) are included in appropriate matrix forest systems.

Related Concepts:

- Lodgepole Pine: 218 (Eyre 1980) Intersecting

SPATIAL CHARACTERISTICS

Size: Big lava bed in Washington approx. 16,000 acres; Mount Adams north side approx. 8000 acres. Can also be quite small, e.g., lahar at Longmire on Mount Rainier less than 100 acres.

DISTRIBUTION

Range: This uncommon system is found in the east and west Cascades of Washington and Oregon, and may occur in small patches in northern California in the vicinity of Mount Lassen or Mount Shasta.

Divisions: 204:C

Nations: US

Subnations: CA?, OR, WA

Map Zones: 1:C, 2:P, 6:P, 7:C

USFS Ecomap Regions: 242A:CC, 342I:PP, M242B:CC, M242C:CC, M242D:CP, M261D:CP, M261G:CC

TNC Ecoregions: 3:P, 4:C, 81:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.767990#references

Description Author: R. Crawford

Version: 31 Aug 2005

Concept Author: R. Crawford

Stakeholders: West

ClassifResp: West

1313 NORTH-CENTRAL INTERIOR BEECH-MAPLE FOREST (CES202.693)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Glaciated; *Acer saccharum* - *Fagus grandifolia*

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2313; ESLF 4119; ESP 1313

CONCEPT

Summary: This system is found primarily along the southern Great Lakes ranging from central Indiana to southern Ontario. It is typically found on flat to rolling uplands to steep slopes with rich loam soils over glacial till. This system is characterized by a dense tree canopy that forms a thick layer of humus and leaf litter leading to a dense and rich herbaceous layer. *Acer saccharum* and *Fagus grandifolia* comprise up to 80% of the canopy. Other associates can include *Quercus rubra*, *Tilia americana*, *Carpinus caroliniana*, and *Ostrya virginiana*. The relative dominance of sugar maple compared to other tree species varies across the range of this system based on regional climate and microclimate. The herbaceous layer is very diverse and typically includes spring ephemerals. Some common species include *Arisaema triphyllum*, *Galium aparine*, *Osmorhiza claytonii*, *Polygonatum biflorum*, and *Trillium grandiflorum*. The primary natural dynamic influencing this system includes wind-driven gap dynamics. Conversion to agriculture has significantly decreased the range of this system, and very few large stands remain intact.

Classification Comments: North-Central Interior Wet Flatwoods (CES202.700) may co-occur in close proximity to this system on clay-plain landscapes. This is on richer sites than the corresponding Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593).

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)--occurs on poorer sites.
- Laurentian-Acadian Northern Hardwoods Forest (CES201.564)--can have inclusions of richer stands. Eastern rich forests CEGL005008 are placed in CES201.564, and range for that system includes Mapzones 41, 50, 51.
- North-Central Interior Maple-Basswood Forest (CES202.696)--less beech.
- South-Central Interior Mesophytic Forest (CES202.887)-- present system is in glaciated landscape; this one (CES202.887) is not.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Fagus grandifolia* - *Betula* spp. / *Maianthemum canadense* Forest (CEGL005004, G4G5)
- *Fagus grandifolia* - *Acer saccharum* Glaciated Midwest Forest (CEGL005013, G2G3)

Alliances:

- *Acer saccharum* - *Betula alleghaniensis* - (*Fagus grandifolia*) Forest Alliance (A.216)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North-Central Interior Wet Flatwoods (CES202.700)

Adjacent Ecological System Comments: North-Central Interior Wet Flatwoods (CES202.700) may co-occur in close proximity to this system on clay-plain landscapes.

DISTRIBUTION

Range: This system is located in the southern Great Lakes from central Indiana north into southern Ontario, and east to northwestern Pennsylvania and western New York.

Divisions: 202:C

Nations: CA, US

Subnations: IN, MI, NY, OH, ON, PA

Map Zones: 47:C, 49:C, 51:C, 52:C, 62:P, 63:C

USFS Ecomap Regions: 221F:CC, 222H:CC, 222Ia:CCC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222L:CC, 222M:CC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC, 223G:PP, 251D:CC

TNC Ecoregions: 36:C, 45:C, 47:P, 48:C

SOURCES

References: Barbour and Billings 1988, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722966#references

Description Author: S. Menard, mod. S.C. Gawler

Version: 20 Jul 2007

Stakeholders: Canada, East, Midwest, Southeast

1311 NORTH-CENTRAL INTERIOR DRY OAK FOREST AND WOODLAND (CES202.047)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Outwash plain; Forest and Woodland (Treed); Sand Soil Texture; Intermediate Disturbance Interval; F-Patch/Medium Intensity

Non-Diagnostic Classifiers: Outwash terrace; Acidic Soil; Ustic; Xeric

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2311; ESLF 4117; ESP 1311

CONCEPT

Summary: This system is found throughout the glaciated regions of the Midwest, typically in gently rolling to flat landscapes. It can occur on uplands within the prairie matrix or within the context of dry-mesic oak-hickory forests and oak savannas. These are common on rolling glacial moraines and outwash plains. Soils are typically well-drained to excessively drained Mollisols or Alfisols that range from sand to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. It is distinguished from other forested systems within the region by a dry edaphic condition that is transitional between dry prairies, oak barrens, or savannas and dry-mesic oak-hickory forests and woodlands. Forest cover can range from dense to moderately open canopy. Fire-resistant oak species, in particular *Quercus velutina*, *Quercus macrocarpa*, *Quercus coccinea*, and *Quercus ellipsoidalis*, dominate the overstory. *Carya glabra*, *Prunus serotina*, and *Sassafras albidum* are also common in portions of the range of this system. Depending on range of distribution and overstory canopy density, the understory may include species such as *Gaylussacia baccata* (in MI, WI, and MN), *Vaccinium angustifolium*, and *Rhus aromatica*, and/or a mixture of woodland and grassland species, including *Schizachyrium scoparium*, *Deschampsia flexuosa*, and *Carex pensylvanica*. Extreme drought, along with periodic ground and crown fire events, constitute the main natural processes for this type and likely maintained a more open canopy structure that supported oak regeneration. In fact, many current examples of this type have resulted from long-term fire suppression and conversion of oak barrens to these forests and woodlands. Fire suppression may also account for examples of this system with the more dry-mesic understorey. It likely has allowed for other associates such as *Quercus rubra* and *Fraxinus americana* to become more prevalent. Extensive conversion for agriculture in the surrounding landscape with more productive soils has fragmented and isolated examples of this system. It is found primarily within the "corn belt" of the United States, and remaining large areas of this system are likely under considerable pressure due to conversion to pastureland and urban development.

DESCRIPTION

Environment: This system can occur on uplands within the prairie matrix or within the context of dry-mesic oak-hickory forests and oak savannas. These are common on rolling glacial moraines and outwash plains. Soils are typically well-drained to excessively drained Mollisols or Alfisols that range from sand to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. It is distinguished from other forested systems within the region by a dry edaphic condition that is transitional between dry prairies, oak barrens, or savannas and dry-mesic oak-hickory forests and woodlands.

Vegetation: Forest cover can range from a dense to moderately open canopy. Fire-resistant oak species, in particular *Quercus velutina*, *Quercus macrocarpa*, *Quercus coccinea*, and *Quercus ellipsoidalis*, dominate the overstory. *Carya glabra*, *Prunus serotina*, and *Sassafras albidum* are also common in portions of the range of this system. Depending on range of distribution and overstory canopy density, the understorey may include species such as *Gaylussacia baccata* (in MI, WI, and MN), *Vaccinium angustifolium*, and *Rhus aromatica*, and/or a mixture of woodland and grassland species, including *Schizachyrium scoparium*, *Deschampsia flexuosa*, and *Carex pensylvanica*.

Dynamics: Extreme drought, along with periodic ground and crown fire events, constitute the main natural processes for this type and likely maintained a more open canopy structure that supported oak regeneration. In fact, many current examples of this type have resulted from long-term fire suppression and conversion of oak barrens to these forests and woodlands. Fire suppression may also account for examples of this system with the more dry-mesic understorey. It likely has allowed for other associates such as *Quercus rubra* and *Fraxinus americana* to become more prevalent. Extensive conversion for agriculture in the surrounding landscape with more productive soils has fragmented and isolated examples of this system. It is found primarily within the "corn belt" of the United States, and remaining large areas of this system are likely under considerable pressure due to conversion to pastureland and urban development.

MEMBERSHIP

Associations:

- *Quercus ellipsoidalis* - (*Quercus macrocarpa*) Forest (CEGL002077, G4?)
- *Quercus velutina* - (*Quercus ellipsoidalis*) - *Quercus alba* / *Deschampsia flexuosa* Woodland (CEGL005029, GNR)
- *Quercus velutina* - *Quercus alba* - *Carya (glabra, ovata)* Forest (CEGL002076, G4?)
- *Quercus velutina* - *Quercus alba* / *Vaccinium (angustifolium, pallidum)* / *Carex pensylvanica* Forest (CEGL005030, G4?)
- *Quercus velutina* / *Carex pensylvanica* Forest (CEGL002078, G4?)

Alliances:

- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Quercus ellipsoidalis* Forest Alliance (A.255)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

DISTRIBUTION

Range: Found throughout the glaciated regions of the Midwest.

Divisions: 202:C; 205:P

Nations: US

Subnations: IL, IN, MI, MN, MO, ND, OH, WI

Map Zones: 38:P, 39:P, 40:P, 41:C, 42:C, 43:C, 44:P, 47:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 212H:CC, 222H:CC, 222Ja:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Ua:CCC, 223A:CP, 223G:CC, 251B:CC, 251C:CC, 251D:CC, 251E:CC, 251G:CC, 251H:CC, 255A:CC, 331F:CC, 331M:CC, 332B:PP

TNC Ecoregions: 35:P, 36:C, 37:?, 44:?, 45:C, 46:C, 47:?, 48:C

SOURCES

References: Abrams 1992, Archambault et al. 1989, Archambault et al. 1990, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1999, Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722662#references

Description Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen

Version: 18 Jul 2006

Concept Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1310 NORTH-CENTRAL INTERIOR DRY-MESIC OAK FOREST AND WOODLAND (CES202.046)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Udic; F-Patch/Low Intensity; Quercus - Carya

Non-Diagnostic Classifiers: Footslope; Glaciated uplands; Kame moraine; Lakeplain; Moraine; Temperate [Temperate Continental]; Mesotrophic Soil; Loam Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2310; ESLF 4116; ESP 1310

CONCEPT

Summary: This system is found throughout the glaciated regions of the Midwest, typically in gently rolling landscapes. It can occur on uplands within the prairie matrix and near floodplains, or on rolling glacial moraines and among kettle-kame topography. Soils are typically well-drained Mollisols or Alfisols that range from loamy to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. Well over 700,000 hectares likely occurred in southern Michigan alone (ca. 1800). It is distinguished from other forested systems within the region by a dry-mesic edaphic condition that is transitional between dry oak forests and woodlands and mesic hardwood forests, such as maple-basswood forests. Forest cover can range from a dense to moderately open canopy and there is commonly a dense shrub layer. Fire-resistant oak species, in particular *Quercus macrocarpa*, *Quercus rubra*, and/or *Quercus alba*, dominate the overstory. *Carya* spp., including *Carya ovata*, *Carya cordiformis*, and *Carya alba* (= *Carya tomentosa*), are diagnostic in portions of the range of this system. Depending on site location and overstory canopy density, the understory may include species such as *Corylus americana*, *Amelanchier* spp., *Maianthemum stellatum*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Trillium grandiflorum*, *Aralia nudicaulis*, and *Urtica dioica*. Occasionally, prairie grasses such as *Andropogon gerardii* and *Panicum virgatum* may be present. Fire constitutes the main natural process for this type and likely maintained a more open canopy structure to support oak regeneration. Historic fire frequency was likely highest in the prairie-forest border areas. Fire suppression may account for the more closed oak forest examples of this system with the more mesic understory. It likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains. Periodic drought, intensified by local conditions, such as slope, southern exposure, or sandy soil, also inhibit growth of mesophytic trees. Extensive conversion for agriculture has fragmented this system. Continued fire suppression has also resulted in succession to mesic hardwoods, such that in many locations, no oak species are regenerating. Remaining large areas of this system are likely under considerable pressure due to conversion to agriculture, pastureland, and urban development.

Similar Ecological Systems:

- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DESCRIPTION

Environment: This system can occur on uplands within the prairie matrix and near floodplains, or on rolling glacial moraines and among kettle-kame topography. Soils are typically well-drained Mollisols or Alfisols that range from loamy to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. Well over 700,000 hectares likely occurred in southern Michigan alone (ca. 1800). It is distinguished from other forested systems within the region by a dry-mesic edaphic condition that is transitional between dry oak forests and woodlands and mesic hardwood forests, such as maple-basswood forests.

Vegetation: Forest cover can range from a dense to moderately open canopy and there is commonly a dense shrub layer. Fire-resistant oak species, in particular *Quercus macrocarpa*, *Quercus rubra*, and/or *Quercus alba*, dominate the overstory. *Carya* spp., including *Carya ovata*, *Carya cordiformis*, and *Carya alba* (= *Carya tomentosa*), are diagnostic in portions of the range of this system. Depending on site location and overstory canopy density, the understory may include species such as *Corylus americana*, *Amelanchier* spp., *Maianthemum stellatum*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Trillium grandiflorum*, *Aralia nudicaulis*, and *Urtica dioica*. Occasionally, prairie grasses such as *Andropogon gerardii* and *Panicum virgatum* may be present. Fire suppression likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains.

Dynamics: Fire constitutes the main natural process for this type and likely maintained a more open canopy structure to support oak regeneration. Historic fire frequency was likely highest in the prairie-forest border areas. Fire suppression may account for the more closed oak forest examples of this system with the more mesic understory. It likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains. Periodic drought, intensified by local conditions like slope, southern exposure, or sandy soil, also inhibit growth of mesophytic trees. Extensive conversion for agriculture has fragmented these systems. Continued fire suppression has also resulted in succession to mesic hardwoods, such that in many locations, no oak species are regenerating. Remaining large areas of this system are likely under considerable pressure due to conversion to agriculture, pastureland, and urban development.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Quercus muehlenbergii* Forest (CEGL005010, GNR)
- *Quercus alba* - (*Carya ovata*) / *Carex pensylvanica* Glaciated Woodland (CEGL002134, G1Q)
- *Quercus alba* - (*Quercus velutina*) - *Carya ovata* / *Ostrya virginiana* Forest (CEGL002011, G3)
- *Quercus alba* - *Quercus macrocarpa* - *Quercus rubra* / *Corylus americana* Woodland (CEGL002142, G3G4)
- *Quercus alba* - *Quercus rubra* - *Acer saccharum* - *Carya cordiformis* / *Lindera benzoin* Forest (CEGL002058, G3?)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* Glaciated Forest (CEGL002068, G4?)
- *Quercus bicolor* - (*Quercus macrocarpa*, *Quercus stellata*) Woodland (CEGL005181, G1)
- *Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (CEGL002072, G4)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Panicum virgatum* Woodland (CEGL002052, G1G2)
- *Quercus macrocarpa* / *Corylus americana* - *Amelanchier alnifolia* Woodland (CEGL000556, G3)
- *Quercus rubra* - *Quercus alba* - (*Quercus velutina*, *Acer rubrum*) / *Viburnum acerifolium* Forest (CEGL002462, GNR)

Alliances:

- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Quercus macrocarpa* - *Quercus* (*alba*, *ellipsoidalis*, *velutina*) Woodland Alliance (A.619)
- *Quercus macrocarpa* Forest Alliance (A.245)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

DISTRIBUTION

Range: Found throughout the glaciated regions of the Midwest.

Divisions: 202:C; 205:C

Nations: US

Subnations: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI

Map Zones: 38:C, 39:C, 40:C, 41:?, 42:C, 43:C, 44:C, 47:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 221H:CC, 222H:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222L:CC, 222M:CC, 222Ua:CCC, 222Ue:CCC, 223G:CC, 251B:CC, 251C:CC, 251D:CC, 251H:CC

TNC Ecoregions: 35:C, 36:C, 44:?, 45:C, 46:C, 47:?, 48:C

SOURCES

References: Abrams 1992, Archambault et al. 1989, Archambault et al. 1990, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722663#references

Description Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen, mod. J. Drake

Version: 18 Jul 2006

Concept Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1314 NORTH-CENTRAL INTERIOR MAPLE-BASSWOOD FOREST (CES202.696)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Sideslope; Toeslope/Valley Bottom; Mesotrophic Soil; Deep Soil; Loam Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2314; ESLF 4120; ESP 1314

CONCEPT

Summary: This system is primarily found in the prairie forest border region of Minnesota, Wisconsin, and Iowa, but it can range north into northern Minnesota and Wisconsin and south to southern Illinois, central Missouri, and eastern Kansas. This forest system is distinguished by underlying mesic soils and the predominance of mesic deciduous species forming a moderately dense to dense canopy. Examples of this system occur on valley slopes and bottoms often with northern or eastern aspects. Soils are moderately well-drained, fertile, and medium to deep loams that have developed from glacial till or loess parent material. *Acer saccharum* typifies this system, with *Tilia americana*, *Quercus rubra*, and *Ostrya virginiana* as common associates. The dense canopy allows for a rich mixture of shrub and herbaceous species in the understory. Examples of common herbaceous species include *Anemone quinquefolia*, *Adiantum pedatum*, *Arisaema triphyllum*, and *Sanicula* spp. Dynamic processes such as wind and fire can impact this system over long return cycles; however, the most immediate threats to remaining examples of this system are grazing and conversion to agriculture.

Similar Ecological Systems:

- North-Central Interior Beech-Maple Forest (CES202.693)

DESCRIPTION

Environment: This system is found primarily on mesic soils that are moderately well-drained and fertile. These are mostly moderate to deep loams that have developed from glacial till or loess. This system occurs primarily on valley slopes and bottoms often with northern or eastern aspects.

Vegetation: Mesic deciduous trees form a moderately dense to dense canopy in examples of this system. *Acer saccharum* is the most common tree species forming the majority of the canopy and sapling layers. Common associates include *Tilia americana*, *Quercus rubra*, and *Ostrya virginiana*. The understory contains a rich mixture of shrub and herbaceous species such as *Anemone quinquefolia*, *Adiantum pedatum*, *Arisaema triphyllum*, and *Sanicula* spp.

Dynamics: Wind and fire can impact this system over long return intervals. Small gap development and replacement due to tree death is more frequent than more catastrophic fire or wind. The greatest impacts on this system are due to conversion to agriculture, logging and grazing.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Acer nigrum* - *Tilia americana* - *Quercus rubra* / *Ostrya virginiana* Forest (CEGL002061, G3G4)
- *Acer saccharum* - *Tilia americana* / *Ostrya virginiana* - *Carpinus caroliniana* Forest (CEGL002062, G3G4)
- *Quercus rubra* - (*Acer saccharum*, *Quercus alba*) Forest (CEGL005017, GNRQ)
- *Quercus rubra* - *Acer saccharum* Forest (CEGL002461, G4G5)

Alliances:

- *Acer saccharum* - *Tilia americana* - (*Quercus rubra*) Forest Alliance (A.220)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

DISTRIBUTION

Range: This system ranges from Minnesota and Wisconsin south to eastern Kansas and Nebraska and southeast to Illinois, Missouri, and possibly western Indiana.

Divisions: 202:C; 205:C

Nations: US

Subnations: IA, IL, IN, KS, MI, MN, MO, NE, WI

Map Zones: 39:C, 40:C, 41:C, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 212J:CP, 212Q:CC, 212S:CP, 212T:CP, 212X:CP, 212Y:C?, 212Z:CP, 222K:CC, 222L:CC, 222M:CC, 222R:CC, 251B:CC, 251G:CC, 251H:CC

TNC Ecoregions: 36:C, 37:?, 38:?, 45:C, 46:C, 47:C, 48:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722963#references

Description Author: S. Menard and K. Kindscher

Version: 07 Mar 2003

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1303 NORTHEASTERN INTERIOR DRY-MESIC OAK FOREST (CES202.592)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Acidic Soil; Quercus - Carya

Non-Diagnostic Classifiers: Sideslope; Toeslope/Valley Bottom; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Ustic; F-Patch/Medium Intensity; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2303; ESLF 4109; ESP 1303

CONCEPT

Summary: These oak-dominated forests are one of the matrix forest systems in the northeastern and north-central U.S. Occurring in dry-mesic settings, they are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. They cover large expanses at low to mid elevations, where the topography is flat to gently rolling, occasionally steep. Soils are mostly acidic and relatively infertile but not strongly xeric. Local areas of calcareous bedrock, or colluvial pockets, may support forests typical of richer soils. Oak species characteristic of dry-mesic conditions (e.g., *Quercus rubra*, *Quercus alba*, *Quercus velutina*, and *Quercus coccinea*) and *Carya* spp. are dominant in mature stands. *Quercus prinus* may be present but is generally less important than the other oak species. *Castanea dentata* was a prominent tree before chestnut blight eradicated it as a canopy constituent. *Acer rubrum*, *Betula lenta*, and *Betula alleghaniensis* may be common associates; *Acer saccharum* is occasional. With a long history of human habitation, many of the forests are early- to mid-successional, where *Pinus strobus*, *Pinus virginiana*, or *Liriodendron tulipifera* may be dominant or codominant. Within these forests, hillslope pockets with impeded drainage may support small isolated wetlands, including non-forested seeps or forested wetlands with *Acer rubrum*, *Quercus bicolor*, or *Nyssa sylvatica* characteristic.

Classification Comments: The oak-dominated forest matrix in this region spans a range of elevational and moisture regimes, reflected in different ecological systems. Those in drier settings, within the general range of this system, are placed in either Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359) or Central Appalachian Dry Oak-Pine Forest (CES202.591).

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--is somewhat more xeric and confined to the Southern Unglaciated Allegheny Plateau.
- Central Appalachian Dry Oak-Pine Forest (CES202.591)--is also more xeric and with *Quercus prinus* generally more important.
- Southern Appalachian Oak Forest (CES202.886)--is an equivalent system to the south (in the Southern Blue Ridge, EPA 66).

DESCRIPTION

Environment: These oak-dominated forests are one of the matrix forest systems in the northeastern and north-central U.S. Occurring in dry-mesic settings, they are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. They cover large expanses at low to mid elevations, where the topography is flat to gently rolling, occasionally steep. The typical landscape position is midslope to toeslope, transitioning to more xeric systems on the upper slopes and ridges. Soils are acidic and relatively infertile but not strongly xeric.

Vegetation: Mature stands are dominated by oak species characteristic of dry-mesic conditions (e.g., *Quercus rubra*, *Quercus alba*, *Quercus velutina*, and *Quercus coccinea*), along with various *Carya* spp. *Quercus prinus* may be present but is generally less important than the other oak species. *Castanea dentata* was a prominent tree before chestnut blight eradicated it as a canopy constituent. *Acer rubrum* and *Betula lenta* are frequently common associates. Local areas of calcareous bedrock may support forests typical of richer soils (e.g., with *Acer saccharum* and/or *Quercus muehlenbergii*).

MEMBERSHIP

Associations:

- *Carya (glabra, ovata) - Fraxinus americana - Quercus* spp. Forest (CEGL006236, GNR)
- *Fagus grandifolia - Betula lenta - Quercus (alba, rubra) / Carpinus caroliniana* Forest (CEGL006921, GNR)
- *Liriodendron tulipifera - Pinus strobus - Tsuga canadensis - Quercus (rubra, alba) / Polystichum acrostichoides* Forest (CEGL006304, G4?)
- *Pinus strobus - Quercus (rubra, velutina) - Fagus grandifolia* Forest (CEGL006293, G5)
- *Quercus (alba, rubra, velutina) / Cornus florida / Viburnum acerifolium* Forest (CEGL006336, G4G5)
- *Quercus (rubra, velutina, alba) - Betula lenta - (Pinus strobus)* Forest (CEGL006454, G4G5)
- *Quercus alba - Quercus rubra - Carya (alba, ovata) / Cornus florida* Acidic Forest (CEGL002067, G3)
- *Quercus alba - Quercus rubra - Carya alba / Cornus florida / Vaccinium stamineum / Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
- *Quercus alba - Quercus rubra - Carya ovata* Glaciated Forest (CEGL002068, G4?)
- *Quercus alba - Quercus rubra - Quercus prinus - Acer saccharum / Liriodendron benzoin* Forest (CEGL002059, GNR)
- *Quercus bicolor / Vaccinium corymbosum / Carex stipata* Forest (CEGL006241, GNR)

- *Quercus muehlenbergii* - *Quercus (alba, rubra)* - *Carya cordiformis* / *Viburnum prunifolium* Forest (CEGL004793, G3G4)
- *Quercus prinus* - *Quercus rubra* - *Carya ovalis* / *Solidago (ulmifolia, arguta)* - *Galium latifolium* Forest (CEGL008516, G3G4)
- *Quercus prinus* - *Quercus rubra* / *Hamamelis virginiana* Forest (CEGL006057, G5)
- *Quercus prinus* - *Quercus velutina* / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL008522, G4?)
- *Quercus rubra* - *Acer saccharum* / *Ostrya virginiana* / *Cardamine concatenata* Forest (CEGL008517, G4)
- *Quercus rubra* - *Carya (glabra, ovata)* / *Ostrya virginiana* / *Carex lucorum* Forest (CEGL006301, G4?)
- *Quercus rubra* - *Quercus alba* - *Fraxinus americana* - *Carya (ovata, ovalis)* / *Actaea racemosa* Forest (CEGL008518, G3)
- *Quercus rubra* - *Quercus prinus* - *Carya ovalis* / (*Cercis canadensis*) / *Solidago caesia* Forest (CEGL008514, G3G4)

Alliances:

- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus (alba, rubra)* Forest Alliance (A.258)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Pinus strobus* - *Quercus (alba, rubra, velutina)* Forest Alliance (A.401)
- *Quercus alba* - (*Quercus rubra, Carya spp.*) Forest Alliance (A.239)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus prinus* - *Quercus rubra* Forest Alliance (A.250)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

SPATIAL CHARACTERISTICS

Spatial Summary: These were historically among the most important matrix forests of the Northeast. They cover extensive areas where conditions are not extreme. Upslope they may grade into more xeric oak ridge systems or rocky oak-pine forests/woodlands. Mesic cove forest systems may be embedded within this matrix in protected draws. Small pocket wetlands, not discriminated as separate systems, may also occur within these forests.

DISTRIBUTION

Range: This system is found from southern New York west through Ohio and Pennsylvania and south to Virginia. It does not extend to the southernmost part of Virginia, except in the Ridge and Valley.

Divisions: 202:C

Nations: US

Subnations: MD, NJ, NY, OH, PA, VA, WV

Map Zones: 57:C, 60:C, 61:C, 62:C, 63:C, 64:C

USFS Ecomap Regions: 211E:CC, 211F:CC, 211G:CC, 221A:CC, 221B:CC, 221D:CC, 221F:CC, M221A:CC, M221B:CC, M221Da:CCC

TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003, Vanderhorst and Streets 2006

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723014#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

1354 NORTHEASTERN INTERIOR PINE BARRENS (CES202.590)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Sandplains/Glacial Outwash or Flats; Glaciated; Oligotrophic Soil; Acidic Soil; Sand Soil Texture; F-Landscape/Medium Intensity; *Pinus rigida*

Non-Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Ustic

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2354; ESLF 4257; ESP 1354

CONCEPT

Summary: These pine barrens occur on glacial sandplains of the inland regions of the northeastern U.S., with a disjunction to the distinctive till plain shrublands in the Poconos of eastern Pennsylvania. Substrates include outwash plains, stabilized sand dunes, and glacial till. The soils are consequently coarse-textured, acidic, mostly well-drained to xeric, and low in nutrients. *Pinus rigida* is the usual dominant, and cover may range from closed-canopy forest to (more typically) open woodlands. *Quercus rubra*, *Pinus strobus*, and *Betula populifolia* are common associates. A tall-shrub layer of *Quercus ilicifolia* and/or *Quercus prinoides* is commonly present, although portions of some barrens (or occasionally the entire barrens) lack the scrub oak component. A well-developed low-shrub layer is typical, with lowbush *Vaccinium* spp., *Gaylussacia baccata*, and *Comptonia peregrina* characteristic, with *Rhododendron canadense* characteristic on slightly more mesic microsites. The system is often a physiognomic patchwork, ranging from nearly closed-canopy forest to open pine woodlands, to scrub oak shrublands, to herbaceous/dwarf-shrub frost pockets. Grassy areas dominated by *Schizachyrium scoparium* with *Lupinus perennis*, *Lespedeza capitata*, and other forbs provide habitat for several rare invertebrates. Small changes in elevation can create pockets with saturated soil, where shrubs such as *Corylus americana*, *Cephalanthus occidentalis*, *Vaccinium corymbosum*, and *Alnus* spp. form dense cover. These barrens always have a history of recurrent fires, and fire is required to maintain them.

Similar Ecological Systems:

- Laurentian Pine-Oak Barrens (CES201.718)--is centered around the Great Lakes.
- Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

MEMBERSHIP

Associations:

- *Pinus rigida* - *Quercus* (*velutina*, *pinus*) Forest (CEGL006290, GNR)
- *Pinus rigida* - *Quercus ilicifolia* - *Rhododendron canadense* Woodland (CEGL006157, G1)
- *Pinus rigida* / *Quercus ilicifolia* / *Lespedeza capitata* Woodland (CEGL006025, G2)
- *Pinus rigida* / *Quercus ilicifolia* / *Piptatherum pungens* Woodland (CEGL006203, G2)
- *Pinus rigida* / *Vaccinium* spp. - *Gaylussacia baccata* Woodland (CEGL005046, G3G5)
- *Pinus strobus* - *Pinus resinosa* - *Pinus rigida* Forest (CEGL006259, G4G5)
- *Quercus ilicifolia* Shrubland [Placeholder] (CEGL003883, GNR)
- *Vaccinium angustifolium* / *Schizachyrium scoparium* - *Carex lucorum* Shrub Herbaceous Vegetation (CEGL006393, GNR)

Alliances:

- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus strobus* Forest Alliance (A.128)
- *Quercus ilicifolia* Shrubland Alliance (A.906)
- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Schizachyrium littorale* Shrub Herbaceous Alliance (A.1533)

SPATIAL CHARACTERISTICS

Size: As an order of magnitude, generally a few hundred to a 1000-2000 acres.

Adjacent Ecological System Comments: Wetland pockets are common, and vary from small to large. Outwash Plain Pondshores and Basin Peatlands are characteristic wetland systems that may be embedded in pine barrens.

DISTRIBUTION

Range: This system is restricted to south-central New England; Colchester, Vermont; eastern New York; and the Pennsylvania Poconos.

Divisions: 202:C

Nations: US

Subnations: CT, MA, ME, NH, NY, PA, RI, VT

Map Zones: 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 211Fd:CCC, 221Af:CCC, 221Ai:CCC, 221Al:CCC, 221Bc:CCC

TNC Ecoregions: 60:C, 61:C, 63:C, 64:C

SOURCES

References: Comer et al. 2003, Fike 1999, Olsvig 1980, Schweitzer and Rawinski 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723016#references

Description Author: S.C. Gawler

Version: 22 Sep 2008

Concept Author: Schweitzer and Rawinski (1988)

Stakeholders: East

ClassifResp: East

1324 NORTHERN ATLANTIC COASTAL PLAIN HARDWOOD FOREST (CES203.475)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2324; ESLF 4130; ESP 1324

CONCEPT

Summary: This ecological system is comprised of dry hardwood forests largely dominated by oaks, ranging from sandy glacial and outwash deposits of Cape Cod, Massachusetts, and Long Island, New York, south to the Coastal Plain portions of Maryland and Virginia south to about the James River. *Quercus alba*, *Quercus prinus*, *Quercus coccinea*, and *Quercus rubra* are typical, and *Ilex opaca* is sometimes present. In the northern half of the range, conditions can grade to dry-mesic, reflected in the local abundance of *Fagus grandifolia*. These forests occur on acidic, sandy to gravelly soils with a thick duff layer, often with an ericaceous shrub layer. From New Jersey south to Virginia, this system also includes oak-beech/heath forests on steep slopes.

Classification Comments: This system grades into other hardwood types of the northeastern U.S. as one moves inland and northward. North of Cape Cod, similar forests are treated as part of Central Appalachian Dry Oak-Pine Forest (CES202.591). In Delaware and New York these coastal forests are apparently distinct (fauna, flora and substrate are distinct) from more inland forests. The southern part of this type's range overlaps with Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242); where they overlap, they are separated based on moisture regime, with the drier forests (often with an ericaceous shrub layer) going to this type.

Similar Ecological Systems:

- Central Appalachian Dry Oak-Pine Forest (CES202.591)--similar forests found north of Cape Cod.
- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Quercus* (*alba*, *rubra*) - *Liriodendron tulipifera* / (*Ilex opaca* var. *opaca*) / *Polystichum acrostichoides* Forest (CEGL006075, G5)
- *Fagus grandifolia* - *Quercus* (*alba*, *velutina*, *prinus*) / *Kalmia latifolia* Forest (CEGL006919, G4)
- *Fagus grandifolia* - *Quercus alba* - *Quercus rubra* Forest (CEGL006377, GNR)
- *Pinus echinata* / *Quercus* (*falcata*, *nigra*) / *Vaccinium pallidum* Forest (CEGL006851, G3)
- *Pinus strobus* - *Quercus alba* / *Ilex glabra* Forest (CEGL006382, GNR)
- *Pinus virginiana* - *Quercus falcata* - *Carya pallida* Forest (CEGL006354, GNR)
- *Quercus* (*alba*, *velutina*, *stellata*, *falcata*) / *Carya pallida* - *Quercus prinoides* / *Carex pensylvanica* Woodland (CEGL006954, GNR)
- *Quercus alba* - *Quercus* (*coccinea*, *velutina*, *prinus*) / *Gaylussacia baccata* Forest (CEGL008521, G5)
- *Quercus alba* - *Quercus falcata* - (*Carya pallida*) / *Gaylussacia frondosa* Forest (CEGL006269, G4G5)
- *Quercus alba* - *Quercus rubra* - *Carya alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
- *Quercus coccinea* - *Quercus velutina* / *Sassafras albidum* / *Vaccinium pallidum* Forest (CEGL006375, GNR)
- *Quercus prinus* / *Deschampsia flexuosa* - *Solidago bicolor* Forest (CEGL006490, GNR)
- *Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Forest (CEGL006506, GNR)
- *Quercus rubra* - *Betula alleghaniensis* / *Osmunda cinnamomea* Forest (CEGL006000, GNR)
- *Quercus velutina* - *Quercus coccinea* - *Quercus prinus* / *Kalmia latifolia* Forest (CEGL006374, GNR)
- *Quercus velutina* / *Ilex opaca* Forest (CEGL006378, GNR)

Alliances:

- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Pinus echinata* Forest Alliance (A.119)
- *Pinus strobus* - *Quercus* (*alba*, *rubra*, *velutina*) Forest Alliance (A.401)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus prinus* - *Quercus* (*alba*, *falcata*, *rubra*, *velutina*) Forest Alliance (A.249)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

DISTRIBUTION

Range: This system ranges from sandy glacial and outwash deposits of Massachusetts and Long Island, New York, south to the Coastal Plain portions of Maryland and Virginia, south to about the James River, with historic occurrences (and possibly some extant remnants) in eastern Pennsylvania.

Divisions: 202:C; 203:C

Nations: US

Subnations: CT, DC, DE, MA, MD, NJ, NY, PA, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 221A:CC, 221D:CC

TNC Ecoregions: 52:P, 58:C, 61:C, 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723111#references

Description Author: R. Evans, mod. S.C. Gawler and J. Teague

Version: 05 Feb 2009

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

1379 NORTHERN ATLANTIC COASTAL PLAIN MARITIME FOREST (CES203.302)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2379; ESLF 4322; ESP 1379

CONCEPT

Summary: This system encompasses a range of woody vegetation present on barrier islands and near-coastal strands, from Virginia Beach, the northern range limit of *Quercus virginiana*, northward to the extent of the Atlantic Coastal Plain. It includes forests and shrublands whose structure and composition are influenced by proximity to marine environments, including both upland and wetlands. Vegetation includes narrow bands of forests with often stunted trees with contorted branches and wilted leaves and dense vine layers (Edinger et al. 2002). A range of trees may be present depending upon actual location and degree of protection from most extreme maritime influences.

Classification Comments: In New York this concept includes Maritime Holly Forest, Maritime Post Oak Forest, Maritime Beech Forest, Maritime Red Cedar Forest (Edinger et al. 2002).

Similar Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)
- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)

DESCRIPTION

Environment: These areas occur in general proximity to marine environments and are subject to salt spray, high winds, dune deposition, sand shifting and blasting, and occasional overwash during extreme disturbance events.

Vegetation: Vegetation includes narrow bands of forest with often stunted trees with contorted branches and wilted leaves and dense vine layers (Edinger et al. 2002). A range of trees may be present depending upon actual location and degree of protection from most extreme maritime influences. Species range from deciduous hardwoods to pitch pine and Virginia pine. A rare pitch pine variant is found in Delaware (Cape Henlopen) and New York.

MEMBERSHIP

Associations:

- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156, GNR)
- *Amelanchier canadensis* - *Viburnum* spp. - *Morella pensylvanica* Scrub Forest (CEGL006379, GNR)
- *Fagus grandifolia* / *Smilax rotundifolia* Forest (CEGL006043, G1)
- *Ilex opaca* / *Morella pensylvanica* Forest (CEGL006376, G1)
- *Juniperus virginiana* var. *virginiana* / *Morella pensylvanica* Woodland (CEGL006212, G2)
- *Morella pensylvanica* - *Prunus maritima* Shrubland (CEGL006295, G4)
- *Pinus rigida* / *Hudsonia tomentosa* Woodland (CEGL006117, G2G3)
- *Pinus rigida* / *Quercus ilicifolia* / *Morella pensylvanica* Woodland (CEGL006315, G3)
- *Pinus taeda* - *Quercus (falcata, nigra)* / *Morella cerifera* / *Vitis rotundifolia* Forest (CEGL006040, G2)
- *Pinus taeda* / *Hudsonia tomentosa* Woodland (CEGL006052, G1G2)
- *Pinus taeda* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL006137, G3)
- *Pinus taeda* / *Morella cerifera* / *Spartina patens* Tidal Woodland (CEGL006849, GNR)
- *Prunus serotina* - *Sassafras albidum* - *Amelanchier canadensis* - *Quercus velutina* / *Smilax rotundifolia* Forest (CEGL006145, G2G3)
- *Prunus serotina* / *Morella cerifera* / *Smilax rotundifolia* Scrub Forest (CEGL006319, G1G2)
- *Quercus stellata* - *Quercus velutina* / *Morella pensylvanica* / *Deschampsia flexuosa* Forest (CEGL006373, GNR)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Ilex opaca* Forest Alliance (A.3002)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Morella pensylvanica* - (*Prunus maritima*) Shrubland Alliance (A.902)
- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus taeda* - *Quercus nigra* Forest Alliance (A.406)
- *Pinus taeda* Saturated Forest Alliance (A.3009)
- *Pinus taeda* Woodland Alliance (A.526)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)

- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)

DISTRIBUTION

Range: This system ranges from Virginia Beach northward to the extent of the Atlantic Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: DE, MA, MD, NJ, NY, VA

Map Zones: 60:C, 65:C

USFS Ecomap Regions: 221Ab:CCC, 221Ad:CCC, 221An:CCC

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Edinger et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723189#references

Description Author: R. Evans, G. Fleming, P. Coulling, L. Sneddon

Version: 22 Nov 2002

Concept Author: R. Evans, G. Fleming, P. Coulling, L. Sneddon

Stakeholders: East, Southeast

ClassifResp: East

1355 NORTHERN ATLANTIC COASTAL PLAIN PITCH PINE BARRENS (CES203.269)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Xeric; F-Patch/High Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2355; ESLF 4258; ESP 1355

CONCEPT

Summary: This system is comprised of a group of dry pitch pine woodlands and forests of deep sandy soils ranging from Cape Cod (Massachusetts) south through Long Island (New York) and the New Jersey Coastal Plain, with occasional occurrences north to southernmost Maine and south to the Anacostia watershed (Maryland). The vegetation is characterized by a tree canopy of *Pinus rigida* with a tall-shrub layer dominated by *Quercus ilicifolia* and a low-shrub layer characterized by *Vaccinium pallidum* or *Vaccinium angustifolium*. The system is heavily influenced by fire, the composition and structure of its components varying with fire frequency. In general, tree oaks are more prevalent in those stands having a longer fire-return interval, fire frequencies of 8-10 years foster the growth of "pine plains," i.e., dwarf pine stands 1 meter in height. Pine barrens with a history of more-or-less biennial burns for *Vaccinium angustifolium* production may have very few trees and be characterized as sandplain grasslands. Dwarf-shrubs such as *Arctostaphylos uva-ursi*, *Vaccinium angustifolium*, and *Hudsonia ericoides* typify the field layer of pine plains and sandplain grasslands. *Schizachyrium scoparium* and (in close proximity to the coast) *Schizachyrium littorale* are common grasses.

Scrub oak stands may occur without pine cover, particularly in low-lying areas that do not intersect the water table, where cold-air drainage inhibits pine growth. North of the glacial boundary, heathlands characterized by *Arctostaphylos uva-ursi*, *Corema conradii*, and *Morella pensylvanica* and grasslands characterized by *Schizachyrium littorale*, *Schizachyrium scoparium*, and *Danthonia spicata* occur as small (or occasionally large) patches. The Pine Barrens of New Jersey are very similar in structure and composition to those north of the glacial boundary but are characterized by additional species, such as *Quercus marilandica*, *Pyxidantha barbulata*, *Leiophyllum buxifolium*, and others. Where the water table is close to the surface, pitch pine lowland vegetation (described as a separate system) occurs.

Classification Comments: The uniqueness of the New Jersey Pine Barrens has long been recognized, and the system is well studied and summarized in a number of recent treatments (Forman 1979, Buckholz and Good 1982, Gibson et al. 1999).

Similar Ecological Systems:

- Northeastern Interior Pine Barrens (CES202.590)--occurs farther inland and lacks coastal elements.
- Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895)

DESCRIPTION

Environment: This system typically occurs on deep sand deposits. In New Jersey, it occurs on Cohansey sand, which is sometimes overlain with hilltop gravel deposits.

Vegetation: The uniqueness of the New Jersey Pine Barrens flora has long been recognized (Stone 1911, Harshberger 1916). More recent treatments by Forman (1979) and Buckholz and Good (1982) have compiled much of the available information. *Pinus rigida* is the dominant and characteristic species of this system. It may be found in well-developed tree form or as a short-statured, shrubby ecotype. *Pinus rigida* may occur as the sole dominant or occur with a variety of oak species, especially *Quercus marilandica* and *Quercus ilicifolia*. In some examples *Pinus echinata* may co-occur.

Dynamics: The pine cones of pine plains have a very high incidence of serotiny as compared to *Pinus rigida* elsewhere in this system.

MEMBERSHIP

Associations:

- *Gaylussacia baccata* - *Vaccinium angustifolium* - *Arctostaphylos uva-ursi* / *Schizachyrium littorale* Dwarf-shrubland (CEGL006066, G3)
- *Morella pensylvanica* / *Schizachyrium littorale* - *Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067, G2)
- *Pinus (rigida, echinata)* - *Quercus coccinea* / *Ilex opaca* Woodland (CEGL006115, GNR)
- *Pinus rigida* - (*Pinus echinata*) / *Quercus (marilandica, ilicifolia)* / *Vaccinium pallidum* Woodland (CEGL006383, G2?)
- *Pinus rigida* - *Quercus coccinea* - *Quercus falcata* / (*Quercus marilandica*) / *Gaylussacia frondosa* Woodland (CEGL006329, G2G3)
- *Pinus rigida* - *Quercus coccinea* / *Vaccinium pallidum* - (*Morella pensylvanica*) Woodland (CEGL006381, GNR)
- *Pinus rigida* - *Quercus ilicifolia* / *Arctostaphylos uva-ursi* Shrubland (CEGL006097, G1Q)
- *Pinus rigida* - *Quercus marilandica* / *Corema conradii* Shrubland (CEGL006148, G2)
- *Pinus rigida* / *Carex pensylvanica* Woodland (CEGL006385, GNR)
- *Pinus rigida* / *Quercus (marilandica, ilicifolia)* / *Pyxidantha barbulata* Woodland (CEGL006051, G2)
- *Pinus rigida* / *Quercus ilicifolia* - *Kalmia angustifolia* / *Pyxidantha barbulata* Woodland (CEGL006384, G2?)

- *Pinus rigida* / *Quercus ilicifolia* / *Morella pensylvanica* Woodland (CEGL006315, G3)
- *Quercus ilicifolia* - *Quercus prinoides* Shrubland (CEGL006111, GNR)
- *Quercus prinus* - *Quercus velutina* / *Gaylussacia frondosa* Forest (CEGL006334, GNR)
- *Vaccinium angustifolium* / *Schizachyrium scoparium* - *Carex lucorum* Shrub Herbaceous Vegetation (CEGL006393, GNR)

Alliances:

- *Pinus rigida* Shrubland Alliance (A.809)
- *Pinus rigida* Woodland Alliance (A.524)
- *Quercus ilicifolia* Shrubland Alliance (A.906)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Schizachyrium littorale* Shrub Herbaceous Alliance (A.1533)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Dwarf-shrubland Alliance (A.1113)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)
- Northern Atlantic Coastal Plain Pond (CES203.518)
- Northern Atlantic Coastal Plain Stream and River (CES203.070)

Adjacent Ecological System Comments: Coastal Plain ponds and Atlantic white-cedar swamps may be embedded in these pine barrens.

DISTRIBUTION

Range: This system is found in the Coastal Plain from Delaware Bay northward through the New Jersey Coastal Plain and Long Island (New York) to Cape Cod, Massachusetts, with peripheral occurrences in Pennsylvania (historic), New Hampshire (historic), and southern Maine (Kennebunk Plains and Wells Barren).

Divisions: 203:C

Nations: US

Subnations: DE, MA, MD, ME, NH, NJ, NY, PA, RI

Map Zones: 60:C, 65:C

USFS Ecomap Regions: 221Ab:CCC, 221Ac:CCP, 221Ak:CCC, 232A:CC, 232Hc:CCC

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Buckholz and Good 1982, Comer et al. 2003, Forman 1979, Gibson et al. 1999, Harshberger 1916, Stone 1911

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723217#references

Description Author: R. Evans, mod. S.C. Gawler

Version: 22 Sep 2008

Concept Author: L. Sneddon and K. Straskoch-Walz

Stakeholders: East, Southeast

ClassifResp: East

1044 NORTHERN CALIFORNIA MESIC SUBALPINE WOODLAND (CES206.911)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Temperate [Temperate Oceanic]; Udic

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Sideslope

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2044; ESLF 4231; ESP 1044

CONCEPT

Summary: This ecological system occurs on ridges and rocky slopes around timberline at 2600 m (7900 feet) elevation in the central Sierra Nevada and 2450 m (8000 feet) in the southern Cascades. These woodlands are found on concave or mesic slopes in areas with long-lasting snowpack and better soil development than other drier and more exposed subalpine woodlands. The tree canopy is characterized by *Tsuga mertensiana* and may include *Abies magnifica*, *Abies procera*, *Pinus albicaulis*, and *Pinus monticola*. Mesic-site shrubs will include *Cassiope mertensiana*, *Phyllodoce breweri*, *Phyllodoce empetriformis*, *Vaccinium membranaceum*, and others. *Juniperus communis* is found in most stands of the northern Sierra Nevada. *Penstemon davidsonii*, as well as patches of grasses, sedges, and forbs grade into adjacent meadows.

Similar Ecological Systems:

- Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland (CES206.912)

Related Concepts:

- California Mixed Subalpine: 256 (Eyre 1980) Intersecting
- Mountain Hemlock: 205 (Eyre 1980) Intersecting. Mountain hemlock stands are a component of subalpine parklands.
- Whitebark Pine: 208 (Eyre 1980) Intersecting. Whitebark pine stands are a component of this ecological system.

MEMBERSHIP

Associations:

- *Pinus albicaulis* - *Tsuga mertensiana* / Mixed Herbaceous Woodland (CEGL003132, G2G4)
- *Pinus albicaulis* / *Penstemon davidsonii* Woodland (CEGL003134, G3G4)
- *Tsuga mertensiana* - *Pinus contorta* var. *murrayana* - *Pinus albicaulis* Forest (CEGL008692, GNR)
- *Tsuga mertensiana* - *Pinus contorta* var. *murrayana* - *Pinus monticola* Forest (CEGL008691, G3?)
- *Tsuga mertensiana* - *Pinus contorta* var. *murrayana* / *Carex rossii* Forest (CEGL008690, G3?)
- *Tsuga mertensiana* - *Pinus contorta* var. *murrayana* / *Phyllodoce breweri* Forest (CEGL008689, G3?)
- *Tsuga mertensiana* - *Pinus contorta* var. *murrayana* Forest (CEGL008688, G3G4)
- *Tsuga mertensiana* - *Pinus monticola* Forest (CEGL008687, G3)
- *Tsuga mertensiana* / *Arabis platysperma* Forest (CEGL008686, GNR)
- *Tsuga mertensiana* / Sparse Understory Forest (CEGL008685, G3G4)

Alliances:

- *Pinus albicaulis* Woodland Alliance (A.531)
- *Tsuga mertensiana* Forest Alliance (A.146)

DISTRIBUTION

Range: This system occurs on ridges and rocky slopes around timberline at 2600 m (7900 feet) elevation in the central Sierra Nevada and 2450 m (8000 feet) in the southern Cascades.

Divisions: 204:C; 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 6:C, 7:C

USFS Ecomap Regions: 341D:CC, M242B:??, M261E:CC

TNC Ecoregions: 4:C, 5:P, 12:C, 81:P

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Potter 1994, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722770#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1045 NORTHERN ROCKY MOUNTAIN DRY-MESIC MONTANE MIXED CONIFER FOREST (CES306.805)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Montane]; Forest and Woodland (Treed); Ustic; Short Disturbance Interval; F-Patch/Low Intensity; Needle-Leaved Tree; *Abies grandis* - Mixed

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane [Lower Montane]; Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Mesotrophic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2045; ESLF 4232; ESP 1045

CONCEPT

Summary: This ecological system is composed of highly variable montane coniferous forests found in the interior Pacific Northwest, from southernmost interior British Columbia, eastern Washington, eastern Oregon, northern Idaho, western and north-central Montana, and south along the east slope of the Cascades in Washington and Oregon. In central Montana it occurs on mountain islands (the Snowy Mountains). This system is associated with a submesic climate regime with annual precipitation ranging from 50 to 100 cm, with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from 460 to 1920 m. Most occurrences of this system are dominated by a mix of *Pseudotsuga menziesii* and *Pinus ponderosa* (but there can be one without the other) and other typically seral species, including *Pinus contorta*, *Pinus monticola* (not in central Montana), and *Larix occidentalis* (not in central Montana). *Picea engelmannii* (or *Picea glauca* or their hybrid) becomes increasingly common towards the eastern edge of the range. The nature of this forest system is a matrix of large patches dominated or codominated by one or combinations of the above species; *Abies grandis* (a fire-sensitive, shade-tolerant species not occurring in central Montana) has increased on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by low-severity wildfire. Presettlement fire regimes may have been characterized by frequent, low-intensity ground fires that maintained relatively open stands of a mix of fire-resistant species. Under present conditions the fire regime is mixed severity and more variable, with stand-replacing fires more common, and the forests are more homogeneous. With vigorous fire suppression, longer fire-return intervals are now the rule, and multi-layered stands of *Pseudotsuga menziesii*, *Pinus ponderosa*, and/or *Abies grandis* provide fuel "ladders," making these forests more susceptible to high-intensity, stand-replacing fires. They are very productive forests which have been priorities for timber production. They rarely form either upper or lower timberline forests. Understories are dominated by graminoids, such as *Pseudoroegneria spicata*, *Calamagrostis rubescens*, *Carex geyeri*, and *Carex rossii*, that may be associated with a variety of shrubs, such as *Acer glabrum*, *Juniperus communis*, *Physocarpus malvaceus*, *Symphoricarpos albus*, *Spiraea betulifolia*, or *Vaccinium membranaceum* on mesic sites. *Abies concolor* and *Abies grandis* X *concolor* hybrids in central Idaho (the Salmon Mountains) are included here but have very restricted range in this area. *Abies concolor* and *Abies grandis* in the Blue Mountains of Oregon are probably hybrids of the two and mostly *Abies grandis*.

Classification Comments: Need to re-assess the concept of this system in relation to Northern Rocky Mountain Western Larch Savanna (CES306.837) and East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086). In PNV (PAGs) concept, this is mostly *Pseudotsuga menziesii*, moist *Pinus ponderosa* series, dry *Abies grandis* or warm, dry *Abies lasiocarpa* series in the Canadian Rockies, northern Middle Rockies, East Cascades and Okanagan ecoregions. Everett et al. (2000) indicate that in the eastern Cascades of Washington this system forms fire polygons due to abrupt north and south topography with presettlement fire-return intervals of 11-12 years typically covering less than 810 ha. Currently, fires have 40- to 45-year return intervals with thousands of hectares in size. Northern Rocky Mountain Western Larch Savanna (CES306.837) is a large-patch type that occurs typically within this matrix or the Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802) matrix. We need to define the percent cover of larch over 50% or over 75% relative cover of all trees for an occurrence to be placed in Northern Rocky Mountain Western Larch Savanna (CES306.837). This needs to be relative because these look(ed) like ponderosa savanna in places. East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086) has North Pacific floristic composition, and is mostly east Cascades ecoregion, peripheral in Okanagan ecoregion, and west Cascades. PAGs most of the *Abies grandis*, dry western red-cedar and western hemlock in the east Cascades. Environmentally, it is equivalent to Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802). Contrasting this system (CES306.805) with Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828) and Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830) is important in the Middle Rockies ecoregion and Oregon.

Similar Ecological Systems:

- East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)
- North Pacific Interior Dry-Mesic Mixed Conifer Forest [Provisional] (CES207.152)
- Northern Rocky Mountain Western Larch Savanna (CES306.837)
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)
- Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)
- Sierran-Intermontane Desert Western White Pine-White Fir Woodland (CES204.101)

Related Concepts:

- Fd - Feathermoss (IDFw/05) (Steen and Coupe 1997) Intersecting
- Fd - Juniper - Bluebunch wheatgrass (IDFw/01) (Steen and Coupe 1997) Intersecting
- FdPy - Bluebunch wheatgrass - Balsamroot (IDFw/04) (Steen and Coupe 1997) Intersecting
- FdPy - Bluebunch wheatgrass - Pinegrass (IDFw/02) (Steen and Coupe 1997) Intersecting
- FdPy - Western snowberry - Bluebunch wheatgrass (IDFw/03) (Steen and Coupe 1997) Intersecting
- Grand Fir: 213 (Eyre 1980) Intersecting. Grand fir stands are an important component of this ecological system.
- Interior Douglas-fir: 210 (Eyre 1980) Intersecting
- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting
- Western Larch: 212 (Eyre 1980) Intersecting. Western larch stands are an important component of this ecological system.
- Western White Pine: 215 (Eyre 1980) Intersecting
- White Fir: 211 (Eyre 1980) Intersecting. White fir is a minor component of this ecological system, primarily in southern Idaho and southern Oregon, where it hybridizes with grand fir.

DESCRIPTION

Dynamics: Landfire VDDT models: R#MCONdy.

MEMBERSHIP

Associations:

- *Abies concolor* - *Pseudotsuga menziesii* / *Carex rossii* Forest (CEGL000431, G2?)
- *Abies grandis* / *Acer glabrum* Forest (CEGL000267, G3)
- *Abies grandis* / *Arctostaphylos nevadensis* Woodland (CEGL000915, G2G3)
- *Abies grandis* / *Bromus vulgaris* Forest (CEGL002601, G3)
- *Abies grandis* / *Calamagrostis rubescens* Woodland (CEGL000916, G4?)
- *Abies grandis* / *Carex geyeri* Woodland (CEGL000917, G3)
- *Abies grandis* / *Linnaea borealis* Forest (CEGL000275, G3)
- *Abies grandis* / *Physocarpus malvaceus* Forest (CEGL000277, G3)
- *Abies grandis* / *Spiraea betulifolia* Forest (CEGL000281, G2)
- *Abies grandis* / *Symphoricarpos albus* Forest (CEGL000282, G3?)
- *Pinus monticola* / *Clintonia uniflora* Forest (CEGL000176, G1Q)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Arctostaphylos nevadensis* Woodland (CEGL000208, G2)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Arctostaphylos patula* Woodland (CEGL000209, G3)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Carex geyeri* Forest (CEGL000211, GNRQ)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Penstemon fruticosus* Woodland (CEGL000212, G2G3)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Physocarpus malvaceus* Forest (CEGL000213, GNRQ)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Pseudoroegneria spicata* ssp. *inermis* Woodland (CEGL000207, G3Q)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Purshia tridentata* Woodland (CEGL000214, G3)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* - *Purshia tridentata* Forest (CEGL000426, G3?)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Cascadian Forest (CEGL000425, G3G4)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest (CEGL000424, G4)
- *Pseudotsuga menziesii* / *Arnica cordifolia* Forest (CEGL000427, G4)
- *Pseudotsuga menziesii* / *Bromus ciliatus* Forest (CEGL000428, G4)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429, G5)
- *Pseudotsuga menziesii* / *Carex geyeri* Forest (CEGL000430, G4?)
- *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005854, G4G5)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850, G4G5)
- *Pseudotsuga menziesii* / *Heracleum maximum* Forest (CEGL005853, G2?)
- *Pseudotsuga menziesii* / *Linnaea borealis* Forest (CEGL000441, G4)
- *Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005851, G3?)
- *Pseudotsuga menziesii* / *Osmorhiza berteroi* Forest (CEGL000445, G4G5)
- *Pseudotsuga menziesii* / *Paxistima myrsinites* Forest (CEGL000446, G2G3)
- *Pseudotsuga menziesii* / *Physocarpus malvaceus* - *Linnaea borealis* Forest (CEGL000448, G4)
- *Pseudotsuga menziesii* / *Symphoricarpos occidentalis* Forest (CEGL000461, G3?)
- *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Forest (CEGL000462, G5)
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest (CEGL000465, G5)
- *Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005852, G4G5)
- *Pseudotsuga menziesii* / *Vaccinium* spp. Forest (CEGL000464, G4Q)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies grandis* Forest Alliance (A.153)
- *Abies grandis* Woodland Alliance (A.558)
- *Pinus monticola* Forest Alliance (A.133)
- *Pinus ponderosa* - *Pseudotsuga menziesii* Forest Alliance (A.134)

- *Pinus ponderosa* - *Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)

DISTRIBUTION

Range: This system is found in the interior Pacific Northwest, from southern interior British Columbia south and east into Oregon, Idaho (including north and central Idaho, down to the Boise Mountains), and western Montana, and south along the east slope of the Cascades in Washington and Oregon.

Divisions: 204:C; 304:P; 306:C

Nations: CA, US

Subnations: BC, ID, MT, OR, WA

Map Zones: 7:C, 8:C, 9:C, 10:C, 16:?, 17:?, 18:P, 19:C, 20:C

USFS Ecomap Regions: 331A:CC, 331D:C?, 341G:PP, 342C:CC, 342D:CC, 342H:CC, 342I:CC, M242B:CC, M242C:CC, M242D:CC, M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332D:CP, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 2:P, 4:C, 6:C, 7:C, 8:C, 26:C, 68:C

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1987, Crawford and Johnson 1985, Daubenmire and Daubenmire 1968, Lillybridge et al. 1995, Pfister et al. 1977, Steele and Geier-Hayes 1995, Steele et al. 1981, Topik 1989, Topik et al. 1988, Williams and Lillybridge 1983

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722868#references

Description Author: R. Crawford, C. Chappell and M.S. Reid

Version: 23 Jan 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1047 NORTHERN ROCKY MOUNTAIN MESIC MONTANE MIXED CONIFER FOREST (CES306.802)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Long (>500 yrs) Persistence; Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Needle-Leaved Tree; *Tsuga heterophylla* and *Thuja plicata*

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Glaciated; Mesotrophic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2047; ESLF 4234; ESP 1047

CONCEPT

Summary: This ecological system occurs in the northern Rockies of western Montana west into northeastern Washington and southern British Columbia. These are vegetation types dominated by *Tsuga heterophylla* and *Thuja plicata* in most cases, found in areas influenced by incursions of mild, wet, Pacific maritime air masses. Much of the annual precipitation occurs as rain, but where snow does occur, it can generally be melted by rain during warm winter storms. Occurrences generally are found on all slopes and aspects but grow best on sites with high soil moisture, such as toeslopes and bottomlands. At the periphery of its distribution, this system is confined to moist canyons and cooler, moister aspects. Generally these are moist, non-flooded or upland sites that are not saturated yearlong. Along with *Tsuga heterophylla* and *Thuja plicata*, *Pseudotsuga menziesii* commonly shares the canopy, and *Pinus monticola*, *Pinus contorta*, *Abies grandis*, *Taxus brevifolia*, and *Larix occidentalis* are major associates. Mesic *Abies grandis* associations are included in this system, and *Abies grandis* is often the dominant in these situations; *Tsuga heterophylla* and *Thuja plicata* can both be absent. *Cornus nuttallii* may be present in some situations. *Picea engelmannii*, *Abies lasiocarpa*, and *Pinus ponderosa* may be present but only on the coldest or warmest and driest sites. *Linnaea borealis*, *Paxistima myrsinites*, *Alnus incana*, *Acer glabrum*, *Spiraea betulifolia*, *Symphoricarpos hesperius* (= *Symphoricarpos mollis* ssp. *hesperius*), *Cornus canadensis*, *Rubus parviflorus*, *Menziesia ferruginea*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure; it is typically highly diverse in all but closed-canopy conditions. Important forbs and ferns include *Actaea rubra*, *Anemone piperi*, *Aralia nudicaulis*, *Asarum caudatum*, *Clintonia uniflora*, *Coptis occidentalis*, *Thalictrum occidentale*, *Tiarella trifoliata*, *Trientalis borealis*, *Trillium ovatum*, *Viola glabella*, *Gymnocarpium dryopteris*, *Polystichum munitum*, and *Adiantum pedatum*. Typically, stand-replacement, fire-return intervals are 150-500 years, with moderate-severity fire intervals of 50-100 years.

Similar Ecological Systems:

- North Pacific Interior Dry-Mesic Mixed Conifer Forest [Provisional] (CES207.152)

Related Concepts:

- Grand Fir: 213 (Eyre 1980) Intersecting. Grand fir stands are an important component of this ecological system.
- Western Hemlock: 224 (Eyre 1980) Intersecting. Moist western slopes of the northern Rocky Mountains, in northern ID, northwest MT, and northeast WA.
- Western Redcedar - Western Hemlock: 227 (Eyre 1980) Intersecting. NW MT, N ID
- Western Redcedar: 228 (Eyre 1980) Intersecting
- Western White Pine: 215 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Abies grandis* / *Asarum caudatum* Forest (CEGL000269, G4)
- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272, G5)
- *Abies grandis* / *Coptis occidentalis* Forest (CEGL000273, G2)
- *Abies grandis* / *Linnaea borealis* Forest (CEGL000275, G3)
- *Abies grandis* / *Taxus brevifolia* Forest (CEGL000283, G2)
- *Betula papyrifera* Forest [Provisional] (CEGL000520, G4Q)
- *Pinus monticola* / *Clintonia uniflora* Forest (CEGL000176, G1Q)
- *Thuja plicata* / *Adiantum pedatum* Forest (CEGL000470, G2?)
- *Thuja plicata* / *Aralia nudicaulis* Forest (CEGL000471, G2)
- *Thuja plicata* / *Asarum caudatum* Forest (CEGL000472, G5)
- *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005930, G4?)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474, G4)
- *Thuja plicata* / *Gymnocarpium dryopteris* Forest (CEGL000476, G3)
- *Thuja plicata* / *Taxus brevifolia* / *Asarum caudatum* Forest (CEGL000480, G2)
- *Thuja plicata* / *Vaccinium membranaceum* Forest (CEGL000487, G3G4)

- *Tsuga heterophylla* / *Aralia nudicaulis* Forest (CEGL000488, G3)
- *Tsuga heterophylla* / *Asarum caudatum* Forest (CEGL000490, G4)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493, G4)
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest (CEGL000494, G3G4)
- *Tsuga heterophylla* / *Menziesia ferruginea* Forest (CEGL000496, G2)
- *Tsuga heterophylla* / *Rubus pedatus* Forest (CEGL000113, G2)
- *Tsuga heterophylla* / *Xerophyllum tenax* Forest (CEGL000499, G2)

Alliances:

- *Abies grandis* Forest Alliance (A.153)
- *Betula papyrifera* Forest Alliance (A.267)
- *Pinus monticola* Forest Alliance (A.133)
- *Thuja plicata* Forest Alliance (A.166)
- *Tsuga heterophylla* Forest Alliance (A.145)

DISTRIBUTION

Range: This system occurs in the northern Rockies of western Montana west into northeastern Washington and southern British Columbia.

Divisions: 306:C

Nations: CA, US

Subnations: BC, ID, MT, OR, WA

Map Zones: 8:P, 9:C, 10:C, 19:C

USFS Ecomap Regions: 331A:CC, M331A:PP, M332A:CC, M332B:CP, M332E:C?, M332F:C?, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 7:C, 8:C, 68:C

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Meidinger and Pojar 1991, Pfister et al. 1977

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722871#references

Description Author: M.S. Reid

Version: 23 Jan 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1053 NORTHERN ROCKY MOUNTAIN PONDEROSA PINE WOODLAND AND SAVANNA (CES306.030)

CLASSIFIERS

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; F-Patch/Medium Intensity; Needle-Leaved Tree; Graminoid; *Pinus ponderosa* with grassy understory; *Pinus ponderosa* with shrubby understory

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Forest and Woodland (Treed); Temperate [Temperate Continental]; Circumneutral Soil; F-Landscape/Low Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2053; ESLF 4240; ESP 1053

CONCEPT

Summary: This inland Pacific Northwest ecological system occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. These woodlands and savannas occur at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on glacial till, glacio-fluvial sand and gravel, dune, basaltic rubble, colluvium, to deep loess or volcanic ash-derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. In the Oregon "pumice zone" this system occurs as matrix-forming, extensive woodlands on rolling pumice plateaus and other volcanic deposits. These woodlands in the eastern Cascades, Okanagan and northern Rockies regions receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the central Rockies. *Pinus ponderosa* (primarily var. *ponderosa*) is the predominant conifer; *Pseudotsuga menziesii* may be present in the tree canopy but is usually absent. In southern interior British Columbia, *Pseudotsuga menziesii* or *Pinus flexilis* may form woodlands or fire-maintained savannas with and without *Pinus ponderosa* var. *ponderosa* at the lower treeline transition into grassland or shrub-steppe. The understory can be shrubby, with *Artemisia tridentata*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Cercocarpus ledifolius*, *Physocarpus malvaceus*, *Purshia tridentata*, *Symphoricarpos oreophilus* or *Symphoricarpos albus*, *Prunus virginiana*, *Amelanchier alnifolia*, and *Rosa* spp. common species. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support grasses such as *Pseudoroegneria spicata*, *Hesperostipa* spp., *Achnatherum* spp., dry *Carex* species (*Carex inops*), *Festuca idahoensis*, or *Festuca campestris*. The more mesic portions of this system may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805). Mixed fire regimes and ground fires of variable return intervals maintain these woodlands typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density. This includes the northern race of Interior Ponderosa Pine old-growth (USFS Region 6, USFS Region 1). Historically, many of these woodlands and savannas lacked the shrub component as a result of 3- to 7-year fire-return intervals.

Classification Comments: Hot, dry Douglas-fir types with grass are included here. Rocky Mountain Ponderosa Pine Woodland (CES306.827) and Southern Rocky Mountain Ponderosa Pine Savanna (CES306.826) contain mostly *Pinus ponderosa* var. *scopulorum* and *Pinus arizonica* var. *arizonica* (= *Pinus ponderosa* var. *arizonica*). The FRIS site describes different varieties of *Pinus ponderosa* and associated species. Johansen and Latta (2003) have mapped the distribution of the two varieties using mitochondrial DNA. They hybridize along the Continental Divide in Montana backing up the FRIS information. Another ponderosa pine system remains to be defined and described for the woodlands and savannas occurring in central and eastern Montana and the Black Hills region. These "northwestern Great Plains ponderosa pine woodlands" are likely to have a floristic component that is more northern Great Plains mixedgrass in nature, as well as being open woodlands generally found in a grassland matrix. Further work is needed to identify the geographic and conceptual boundaries between Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030) and the northwestern Great Plains system.

Meeting of Pacific Northwest ecologists for Landfire concluded that the "true savanna" of high-frequency / low-intensity fires and grassy understories is now minimally in existence. Most areas that may have been savanna in the past are now more nearly closed-canopy woodlands/forests. Conclusion was that these true savannas should be included with this woodland system, rather than with the climatically-edaphically controlled Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958). Hence, the "true fire-maintained savanna" is included in this woodland system.

Louisa Evers (pers. comm. 2006) notes that she has not found any evidence that ponderosa pine savanna existed historically in north-central and central Oregon. In north-central Oregon, the savanna would have been oak or pine-oak. In central Oregon, it may well have been western juniper. Condition surveys of the Cascades Forest Reserve and General Land Office survey notes suggest that

ponderosa pine formed a woodland with grassy understories, but still was often referred to as open-parklike. Conversely pine-oak and Douglas-fir-oak savannas appeared to have once been quite common in the Willamette Valley (and are classified in North Pacific Oak Woodland (CES204.852)).

Similar Ecological Systems:

- Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650)
- Southern Rocky Mountain Ponderosa Pine Savanna (CES306.649)
- Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Broader
- Ponderosa Pine - Grassland (110) (Shiflet 1994) Intersecting
- Ponderosa Pine - Shrubland (109) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This ecological system within the region occurs at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites at elevations ranging from 500-1600 m (1600-5248 feet). It can occur on all slopes and aspects; however, it commonly occurs on moderately steep to very steep slopes or ridgetops. This ecological system generally occurs on most geological substrates from weathered rock to glacial deposits to eolian deposits. Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Surface textures are highly variable in this ecological system ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations.

Dynamics: *Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States. Historically, ground fires and drought were influential in maintaining open-canopy conditions in these woodlands. With settlement and subsequent fire suppression, occurrences have become denser. Presently, many occurrences contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. These altered occurrence structures have affected fuel loads and alter fire regimes. Presettlement fire regimes were primarily frequent (5- to 15-year return intervals), low-intensity ground fires triggered by lightning strikes or deliberately set fires by Native Americans. With fire suppression and increased fuel loads, fire regimes are now less frequent and often become intense crownfires, which can kill mature *Pinus ponderosa* (Reid et al. 1999).

Establishment is erratic and believed to be linked to periods of adequate soil moisture and good seed crops as well as fire frequencies, which allow seedlings to reach sapling size. Longer fire-return intervals have resulted in many occurrences having dense subcanopies of overstocked and unhealthy young *Pinus ponderosa* (Reid et al. 1999).

White-headed woodpecker, pygmy nuthatch, and flammulated owl are indicators of a healthy ponderosa pine woodland. All of these birds prefer mature trees in an open woodland setting (Winn 1998, Jones 1998, Levad 1998 as cited in Rondeau 2001).

Landfire VDDT models: R#PIPOM.

MEMBERSHIP

Associations:

- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Pseudoroegneria spicata* ssp. *inermis* Woodland (CEGL000207, G3Q)
- *Pinus ponderosa* / *Arctostaphylos patula* - *Arctostaphylos viscida* Forest (CEGL000061, G2Q)
- *Pinus ponderosa* / *Arctostaphylos patula* - *Ceanothus velutinus* Woodland (CEGL000062, G1)
- *Pinus ponderosa* / *Arctostaphylos patula* - *Purshia tridentata* Woodland (CEGL000063, G3)
- *Pinus ponderosa* / *Artemisia arbuscula* Woodland (CEGL000845, G2G3Q)
- *Pinus ponderosa* / *Artemisia tridentata* ssp. *vaseyana* / *Poa nervosa* Woodland (CEGL000180, G2G3)
- *Pinus ponderosa* / *Calamagrostis rubescens* Forest (CEGL000181, G2Q)
- *Pinus ponderosa* / *Carex geyeri* Woodland (CEGL000182, G3G4)
- *Pinus ponderosa* / *Ceanothus velutinus* - *Purshia tridentata* Woodland (CEGL000064, G4)
- *Pinus ponderosa* / *Cercocarpus ledifolius* Woodland (CEGL000850, G4)
- *Pinus ponderosa* / *Elymus glaucus* Forest (CEGL000184, G2)
- *Pinus ponderosa* / *Festuca idahoensis* Woodland (CEGL000857, G4)
- *Pinus ponderosa* / *Hesperostipa comata* Woodland (CEGL000879, G1)
- *Pinus ponderosa* / *Juniperus communis* Woodland (CEGL000859, G4?)
- *Pinus ponderosa* / *Mahonia repens* Forest (CEGL000187, G3Q)
- *Pinus ponderosa* / *Physocarpus malvaceus* Forest (CEGL000189, G2)
- *Pinus ponderosa* / *Pseudoroegneria spicata* Woodland (CEGL000865, G4)
- *Pinus ponderosa* / *Purshia tridentata* / *Carex geyeri* Woodland (CEGL002606, G3)
- *Pinus ponderosa* / *Purshia tridentata* / *Carex rossii* Woodland (CEGL000194, G2G3)
- *Pinus ponderosa* / *Purshia tridentata* / *Festuca idahoensis* Woodland (CEGL000195, G3)
- *Pinus ponderosa* / *Purshia tridentata* / *Pseudoroegneria spicata* Woodland (CEGL000197, G3)
- *Pinus ponderosa* / *Spiraea betulifolia* Forest (CEGL000202, G1G2)
- *Pinus ponderosa* / *Symphoricarpos albus* Forest (CEGL000203, G4?)

- *Pinus ponderosa* / *Symphoricarpos oreophilus* Forest (CEGL000205, G3)
- *Pinus ponderosa* / *Vaccinium caespitosum* Woodland (CEGL005841, G3?)
- *Pseudotsuga menziesii* / *Festuca campestris* Woodland (CEGL000901, G4)
- *Pseudotsuga menziesii* / *Festuca idahoensis* Woodland (CEGL000900, G4)
- *Pseudotsuga menziesii* / *Pseudoroegneria spicata* Woodland (CEGL000908, G4)

Alliances:

- *Pinus ponderosa* - *Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pinus ponderosa* Forest Alliance (A.124)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- California Montane Jeffrey Pine-(Ponderosa Pine) Woodland (CES206.918)

DISTRIBUTION

Range: This system is found in the Fraser River drainage of southern British Columbia south along the Cascades and northern Rocky Mountains of Washington, Oregon and California. In the northeastern part of its range, it extends across the northern Rocky Mountains west of the Continental Divide into northwestern Montana, south to the Snake River Plain in Idaho, and east into the foothills of western Montana.

Divisions: 204:C; 304:C; 306:C

Nations: CA, US

Subnations: BC, ID, MT, NV?, OR, WA

Map Zones: 1:C, 2:C, 7:C, 8:C, 9:C, 10:C, 18:P, 19:C, 20:?, 30:?

USFS Ecomap Regions: 331A:CC, 342B:CC, 342C:CC, 342D:CP, 342H:CC, 342I:CC, M242B:CC, M242C:CC, M242D:CC, M261A:C?, M261D:CC, M261G:CC, M331A:PP, M331J:PP, M332A:CC, M332B:CC, M332D:CP, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 26:?, 33:?, 68:C

SOURCES

References: Camp et al. 1997, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Everett et al. 2000, Evers pers. comm., Franklin and Dyrness 1973, Johansen and Latta 2003, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Pfister et al. 1977, Reid et al. 1999, USFS 1993, Western Ecology Working Group n.d., Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.754393#references

Description Author: M.S. Reid, mod. C. Chappell and R. Crawford

Version: 23 Feb 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West
ClassifResp: West

1046 NORTHERN ROCKY MOUNTAIN SUBALPINE WOODLAND AND PARKLAND (CES306.807)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Upper Treeline; Long (>500 yrs) Persistence; Montane [Upper Montane]; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Oligotrophic Soil; Very Short Disturbance Interval; W-Patch/High Intensity; W-Patch/Medium Intensity; W-Landscape/Medium Intensity; *Larix lyallii*

Non-Diagnostic Classifiers: Glaciated uplands; Moraine; Mountainside; Temperate [Temperate Continental]; Glaciated; Mesotrophic Soil; Shallow Soil; Ustic; Cirque headwall

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2046; ESLF 4233; ESP 1046

CONCEPT

Summary: This system of the northern Rockies, Cascade Mountains, and northeastern Olympic Mountains is typically a high-elevation mosaic of stunted tree clumps, open woodlands, and herb- or dwarf-shrub-dominated openings, occurring above closed forest ecosystems and below alpine communities. It includes open areas with clumps of *Pinus albicaulis*, as well as woodlands dominated by *Pinus albicaulis* or *Larix lyallii*. In the Cascade Mountains and northeastern Olympic Mountains, the tree clump pattern is one manifestation, but these are also woodlands with an open canopy, without a tree clump/opening patchiness to them; in fact, that is quite common with *Pinus albicaulis*. The climate is typically very cold in winter and dry in summer. In the Cascades and Olympic Mountains, the climate is more maritime in nature and wind is not as extreme. The upper and lower elevational limits, due to climatic variability and differing topography, vary considerably; in interior British Columbia, this system occurs between 1000 and 2100 m elevation, and in northwestern Montana it occurs up to 2380 m. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, landslides and rockslides, and cirque headwalls and basins. Some sites have little snow accumulation because of high winds and sublimation. *Larix lyallii* stands generally occur at or near upper treeline on north-facing cirques or slopes where snowfields persist until June or July. In this harsh, often wind-swept environment, trees are often stunted and flagged from damage associated with wind and blowing snow and ice crystals, especially at the upper elevations of the type. The stands or patches often originate when *Picea engelmannii*, *Larix lyallii*, or *Pinus albicaulis* colonize a sheltered site such as the lee side of a rock. *Abies lasiocarpa* can then colonize in the shelter of the *Picea engelmannii* and may form a dense canopy by branch layering. Major disturbances are windthrow and snow avalanches. Fire is known to occur infrequently in this system, at least where woodlands are present; lightning damage to individual trees is common, but sparse canopies and rocky terrain limit the spread of fire. These high-elevation coniferous woodlands are dominated by *Pinus albicaulis*, *Abies lasiocarpa*, and/or *Larix lyallii*, with occasional *Picea engelmannii*. In the Cascades and Olympics, *Abies lasiocarpa* sometimes dominates the tree layer without *Pinus albicaulis*, though in this dry parkland *Tsuga mertensiana* and *Abies amabilis* are largely absent. The undergrowth is usually somewhat depauperate, but some stands support a near sward of heath plants, such as *Phyllodoce glanduliflora*, *Phyllodoce empetriflora*, *Empetrum nigrum*, *Cassiope mertensiana*, and *Kalmia polifolia*, and can include a slightly taller layer of *Ribes montigenum*, *Salix brachycarpa*, *Salix glauca*, *Salix planifolia*, *Vaccinium membranaceum*, *Vaccinium myrtillus*, or *Vaccinium scoparium* that may be present to codominant. The herbaceous layer is sparse under dense shrub canopies or may be dense where the shrub canopy is open or absent. *Vahlodea atropurpurea* (= *Deschampsia atropurpurea*), *Luzula glabrata* var. *hitchcockii*, and *Juncus parryi* are the most commonly associated graminoids.

Classification Comments: There is a proposal to either split the dry, subalpine *Pinus albicaulis* woodlands of the Blue Mountains (Oregon) and northern Nevada into a different system; or else to include them in Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819). For Landfire, these *Pinus albicaulis* woodlands were included in this subalpine parkland system, but ecologically and floristically they are more similar to Rocky Mountain dry subalpine woodlands. In addition, there is a proposal and discussion that tree ribbon spruce-fir woodlands in scattered ranges of southern Wyoming are more ecologically "parklands"; possibly those areas could be included in this system.

Related Concepts:

- Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) Intersecting
- FP Engelmann Spruce - Subalpine Fir Parkland (Ecosystems Working Group 1998) Broader
- WB Whitebark Pine Subalpine (Ecosystems Working Group 1998) Broader
- Whitebark Pine: 208 (Eyre 1980) Finer

DESCRIPTION

Environment: In the Cascades and Olympic Mountains, the climate is more maritime in nature and wind is not as extreme, but summer drought is a more important process than in the related North Pacific Maritime Mesic Subalpine Parkland (CES204.837).

Dynamics: *Larix lyallii* is a very slow-growing, long-lived tree, with individuals up to 1000 years in age. It is generally shade-intolerant; however, extreme environmental conditions limit potentially competing trees.

MEMBERSHIP

Associations:

- *Abies lasiocarpa* - *Picea engelmannii* Krummholz Shrubland (CEGL000985, G4)
- *Abies lasiocarpa* - *Picea engelmannii* Tree Island Forest (CEGL000329, GUQ)
- *Abies lasiocarpa* - *Pinus albicaulis* / *Arctostaphylos uva-ursi* Woodland (CEGL000751, G2Q)
- *Abies lasiocarpa* - *Pinus albicaulis* / *Vaccinium scoparium* Woodland (CEGL000752, G5?)
- *Larix lyallii* / *Vaccinium delicosum* Woodland (CEGL000952, G3)
- *Larix lyallii* / *Vaccinium scoparium* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000951, G2G3)
- *Pinus albicaulis* - (*Abies lasiocarpa*) / *Carex geyeri* Woodland (CEGL000754, G2G3)
- *Pinus albicaulis* - (*Picea engelmannii*) / *Dryas octopetala* Woodland (CEGL005840, G2G3?)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Menziesia ferruginea* / *Xerophyllum tenax* Woodland (CEGL005836, G3?)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium membranaceum* / *Xerophyllum tenax* Woodland (CEGL005837, G3?)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005839, G3?)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Xerophyllum tenax* Woodland (CEGL005838, G3?)
- *Pinus albicaulis* - *Abies lasiocarpa* Woodland (CEGL000128, G5?)
- *Pinus albicaulis* / *Calamagrostis rubescens* Woodland (CEGL000753, G2)
- *Pinus albicaulis* / *Carex rossii* Forest (CEGL000129, G3)
- *Pinus albicaulis* / *Festuca idahoensis* Woodland (CEGL000755, G4)
- *Pinus albicaulis* / *Juniperus communis* Woodland (CEGL000756, G4?)
- *Pinus albicaulis* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000758, G3)
- *Pinus albicaulis* / *Vaccinium scoparium* Forest (CEGL000131, G4)
- *Pinus albicaulis* Woodland [Placeholder] (CEGL000127, G5?)

Alliances:

- *Abies lasiocarpa* - *Picea engelmannii* - *Pinus flexilis* Krummholz Shrubland Alliance (A.811)
- *Abies lasiocarpa* - *Picea engelmannii* Forest Alliance (A.168)
- *Larix lyallii* Woodland Alliance (A.631)
- *Pinus albicaulis* - *Abies lasiocarpa* Woodland Alliance (A.560)
- *Pinus albicaulis* Forest Alliance (A.132)
- *Pinus albicaulis* Woodland Alliance (A.531)

DISTRIBUTION

Range: This system occurs in the northern Rocky Mountains, west into the Cascade Mountains and northeastern Olympic Mountains, and east into the mountain "islands" of central Montana.

Divisions: 204:C; 306:C

Nations: CA, US

Subnations: AB, BC, ID, MT, WA, WY

Map Zones: 1:C, 7:?, 9:P, 10:C, 16:?, 18:C, 19:C, 20:C, 21:C, 22:?, 29:?

USFS Ecomap Regions: 342A:CC, 342F:CP, 342H:CC, 342I:CC, M242A:CC, M242C:CC, M242D:CC, M331A:CC, M331B:CP, M331D:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 3:C, 7:C, 8:C, 9:P, 26:C, 68:C

SOURCES

References: Arno 1970, Arno and Habeck 1972, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1999, Ecosystems Working Group 1998, Lillybridge et al. 1995, Meidinger and Pojar 1991, Williams and Lillybridge 1983, Williams and Smith 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722866#references

Description Author: C. Chappell, R. Crawford, G. Kittel, mod. M.S. Reid

Version: 06 Sep 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1010 NORTHERN ROCKY MOUNTAIN WESTERN LARCH SAVANNA (CES306.837)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Other Floristics/Dominants [User-defined]

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Mesotrophic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2010; ESLF 4103; ESP 1010

CONCEPT

Summary: This ecological system is restricted to the interior montane zone of the Pacific Northwest in northern Idaho and adjacent Montana, Washington, Oregon, and in southeastern interior British Columbia. It also appears in the east Cascades of Washington. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from 680 to 2195 m (2230-7200 feet), and sites include drier, lower montane settings of toeslopes and ash deposits. This system is composed of open-canopied "savannas" of the deciduous conifer *Larix occidentalis*, which may have been initiated following stand-replacing crownfires of other conifer systems, but are maintained by a higher frequency, surface-fire regime. These savannas are found in settings where low-intensity, high-frequency fires create open larch woodlands, often with the undergrowth dominated by low-growing *Arctostaphylos uva-ursi*, *Calamagrostis rubescens*, *Linnaea borealis*, *Spiraea betulifolia*, *Vaccinium caespitosum*, or *Xerophyllum tenax*. Less frequent or absence of fire creates mixed-dominance stands with often shrubby undergrowth; *Vaccinium caespitosum* is common, and taller shrubs can include *Acer glabrum*, *Ceanothus velutinus*, *Shepherdia canadensis*, *Physocarpus malvaceus*, *Rubus parviflorus*, or *Vaccinium membranaceum*. Fire suppression has led to invasion of the more shade-tolerant tree species *Abies grandis*, *Abies lasiocarpa*, *Picea engelmannii*, or *Tsuga* spp. and loss of much of the single-story canopy woodlands.

Classification Comments: Stands initiated following crownfires in areas with stand-replacing fire frequencies greater than 150 years are included in the more mesic adjacent forest systems (Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802) and Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)). This is a fire-dependant system and was much more extensive in the past; it is now very patchy in distribution. Most *Larix occidentalis* is a seral component of the dry-mesic mixed montane forest.

Similar Ecological Systems:

- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Related Concepts:

- Western Larch: 212 (Eyre 1980) Broader

DESCRIPTION

Dynamics: *Larix occidentalis* is a long-lived species (in excess of 700 years in the northern Rocky Mountains), and thus stands fitting this concept are themselves long-persisting; the life of *Larix*-dominated stands probably does not much exceed 250 years due to various mortality sources and the ingrowth of shade-tolerant species. Occurrences of this ecological system are generated by stand-replacing fire, the fire-return interval for which is speculated to be on the order of 80 to 200 years. These sites may be maintained in a seral status for hundreds of years due to the fact that *Larix occidentalis* is a long-lived species and the understory is often dominated by *Pseudotsuga*, which will grow into the upper canopy. The potential dominants *Abies lasiocarpa*, *Picea engelmannii*, or *Abies grandis* are slow to establish on these sites and grow slowly presenting the distinct probability, given the fire-return intervals for this type, that the "climax" (long-term stable) condition is never realized.

It has been noted in northern Idaho that, following disturbance (particularly logging) in some mesic-site occurrences, *Larix occidentalis* does not necessarily succeed itself, the first tree-dominated successional stages being dominated by *Pseudotsuga menziesii*, *Pinus contorta*, or less frequently by more shade-tolerant species (Cooper et al. 1987); this response is a consequence of the episodic nature of favorable cone crop years in *Larix occidentalis*.

Landfire VDDT models: #RMCONm and #RMCONdy classes B, C, & D.

MEMBERSHIP

Associations:

- *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005881, GNR)
- *Larix occidentalis* / *Clintonia uniflora* Forest (CEGL005880, GNR)
- *Larix occidentalis* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005883, GNR)
- *Larix occidentalis* / *Vaccinium caespitosum* Forest (CEGL005882, GNR)

Alliances:

- *Larix occidentalis* Forest Alliance (A.275)

DISTRIBUTION

Divisions: 204:C; 306:C

Nations: CA?, US

Subnations: BC?, ID, MT, OR, WA

Map Zones: 1:C, 7:C, 8:P, 9:P, 10:C, 19:C

USFS Ecomap Regions: 331A:CC, 342I:??, M242D:CC, M332A:CC, M332B:CP, M332E:C?, M332F:C?, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 3:C, 4:C, 6:P, 7:C, 8:P, 68:C

SOURCES

References: Agee 1993, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hessburg et al. 1999, Hessburg et al. 2000, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.742829#references

Description Author: R.C. Crawford and M.S. Reid

Version: 01 Sep 2005

Concept Author: R.C. Crawford and M.S. Reid

Stakeholders: Canada, West
ClassifResp: West

1179 NORTHWESTERN GREAT PLAINS - BLACK HILLS PONDEROSA PINE WOODLAND AND SAVANNA (CES303.650)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; F-Patch/Medium Intensity; Needle-Leaved Tree; *Pinus ponderosa* with grassy understory; *Pinus ponderosa* with shrubby understory

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2179; ESLF 4280; ESP 1179

CONCEPT

Summary: This system occurs throughout the Great Plains Division along areas that border the Rocky Mountain Division and into the central Great Plains. The expansion of this system into the central Great Plains may be due to fire suppression. These can be physiognomically variable, ranging from very sparse patches of trees on drier sites, to nearly closed-canopy forest stands on north slopes or in draws where available soil moisture is higher. This system occurs primarily on gentle to steep slopes along escarpments, buttes, canyons, rock outcrops or ravines and can grade into one of the Great Plains canyon systems or the surrounding prairie system. Soils typically range from well-drained loamy sands to sandy loams formed in colluvium, weathered sandstone, limestone, scoria or eolian sand. This system is primarily dominated by *Pinus ponderosa* but may include a sparse to relatively dense understory of *Juniperus scopulorum*, *Thuja*, or *Cercocarpus* with just a few scattered trees. Deciduous trees are an important component in some areas (western Dakotas, Black Hills) and are sometimes codominant with the pines, including *Fraxinus pennsylvanica*, *Betula papyrifera*, *Quercus macrocarpa*, *Ulmus americana*, *Acer negundo*, and *Populus tremuloides*. Along the Missouri Breaks in north-central Montana, woodlands dominated by *Pseudotsuga menziesii* are in similar ecological settings as *Pinus ponderosa* in the Great Plains and are included in this system. In the breaks where it occurs, *Pseudotsuga menziesii* has a very open canopy over grassy undergrowth, predominantly composed of *Pseudoroegneria spicata*, with little to no shrubs present. Important or common shrub species with ponderosa pine can include *Arctostaphylos uva-ursi*, *Mahonia repens*, *Yucca glauca*, *Symphoricarpos* spp., *Prunus virginiana*, *Juniperus communis*, *Juniperus horizontalis*, *Amelanchier alnifolia*, *Rhus trilobata*, and *Physocarpus monogynus*. The herbaceous understory can range from sparse to a dense layer with species typifying the surrounding prairie system, with mixedgrass species common, such as *Andropogon gerardii*, *Bouteloua curtipendula*, *Carex inops* ssp. *heliophila*, *Carex filifolia*, *Danthonia intermedia*, *Koeleria macrantha*, *Nassella viridula*, *Oryzopsis asperifolia*, *Pascopyrum smithii*, *Piptatherum micranthum*, and *Schizachyrium scoparium*. Timber cutting and other disturbances have degraded many examples of this system within the Great Plains, however, some good examples may occur along the Pine Ridge escarpment and Pine Ridge district of the Nebraska National Forest in Nebraska.

Classification Comments: In this Great Plains region, what were previously called Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958), Southern Rocky Mountain Ponderosa Pine Woodland (CES303.648) and Southern Rocky Mountain Ponderosa Pine Savanna (CES306.826) are now included in this new system. Physiognomically, this is a variable system, with everything from sparse woodlands on breaks and scoria bluffs to dense closed-canopy stands in the Black Hills included.

Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648) is now defined to occur in the montane zones of the Bighorns (USFS section M331B) and Laramie Range (USFS section M331I) and to the west and south of these mountains. It will also occur in other isolated mountain ranges of central Wyoming, but not in eastern Wyoming. It does not occur farther north than Wyoming; all Montana ponderosa pine woodlands are placed into either this Northwest Great Plains system or into Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030), as appropriate. The southern extent is hard to determine, but farther south in Colorado, there is more *Juniperus*, *Pinus edulis*, and *Quercus gambelii*. This system certainly occurs in New Mexico, but stands at the Black Mesa in western Oklahoma and in southeastern Colorado may also be viewed as having the southwestern affinities.

In the Pine Escarpments of Nebraska, pine communities can range from open canopies with grassy understories to more closed canopies. Included within these areas are also several rocky outcrops, which probably should be included within the system as they are often intermingled with the savanna. The more closed-canopy examples may be more similar to Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648) but are included in this system for now.

Similar Ecological Systems:

- Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958)
- Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)
- Southern Rocky Mountain Ponderosa Pine Savanna (CES306.649)
- Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting

DESCRIPTION

Dynamics: Marriot and Faber-Langendoen (2000) report different fire regimes for ponderosa pine communities in the Black Hills,

with their "Dry Group" more typically having frequent surface fires and the "Mesic Group" having infrequent catastrophic fires (every 100-200 years). The Dry Group of associations includes lower elevation foothill savanna associations, and the mesic group somewhat higher elevation, north-slope, swale associations. K. Kindscher (pers. comm. 2007) believes that almost all of the stands in Nebraska were there at the time of settlement and are not a result of pine expansion due to fire suppression; in addition, at least some have disappeared, such as the one in southern Nebraska (Franklin County). It is possible, however, that some areas of this system have expanded in size due to fire suppression, but this needs substantiation.

MEMBERSHIP

Associations:

- *Pinus ponderosa* / *Carex inops* ssp. *heliophila* Woodland (CEGL000849, G3G4)
- *Pinus ponderosa* / *Juniperus horizontalis* Woodland (CEGL000860, G3?)
- *Pinus ponderosa* / *Oryzopsis asperifolia* Woodland (CEGL002123, G3G4Q)
- *Pinus ponderosa* / *Pascopyrum smithii* Woodland (CEGL000188, G3G4)
- *Pinus ponderosa* / *Physocarpus monogynus* Forest (CEGL000190, G3)
- *Pinus ponderosa* / *Prunus virginiana* Forest (CEGL000192, G3G4)
- *Pinus ponderosa* / *Quercus macrocarpa* Woodland (CEGL000873, G3)
- *Pinus ponderosa* / *Schizachyrium scoparium* Woodland (CEGL000201, G3G4)
- *Pinus ponderosa* / *Symphoricarpos occidentalis* Forest (CEGL000204, G3)

Alliances:

- *Pinus ponderosa* Forest Alliance (A.124)
- *Pinus ponderosa* Woodland Alliance (A.530)

SPATIAL CHARACTERISTICS

Spatial Summary: These ponderosa pine occurrences are typically found in the matrix of the Great Plains grassland systems. They are often surrounded by mixedgrass or tallgrass prairie, in places where available soil moisture is higher or soils are more coarse and rocky. In some cases, these woodlands or savannas may occur where fire suppression has allowed trees to become established (in areas where deciduous trees are more abundant (Girard et al. 1987)). These are typically not in the same setting as Rocky Mountain ponderosa pine, where ponderosa pine forms woodlands at lower treeline and grades into mixed montane conifer systems at higher elevations (it did not make sense to keep Black Hills ponderosa woodlands with the Rocky Mountain system, so they are included here).

Floristically, these pine stands have a graminoid component that is strongly related to mixedgrass or tallgrass Great Plains floristics. The shrub component is not very diagnostic, as most of the important shrubs are commonly also important in Rocky Mountain ponderosa pine or Douglas-fir systems.

DISTRIBUTION

Range: This system is found in central and eastern Montana, the western Dakotas, eastern Wyoming (east of the Bighorns), the Black Hills, and south into the Sand Hills of Nebraska and northeastern Colorado (north of Pawnee National Grasslands to Cedar Point near Limon and south). In Montana, it occurs along the Missouri River breaks, around the Little Belts and Snowy mountains, in south-central Montana between the Bighorns and the Black Hills (along the Tongue and Powder rivers), and other areas of eastern Montana. In Wyoming, it is found around the Black Hills and Bear Lodge Mountains, and in isolated areas of eastern Wyoming on bluffs and rock outcrops, and along "breaks." Whether this system occurs in Kansas is uncertain.

Divisions: 303:C; 306:C

Nations: US

Subnations: CO, KS?, MT, ND, NE, SD, WY

Map Zones: 20:C, 29:C, 30:C, 31:C, 33:C, 39:?, 40:?

USFS Ecomap Regions: 331C:C?, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CC, 332A:C?, 332B:C?, 332C:CC, 332D:C?, 332E:C?, M334A:CC

TNC Ecoregions: 25:C, 26:C, 27:C, 33:C, 34:?

SOURCES

References: Bock and Bock 1984, Girard 1985, Girard et al. 1987, Girard et al. 1989, Hansen and Hoffman 1988, Hoffman and Alexander 1987, Marriott and Faber-Langendoen 2000, Thilenius 1972, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.797971#references

Description Author: M.S. Reid

Version: 25 Jan 2007

Concept Author: M.S. Reid

Stakeholders: Midwest, West

ClassifResp: West

1048 NORTHWESTERN GREAT PLAINS HIGHLAND WHITE SPRUCE WOODLAND (CES303.957)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Temperate [Temperate Continental]; *Picea glauca*

Non-Diagnostic Classifiers: Montane [Montane]; Forest and Woodland (Treed); Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2048; ESLF 4235; ESP 1048

CONCEPT

Summary: This uncommon system is limited to relatively high-elevation outliers of montane environments in the northwestern Great Plains. Best known areas of this system are small portions of the Black Hills of Wyoming and South Dakota and the Cypress Upland of southern Alberta and Saskatchewan. These highland areas have a cooler climate than surrounding mixedgrass prairie. In the Black Hills, these woodlands occur as small or large patches within the ponderosa pine matrix, from about 1740 to 2135 m (5700-7000 feet); at lower elevations, they are restricted to north-facing slopes. At the higher elevations, they are found on level or gently sloping areas. In other locations, this woodland system is limited to sideslopes and depressions, likely adjoining riparian zones, where snow is well-retained. Soils vary widely from deep to quite shallow. *Picea glauca* is the characteristic conifer, but other trees can include *Pinus ponderosa*, *Populus tremuloides*, and *Betula papyrifera*. Undergrowth shrubs typically include *Arctostaphylos uva-ursi*, *Juniperus communis*, *Linnaea borealis*, *Symphoricarpos albus*, and *Vaccinium scoparium*. Disturbance regimes are not well-documented for this system, but likely include periodic windthrow as well as fire spreading from adjacent, lower elevation woodlands and grasslands.

MEMBERSHIP

Associations:

- *Picea glauca* / *Linnaea borealis* Forest (CEGL000382, G2G3)
- *Picea glauca* / *Vaccinium scoparium* Forest (CEGL000383, G1G2)
- *Picea glauca* Alluvial Black Hills Forest (CEGL002057, G2G3)

Alliances:

- *Picea glauca* Forest Alliance (A.167)
- *Picea glauca* Temporarily Flooded Forest Alliance (A.172)

DISTRIBUTION

Range: This system is limited to relatively high-elevation outliers of montane environments in the northwestern Great Plains. Best known areas of this system are small portions of the Black Hills of Wyoming and South Dakota and the Cypress Upland of southern Alberta and Saskatchewan. It may also occur in very small stands of the Bighorn Mountains of north-central Wyoming and south-central Montana.

Divisions: 303:C; 306:C

Nations: CA, US

Subnations: AB, MT?, SD, SK, WY

Map Zones: 29:C, 30:?, 31:?

USFS Ecomap Regions: M331B:CP, M334A:CC

TNC Ecoregions: 25:C, 26:C

SOURCES

References: Comer et al. 2003, ESWG 1995, Hoffman and Alexander 1987, Marriott and Faber-Langendoen 2000, Rogers 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722724#references

Description Author: P. Comer, mod. M.S. Reid

Version: 25 Jan 2007

Concept Author: P. Comer

Stakeholders: Canada, Midwest, West
ClassifResp: West

1312 OUACHITA MONTANE OAK FOREST (CES202.306)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Ozark/Ouachita; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2312; ESLF 4118; ESP 1312

CONCEPT

Summary: This system represents hardwood forests of the highest elevations of the Ouachita, Rich, and Black Fork mountains of Arkansas and Oklahoma (about 790-850 m [2600-2800 feet]). Vegetation consists of either forests or open woodlands dominated by *Quercus alba* or *Quercus stellata*. Canopy trees are often stunted due to the effects of ice, wind and cold conditions, in combination with fog, shallow soils over rock, and periodic severe drought. Some stands form almost impenetrable thickets.

Classification Comments: *Quercus alba* - *Carya alba* / *Ostrya virginiana* / *Carex pensylvanica* - *Schizachyrium scoparium* Forest (CEGL007818) is taller and less influenced by wind and ice. It is no longer included in this system.

DESCRIPTION

Environment: This system is restricted to the highest elevations of the Ouachita, Rich, and Black Fork mountains of Arkansas and Oklahoma (about 790-850 m [2600-2800 feet]). Ecological factors include the effects of ice, wind and cold, in combination with fog, shallow soils over rock, and periodic severe drought.

Vegetation: The vegetation of this system consists of either forests or open woodlands dominated by *Quercus alba* or *Quercus stellata*. Some examples may have *Quercus marilandica* var. *ashei*; herb layers may contain *Carex pensylvanica* and/or *Carex ouachitana*.

Dynamics: Canopy trees are often stunted due to the effects of ice, wind and cold conditions, in combination with fog, shallow soils over rock, and periodic severe drought.

MEMBERSHIP

Associations:

- *Quercus alba* / *Carex pensylvanica* - *Carex ouachitana* Dwarf Forest (CEGL002433, G1)
- *Quercus stellata* - *Quercus marilandica* var. *ashei* Interior Highlands Scrub Woodland (CEGL003884, G2)

Alliances:

- *Quercus alba* Montane Forest Alliance (A.271)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

DISTRIBUTION

Range: This system is found at the highest elevations of the Ouachita, Rich, and Black Fork mountains of Arkansas and Oklahoma (about 790-850 m [2600-2800 feet]).

Divisions: 202:C

Nations: US

Subnations: AR, OK

Map Zones: 44:C

USFS Ecomap Regions: M231A:CC

TNC Ecoregions: 39:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723186#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 30 May 2007

Concept Author: T. Foti and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1364 OZARK-OUACHITA DRY OAK WOODLAND (CES202.707)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ozark/Ouachita

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2364; ESLF 4306; ESP 1364

CONCEPT

Summary: This system occurs in the Ozark and Ouachita Highlands and far western portions of the Interior Low Plateau regions along gentle to steep slopes and over bluff escarpments with southerly to westerly aspects. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils, sometimes with a fragipan that causes "xero-hydric" moisture conditions. This system was historically woodland in structure, composition, and process but now includes areas of more closed canopy. Oak species such as *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea* dominate this system with an understory of grassland species such as *Schizachyrium scoparium* and shrub species such as *Vaccinium arboreum*. Drought stress is the major dynamic influencing and maintaining this system. On flatwoods with fragipans, *Quercus stellata* is the major dominant. *Quercus alba*, *Quercus falcata*, and/or *Carya texana* may be present in some stands.

Classification Comments: Dry-mesic to mesic oaks were separated from dry oak per the suggestion of Missouri [see Ozark-Ouachita Dry-Mesic Oak Forest (CES202.708)]. This separation may need to be further reviewed.

Similar Ecological Systems:

- Ouachita Novaculite Glade and Woodland (CES202.314)
- Ozark-Ouachita Dry-Mesic Oak Forest (CES202.708)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)

DESCRIPTION

Vegetation: Oak species such as *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea* dominate this system with an understory of grassland species such as *Schizachyrium scoparium* and shrub species such as *Vaccinium arboreum*. Drought stress is the major dynamic influencing and maintaining this system. On flatwoods with fragipans, *Quercus stellata* is the major dominant. *Quercus alba*, *Quercus falcata*, and/or *Carya texana* may be present in some stands. Other species that may be present include *Quercus X macnabiana*, *Schizachyrium scoparium*, *Ulmus alata*, and *Vaccinium arboreum*.

MEMBERSHIP

Associations:

- *Quercus alba* - *Quercus stellata* - *Quercus velutina* / *Schizachyrium scoparium* Woodland (CEGL002150, G2G3)
- *Quercus falcata* - *Quercus alba* - *Quercus stellata* - *Quercus velutina* Forest (CEGL005018, G3G5)
- *Quercus marilandica* / *Vaccinium arboreum* / *Danthonia spicata* Scrub Woodland (CEGL002425, G3G4)
- *Quercus stellata* - *Quercus marilandica* - *Carya (glabra, texana)* / *Vaccinium arboreum* Forest (CEGL002075, G4)
- *Quercus stellata* - *Quercus marilandica* - *Quercus velutina* - *Carya texana* / *Schizachyrium scoparium* Woodland (CEGL002149, G2G3)
- *Quercus stellata* / *Cinna arundinacea* Flatwoods Forest (CEGL002405, G2G3)
- *Quercus velutina* - *Carya (alba, glabra)* / *Vaccinium arboreum* Forest (CEGL004987, G2G3Q)
- *Quercus velutina* - *Quercus coccinea* - *Carya texana* Ozark Forest (CEGL002399, GNR)

Alliances:

- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Forest Alliance (A.253)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus stellata* Flatwoods Forest Alliance (A.261)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

DISTRIBUTION

Range: This system occurs in the Western Interior Highlands of the Ozark, Ouachita, and western Interior Low Plateau regions.

Divisions: 202:C

Nations: US

Subnations: AR, IL, MO, OK

Map Zones: 44:C, 49:P

USFS Ecomap Regions: 223A:CC, 231E:CC, 231G:CC, M223A:CC, M231A:CC

TNC Ecoregions: 38:C, 39:C, 44:C

SOURCES

References: Comer et al. 2003, Nelson 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722953#references

Description Author: S. Menard and T. Nigh, mod. M. Pyne

Version: 30 May 2007

Concept Author: S. Menard and T. Nigh

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1304 OZARK-OUACHITA DRY-MESIC OAK FOREST (CES202.708)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ozark/Ouachita

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Quercus - Carya

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2304; ESLF 4110; ESP 1304

CONCEPT

Summary: This system is found throughout the Ozark and Ouachita Highlands ranging to the western edge of the Interior Low Plateau. It is the matrix system of this region and occurs on dry-mesic to mesic, gentle to moderately steep slopes. Soils are typically moderately to well-drained and more fertile than those associated with oak woodlands. A closed canopy of oak species (*Quercus rubra* and *Quercus alba*) often associated with hickory species (*Carya* spp.) typifies this system. *Acer saccharum* (or *Acer barbatum* to the south) may occur on more mesic examples of this system. Wind, drought, lightning, and occasional fires can influence this system.

Classification Comments: Dry-mesic to mesic oaks were separated from dry oak (Ozark-Ouachita Dry Oak Woodland (CES202.707)) per the suggestion of Missouri. This separation may need to be further reviewed. Likewise, the distribution of this system versus the one farther north (North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046)) needs to be reviewed. Currently the glacial line separates the two systems.

Similar Ecological Systems:

- Ouachita Novaculite Glade and Woodland (CES202.314)
- Ozark-Ouachita Dry Oak Woodland (CES202.707)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)

DESCRIPTION

Environment: This is the matrix system of this region and occurs on dry-mesic to mesic, gentle to moderately steep slopes. Soils are typically moderately to well-drained and more fertile than those associated with oak woodlands.

Vegetation: A closed canopy of oak species (*Quercus rubra* and *Quercus alba*) often associated with hickory species (*Carya* spp.) typifies this system. *Acer saccharum* (or *Acer barbatum* to the south) may occur on more mesic examples of this system. Some stands in the western edge of the Interior Low Plateau (eastern range limit of the system) may contain *Quercus prinus*. Some other species which may be present include *Acer barbatum*, *Acer saccharum*, *Carex pensylvanica*, *Carya alba*, *Carya cordiformis*, *Carya glabra*, *Carya ovata*, *Cercis canadensis*, *Cornus florida*, *Fagus grandifolia*, *Fraxinus americana*, *Gleditsia triacanthos*, *Gymnocladus dioicus*, *Hybanthus concolor*, *Juglans nigra*, *Juniperus virginiana*, *Lindera benzoin*, *Liquidambar styraciflua*, *Maclura pomifera*, *Ostrya virginiana*, *Quercus alba*, *Quercus falcata*, *Quercus X macnabiana*, *Quercus muehlenbergii*, *Quercus rubra*, *Quercus shumardii*, *Quercus velutina*, *Schizachyrium scoparium*, *Smilax* spp., *Ulmus americana*, *Ulmus serotina*, and *Vitis aestivalis*.

Dynamics: Wind, drought, lightning, and occasional fires can influence this system.

MEMBERSHIP

Associations:

- *Acer (barbatum, saccharum)* - *Juglans nigra* - *Fraxinus americana* / *Hybanthus concolor* Forest (CEGL007811, G2)
- *Liquidambar styraciflua* - *Quercus (alba, falcata)* Forest (CEGL007217, GNA)
- *Quercus alba* - *Carya alba* / *Ostrya virginiana* / *Carex pensylvanica* - *Schizachyrium scoparium* Forest (CEGL007818, G3Q)
- *Quercus alba* - *Quercus rubra* - *Acer saccharum* - *Carya cordiformis* / *Lindera benzoin* Forest (CEGL002058, G3?)
- *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acidic Forest (CEGL002067, G3)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070, G4G5)
- *Quercus alba* - *Quercus velutina* - *Carya alba* / *Desmodium nudiflorum* Ozark Forest (CEGL004270, G4)
- *Quercus alba* / *Cornus florida* Unglaciated Forest (CEGL002066, G4?)
- *Quercus falcata* - *Carya alba* - *Carya ovata* Forest (CEGL004543, G3Q)
- *Quercus prinus* / *Smilax* spp. Forest (CEGL005022, G4)
- *Quercus rubra* - *Quercus shumardii* Forest (CEGL004796, G3?)
- *Quercus velutina* - *Quercus alba* - *Carya (glabra, ovata)* Forest (CEGL002076, G4?)
- *Vitis aestivalis* Vine-Shrubland (CEGL003890, G2G3)

Alliances:

- *Acer barbatum* - *Fraxinus americana* - (*Juglans nigra*) Forest Alliance (A.214)
- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus falcata* Forest Alliance (A.243)

- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)
- *Vitis aestivalis* Vine-Shrubland Alliance (A.911)

DISTRIBUTION

Range: This system is found throughout the Ozark and Ouachita Highlands, reaching to the western Interior Low Plateau of Illinois.

Divisions: 202:C

Nations: US

Subnations: AR, IL, KS?, MO, OK

Map Zones: 32:P, 43:?, 44:C, 49:C

USFS Ecomap Regions: 223A:CC, 231E:CC, 231G:CC, M223A:CC, M231A:CC

TNC Ecoregions: 37:P, 38:C, 39:C, 44:C

SOURCES

References: Comer et al. 2003, Nelson 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722952#references

Description Author: S. Menard

Version: 25 Aug 2004

Concept Author: S. Menard

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1334 OZARK-OUACHITA MESIC HARDWOOD FOREST (CES202.043)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ozark/Ouachita

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Toeslope/Valley Bottom

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2334; ESLF 4140; ESP 1334

CONCEPT

Summary: This system is found on lower slopes, toeslopes and valley bottoms within the Ozark and Ouachita regions, as well as on north slopes. In the Ozarks, *Quercus rubra* increases in abundance compared to dry-mesic habitats, and *Acer saccharum* is sometimes a leading dominant. On more alkaline moist soils, *Quercus muehlenbergii*, *Tilia americana*, and *Cercis canadensis* may be common. In the Boston Mountains, mesic forests may also be common on protected slopes and terraces next to streams. Here, *Fagus grandifolia* may be the leading dominant, with codominants of *Acer saccharum*, *Liquidambar styraciflua*, *Tilia americana*, *Magnolia acuminata*, *Magnolia tripetala*, and others. Similar habitats occur in the western Ouachita Mountains.

Similar Ecological Systems:

- South-Central Interior Mesophytic Forest (CES202.887)

DESCRIPTION

Environment: This system is typically found in protected environments such as lower slopes, toeslopes, north-facing slopes, and valley bottoms and terraces next to streams within the Ozark and Ouachita regions.

Vegetation: Dominant or characteristic trees in examples of this system may include *Quercus alba*, *Quercus rubra*, *Acer barbatum*, *Acer saccharum*, *Fagus grandifolia*, *Liquidambar styraciflua*, *Quercus muehlenbergii*, and *Tilia americana*. The understory may contain *Cercis canadensis*, *Magnolia tripetala*, and/or *Magnolia acuminata*.

MEMBERSHIP

Associations:

- *Acer (saccharum, barbatum) - Quercus rubra - Carya cordiformis / Asimina triloba* Forest (CEGL002060, G3)
- *Fagus grandifolia - Acer saccharum - Liriodendron tulipifera* Unglaciated Forest (CEGL002411, G4?)
- *Fagus grandifolia - Quercus rubra - Tilia americana var. caroliniana / Magnolia tripetala / Podophyllum peltatum* Forest (CEGL007823, G3G4)
- *Quercus muehlenbergii - Acer saccharum* Southeastern Oklahoma Forest (CEGL004662, G2G4)

Alliances:

- *Acer saccharum - Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Fagus grandifolia - Acer saccharum - (Liriodendron tulipifera)* Forest Alliance (A.227)
- *Fagus grandifolia - Quercus rubra - Quercus alba* Forest Alliance (A.229)
- *Quercus muehlenbergii - (Acer saccharum)* Forest Alliance (A.1912)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)

DISTRIBUTION

Range: This system is found within the Ozarks and Ouachita Mountains of Missouri, Arkansas, and Oklahoma.

Divisions: 202:C

Nations: US

Subnations: AR, MO, OK

Map Zones: 44:C

USFS Ecomap Regions: 223A:CC, 231E:CC, 231G:CC, M223A:CC, M231A:CC

TNC Ecoregions: 38:C, 39:C

SOURCES

References: Barnes 1991, Comer et al. 2003, Nelson 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722666#references

Description Author: R. Evans and D. Faber-Langendoen, mod. M. Pyne

Version: 30 May 2007

Concept Author: R. Evans, D. Faber-Langendoen

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1507 OZARK-OUACHITA SHORTLEAF PINE-BLUESTEM WOODLAND (CES202.325)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ozark/Ouachita; Very Short Disturbance Interval; Needle-Leaved Tree

National Mapping Codes: EVT 2507; ESLF 4281; ESP 1507

CONCEPT

Summary: This system represents woodlands of the Ouachita and Ozark mountains region of Arkansas, adjacent Oklahoma, and southern Missouri in which *Pinus echinata* is the canopy dominant, and the understory is characterized by *Andropogon gerardii*, *Schizachyrium scoparium*, and other prairie elements. Although examples of this system occur throughout this region, there is local variation in the extent to which they were present. For example, this system was historically prominent in the Ozark Highlands where sandstone derived soils were common, being excluded from or diminished in other areas by inadequate winter precipitation and non-conductive soils. In Missouri and Oklahoma, this system occurs on gently dissected upland cherty plains (in addition to sandstone ridges). The center of distribution would be the northern and western Ouachita Mountains. In the Ouachitas, the system occurs on the northern Hogback Ridges excluding the Novaculite areas to the south. In nearly all cases, *Pinus echinata* occurs with a variable mixture of hardwood species. The exact composition of the hardwoods is much more closely related to aspect and topographic factors than is the pine component.

Classification Comments: This system is primarily confined to gently to moderately sloping, upland plains and is distinguished from Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313), which occurs on more steeply dissected ridges and steep southwest-facing slopes. The abundance of prairie flora also distinguishes this system from the shortleaf pine-oak woodland.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)

DESCRIPTION

Environment: This system was historically prominent in the Ozark Highlands where sandstone derived soils were common, being excluded from or diminished in other areas by inadequate winter precipitation and non-conductive soils. In Missouri and Oklahoma, this system occurs on gently dissected upland cherty plains (in addition to sandstone ridges). This system is primarily confined to gently to moderately sloping, upland plains and is distinguished from shortleaf pine-oak woodland, which occurs on more steeply dissected ridges and steep southwest-facing slopes. In the Ouachitas, the system occurs on the northern Hogback Ridges excluding the Novaculite areas to the south.

Vegetation: In the northern part of this geographic area *Pinus echinata*, xeric oaks and some hickory dominate the overstory with a high percentage of oak on steep north slopes and on *Quercus stellata* flats. Associated species include *Quercus marilandica* and *Carya alba* on drier sites and to the west *Carya texana*. In some examples of this system, the aggregate importance of hardwoods may be greater than pine, especially on subxeric and mesic sites (Dale and Ware 1999). Pine is often the canopy emergent on upper slopes. Stand density increases with available moisture. Typical shrubs may include *Vaccinium arboreum*, *Vaccinium pallidum*, and *Vaccinium stamineum*, but these patches are rare. Various bluestem grasses, legumes and other forbs dominate the understory (herbaceous layer).

Dynamics: This system is fire regime group I, with frequent surface fires. Area fire frequency is 3-4 years mean fire interval (range=1-12 years) (Masters et al. 1995). Annual fire was common historically. Replacement and mixed severity fires are infrequent, every 100 to 1000 years. Stand-replacement fires occurred mostly under extreme drought conditions during the growing season. Other disturbance types include ice storms, wind events, and insect infestations. The impact of native ungulate grazing (buffalo and elk) was negligible, but fire generally maintained systems. Drought and moist cycles play a strong role interacting with both fire and native grazing.

MEMBERSHIP

Associations:

- *Pinus echinata* - *Quercus alba* / *Schizachyrium scoparium* Woodland (CEGL002394, G3G4)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Woodland (CEGL002393, G2G3)
- *Pinus echinata* / Rock Outcrop Interior Highland Woodland (CEGL002402, G2G3)
- *Pinus echinata* / *Schizachyrium scoparium* - *Solidago ulmifolia* - *Monarda russeliana* - *Echinacea pallida* Woodland (CEGL007815, G1G2)

Alliances:

- *Pinus echinata* - *Quercus* (*alba*, *falcata*, *stellata*, *velutina*) Woodland Alliance (A.679)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Pinus echinata* Woodland Alliance (A.515)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Ozark-Ouachita Mesic Hardwood Forest (CES202.043)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)

DISTRIBUTION

Range: This system occurs in the Ouachita and Ozark mountains region of Arkansas, adjacent Oklahoma, and southern Missouri.

Divisions: 202:C

Nations: US

Subnations: AR, MO, OK

Map Zones: 44:C

USFS Ecomap Regions: 223A:CC, M223A:CC, M231A:CC

TNC Ecoregions: 38:C, 39:C

SOURCES

References: Dale and Ware 1999, Masters et al. 1995, Southeastern Ecology Working Group n.d., USFS 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798083#references

Description Author: T. Foti and Ron Masters, mod. M. Melnechuk and B. Hoagland

Version: 01 Feb 2007

Concept Author: T. Foti, R. Masters, D. Zollner

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1367 OZARK-OUACHITA SHORTLEAF PINE-OAK FOREST AND WOODLAND (CES202.313)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ozark/Ouachita; Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2367; ESLF 4310; ESP 1367

CONCEPT

Summary: This system represents forests and woodlands of the Ouachita and Ozark mountains region of Arkansas, adjacent Oklahoma, and southern Missouri in which *Pinus echinata* is an important or dominant component. Although examples of this system occur throughout this region, there is local variation in the extent to which they were present. For example, this system was historically prominent only in the southeastern part of the Ozark Highlands where sandstone derived soils were common, being excluded from or diminished in other areas by inadequate winter precipitation and non-conductive soils. In contrast, pine was virtually ubiquitous in the historical forests of the Ouachitas. In nearly all cases (at least in the Ouachitas), *Pinus echinata* occurs with a variable mixture of hardwood species. The exact composition of the hardwoods is much more closely related to aspect and topographic factors than is the pine component. In some examples of this system, the aggregate importance of hardwoods may be greater than pine, especially on subxeric and mesic sites.

Classification Comments: This system (CES202.313) is distinguished from the equivalent Appalachian system (CES202.332) at its western extent in central Tennessee by the absence of *Pinus virginiana* and *Quercus prinus*, which do not cross the Mississippi River.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
- Ouachita Novaculite Glade and Woodland (CES202.314)
- Ozark-Ouachita Dry Oak Woodland (CES202.707)
- Ozark-Ouachita Dry-Mesic Oak Forest (CES202.708)
- Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)

DESCRIPTION

Environment: In the Ozark Highlands, this system was historically prominent only in the southeastern part, where sandstone derived soils were common (USFS 1999); being limited in other areas by inadequate winter precipitation, and non-conductive soils. In contrast, pine was "virtually ubiquitous in the historical forests of the Ouachitas" (USFS 1999). In nearly all cases (at least in the Ouachitas), *Pinus echinata* occurs with a variable mixture of hardwood species. The exact composition of the hardwoods is much more closely related to aspect and topographic factors than is the pine component (Dale and Ware 1999).

Vegetation: Stands of this system typically contain *Pinus echinata* with various oak species, including *Quercus alba*, *Quercus rubra*, *Quercus falcata*, *Quercus stellata*, *Quercus velutina*, and *Quercus marilandica*. In some examples of this system, the aggregate importance of hardwoods may be greater than pine, especially on subxeric and mesic sites (Dale and Ware 1999). Typical shrubs include *Vaccinium arboreum*, *Vaccinium pallidum*, and *Vaccinium stamineum*. Characteristic herbs include *Schizachyrium scoparium*, *Chasmanthium sessiliflorum*, *Solidago ulmifolia*, *Monarda russeliana*, and *Echinacea pallida*.

MEMBERSHIP

Associations:

- *Pinus echinata* - *Quercus (alba, rubra)* / *Vaccinium (arboreum, pallidum)* / *Schizachyrium scoparium* - *Chasmanthium sessiliflorum* - *Solidago ulmifolia* Forest (CEGL007489, G3G4)
- *Pinus echinata* - *Quercus alba* - *Quercus falcata* Forest (CEGL004444, G3?Q)
- *Pinus echinata* - *Quercus alba* / *Schizachyrium scoparium* Woodland (CEGL002394, G3G4)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Woodland (CEGL002393, G2G3)
- *Pinus echinata* - *Quercus velutina* - *Quercus stellata* / *Vaccinium* spp. Forest (CEGL002401, G3)
- *Pinus echinata* / Rock Outcrop Interior Highland Woodland (CEGL002402, G2G3)
- *Pinus echinata* / *Schizachyrium scoparium* - *Solidago ulmifolia* - *Monarda russeliana* - *Echinacea pallida* Woodland (CEGL007815, G1G2)
- *Pinus echinata* / *Vaccinium (arboreum, pallidum, stamineum)* Forest (CEGL002400, G3G4)

Alliances:

- *Pinus echinata* - *Quercus (alba, falcata, stellata, velutina)* Forest Alliance (A.394)
- *Pinus echinata* - *Quercus (alba, falcata, stellata, velutina)* Woodland Alliance (A.679)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Pinus echinata* Forest Alliance (A.119)
- *Pinus echinata* Woodland Alliance (A.515)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Ozark-Ouachita Mesic Hardwood Forest (CES202.043)
- Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)

DISTRIBUTION

Range: This system occurs in the Ouachita and Ozark mountains region of Arkansas, adjacent Oklahoma, and southern Missouri.

Divisions: 202:C

Nations: US

Subnations: AR, MO, OK

Map Zones: 44:C

USFS Ecomap Regions: 223A:CC, 231G:CC, M223A:CC, M231A:CC

TNC Ecoregions: 38:C, 39:C

SOURCES

References: Comer et al. 2003, Dale and Ware 1999, USFS 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723183#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 17 Apr 2006

Concept Author: T. Foti and R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1342 PIEDMONT HARDPAN WOODLAND AND FOREST (CES202.268)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Clay Soil Texture; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2342; ESLF 4149; ESP 1342

CONCEPT

Summary: This Piedmont system occurs in places where a particularly dense clay hardpan has developed over a range of typically mafic rocks, sometimes with more limited areas of shallow glade-like vegetation. In the deeper soil portions of this system, the density of the clay, in combination with its shrink-swell properties, limits water and root penetration into the soil and creates xeric conditions for plants despite the presence of deep soil. Possibly most typical of this system in North Carolina is an open forest or woodland of *Quercus stellata*, with *Quercus marilandica* as a characteristic associate. The open canopy leads to a better developed herb layer than in most Piedmont forests, one that is usually grassy. In Virginia, typical canopy trees include *Quercus alba*, *Carya glabra*, and *Fraxinus americana*. Some of these sites may have once supported open prairies or prairie savannas when they burned more frequently. Fire was probably once the most important natural dynamic process, but the universal elimination of fire in the Piedmont makes this difficult to observe on most of the modern landscape.

Classification Comments: This system is distinguished from others in the Piedmont by occurrence on distinctive substrates. These include hardpan soils in the Triassic basins, as well as on soils derived from gabbro and on acidic metasediments in the Carolina Slate Belt. Despite the contrast in vegetation, this system will sometimes grade quite gradually into Piedmont Upland Depression Swamp (CES202.336), with which it often co-occurs.

Similar Ecological Systems:

- Piedmont Upland Depression Swamp (CES202.336)

Related Concepts:

- Piedmont Flatwoods (Wharton 1978) Finer
- Piedmont Hardpan Forests (Fleming et al. 2005) Equivalent
- Xeric Hardpan Forest (Schafale and Weakley 1990) Equivalent

DESCRIPTION

Environment: This system occurs in places in the Piedmont where a particularly dense clay hardpan, apparently generally of Montmorillonite, has developed. The substrate is typically mafic igneous or metamorphic rock (gabbro, basalt, diabase, or amphibolite) but occasionally is slate. The density of the clay, or its shrink-swell properties, limits penetration of water into the soil and limits penetration of roots, creating xeric conditions for plants despite the presence of deep soil. These areas generally occur on unusually flat uplands but may occur on tops of narrower ridges. Only a minority of these substrates form the distinctive soil conditions of this system. Local topography that promotes runoff is important to forming this system. Areas with these soil conditions but with concave topography perch water and support Piedmont depressional wetlands. Soils in most examples are basic or circumneutral, but those formed from slate are somewhat acidic. In Virginia and adjacent Maryland, this system occupies one of the largest Triassic basins in eastern North America. It includes a mix of sedimentary rocks, especially siltstone, mixed with igneous intrusions. The igneous rocks weather to form more mafic soils, while the sedimentary rocks are more acidic. The local landscape may best be thought of as a lowland, in comparison with the surrounding and prevailing topography.

Vegetation: Vegetation consists of xerophytic species, most typically consisting of open forests or woodlands of *Quercus stellata*, with *Quercus marilandica* as a characteristic associate in North Carolina. In Virginia and adjacent Maryland, *Quercus alba*, *Fraxinus americana*, and *Carya glabra* are common canopy components. The open canopy leads to a better developed herb layer than in most Piedmont forests, one that is usually grassy. Some of these sites may have once supported open prairies or prairie savannas when they burned more frequently. A significant flora of shade-intolerant herbs with prairie affinities is present in open areas on these soils to support this idea. In contrast to upland forests of adjacent portions of the Virginia Piedmont, there is a pronounced difference in the abundance of hickory present (Farrell and Ware 1991, Ware 1992).

Dynamics: Fire was probably once the most important natural dynamic process, but the universal elimination of fire in the Piedmont makes this difficult to tell. The xeric nature of the sites may have allowed fire to create open vegetation on these sites at the same frequency at which it allowed forests to exist on more typical soils. Fire would have kept canopies open by limiting trees and would have promoted a more diverse, grass-dominated herb layer. Bison may have once been a significant influence on this system.

MEMBERSHIP

Associations:

- *Carya glabra* - *Quercus (rubra, prinus)* - *Fraxinus americana* / *Viburnum rafinesquianum* / *Piptochaetium avenaceum* Forest (CEGL006209, G1G2)
- *Fraxinus americana* - *Juniperus virginiana* / *Talinum teretifolium* - *Polygonum tenue* - *Opuntia humifusa* Wooded Herbaceous

- Vegetation (CEGL006294, G1)
- *Pinus echinata* - (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* - *Salvia urticifolia* Woodland (CEGL008492, G2?)
 - *Quercus alba* - *Carya glabra* - *Fraxinus americana* / *Cercis canadensis* / *Muhlenbergia sobolifera* - *Elymus hystrix* Forest (CEGL006216, G3)
 - *Quercus alba* - *Carya glabra* / *Schizachyrium scoparium* - *Helianthus divaricatus* - *Salvia urticifolia* - *Parthenium auriculatum* Woodland (CEGL003721, G1?)
 - *Quercus alba* - *Quercus rubra* - *Carya alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
 - *Quercus stellata* - (*Pinus echinata*) / *Schizachyrium scoparium* - *Echinacea laevigata* - *Oligoneuron album* Woodland (CEGL003558, G1)
 - *Quercus stellata* - (*Pinus echinata*) / *Schizachyrium scoparium* - *Symphotrichum georgianum* Woodland (CEGL003711, G1)
 - *Quercus stellata* - (*Quercus marilandica*) / *Gaylussacia frondosa* Acidic Hardpan Woodland (CEGL004413, G2)
 - *Quercus stellata* - *Carya (carolinae-septentrionalis, glabra)* - (*Quercus marilandica*) / *Ulmus alata* / (*Schizachyrium scoparium*, *Piptochaetium avenaceum*) Woodland (CEGL003714, G2G3)
 - *Quercus stellata* - *Carya carolinae-septentrionalis* / *Acer leucoderme* / *Piptochaetium avenaceum* - *Danthonia spicata* Woodland (CEGL003713, G2)
 - *Sporobolus vaginiflorus* var. *ozarkanus* - *Diodia teres* - *Croton willdenowii* - *Ruellia humilis* Herbaceous Vegetation (CEGL004276, G1)

Alliances:

- (*Fraxinus americana*, *Juniperus virginiana*) / *Carex pensylvanica* - *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.3014)
- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus (alba, rubra)* Forest Alliance (A.258)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system.

Size: Occurs in large patches, ranging up to dozens of acres.

Adjacent Ecological Systems:

- Piedmont Upland Depression Swamp (CES202.336)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Piedmont Upland Depression Swamp (CES202.336) occurs on similar soils with topography that limits runoff of rainwater. Most are surrounded by basic soil associations of Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) on less extreme soils.

DISTRIBUTION

Range: As currently known, this system is found in the Piedmont of Maryland, Virginia, North Carolina, South Carolina and Georgia. Its status in Alabama is not known. Its occurrence may be more frequent in the Triassic basins, but it is not restricted to them.

Divisions: 202:C

Nations: US

Subnations: GA, MD, NC, SC, VA

Map Zones: 54:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 221B:CC, 221D:CC, 221J:CC, 231A:CC, 231D:CC, 231I:CC, M221A:CC, M221B:CC

TNC Ecoregions: 52:C, 61:C

SOURCES

References: Comer et al. 2003, EPA 2004, Farrell and Ware 1991, Southeastern Ecology Working Group n.d., Ware 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723218#references

Description Author: M. Schafale, R. Evans, G. Fleming, M. Pyne, mod. J. Teague

Version: 23 Jul 2007

Concept Author: M. Schafale, R. Evans, G. Fleming, M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

1011 ROCKY MOUNTAIN ASPEN FOREST AND WOODLAND (CES306.813)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Broad-Leaved Deciduous Tree; *Populus tremuloides*

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Temperate [Temperate Continental]; Mesotrophic Soil; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2011; ESLF 4104; ESP 1011

CONCEPT

Summary: This widespread ecological system is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. An eastern extension occurs along the Rocky Mountains foothill front and in mountain "islands" in Montana (Big Snowy and Highwood mountains), and the Black Hills of South Dakota. In California, this system is only found on the east side of the Sierra Nevada adjacent to the Great Basin. Large stands are found in the Inyo and White mountains, while small stands occur on the Modoc Plateau. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand. Secondly, it is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. In California, *Symphytotrichum spathulatum* (= *Aster occidentalis*) is a common forb. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests. It differs from Northwestern Great Plains Aspen Forest and Parkland (CES303.681), which is limited to plains environments.

Classification Comments: The scattered occurrences in Trans-Pecos of Texas are of interest as they represent disjunct outliers of the type occurring under highly limited circumstances.

Similar Ecological Systems:

- Northwestern Great Plains Aspen Forest and Parkland (CES303.681)--is limited to plains environments.

Related Concepts:

- Aspen Woodland (411) (Shiflet 1994) Broader
- Aspen: 217 (Eyre 1980) Broader

DESCRIPTION

Environment: Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 15 inches and typically greater than 20 inches, except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or large snow drifts. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondly, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable, sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. The soils are typically deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Vegetation: Occurrences have a somewhat closed canopy of trees of 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers that may be present but never codominant include *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Picea pungens*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 15% of the tree canopy before the occurrence is reclassified as a mixed occurrence. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors like disturbance, the understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs.

Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata* (= *Carex foenea*), *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa*

comata. Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Delphinium* spp., *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual *Bromus tectorum* are often common in occurrences disturbed by grazing.

Dynamics: Occurrences in this ecological system often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease and windthrow, or clearcutting by man or beaver. The stems of these thin-barked, clonal trees are easily killed by ground fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1993). The stems are relatively short-lived (100-150 years), and the occurrence will succeed to longer-lived conifer forest if undisturbed. Occurrences are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because of the long moist conditions required to establish are rare in the habitats that it occurs in. Superficial soil drying will kill seedlings (Knight 1993).

MEMBERSHIP

Associations:

- *Ceanothus velutinus* Shrubland (CEGL002167, GNR)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911, G3?)
- *Populus tremuloides* / *Acer glabrum* Forest (CEGL000563, G1G2)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Bromus carinatus* Forest (CEGL000566, G3G5)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest (CEGL000567, G4)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / Mixed Graminoid Forest (CEGL002816, GNR)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000568, G5)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest (CEGL000569, G5)
- *Populus tremuloides* / *Amelanchier alnifolia* / *Pteridium aquilinum* Forest (CEGL000565, G2G3)
- *Populus tremuloides* / *Amelanchier alnifolia* / Tall Forbs Forest (CEGL000570, G3G5)
- *Populus tremuloides* / *Amelanchier alnifolia* / *Thalictrum fendleri* Forest (CEGL000571, G3G4)
- *Populus tremuloides* / *Amelanchier alnifolia* Forest (CEGL000564, G4)
- *Populus tremuloides* / *Artemisia tridentata* / *Monardella odoratissima* - *Kelloggia galioides* Forest (CEGL003146, GNR)
- *Populus tremuloides* / *Artemisia tridentata* Forest (CEGL000572, G3G4)
- *Populus tremuloides* / *Bromus carinatus* Forest (CEGL000573, G5)
- *Populus tremuloides* / *Calamagrostis rubescens* Forest (CEGL000575, G5?)
- *Populus tremuloides* / *Carex geyeri* Forest (CEGL000579, G4)
- *Populus tremuloides* / *Carex rossii* Forest (CEGL000580, G5)
- *Populus tremuloides* / *Carex siccata* Forest (CEGL000578, G4)
- *Populus tremuloides* / *Ceanothus velutinus* Forest (CEGL000581, G2)
- *Populus tremuloides* / *Corylus cornuta* Forest (CEGL000583, G3)
- *Populus tremuloides* / *Festuca thurberi* Forest (CEGL000585, G4)
- *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595, G3)
- *Populus tremuloides* / *Heracleum sphondylium* Forest (CEGL000586, G4Q)
- *Populus tremuloides* / *Hesperostipa comata* Forest (CEGL000608, G2G4)
- *Populus tremuloides* / Invasive Perennial Grasses Forest (CEGL003748, GNA)
- *Populus tremuloides* / *Juniperus communis* / *Carex geyeri* Forest (CEGL000588, G4G5)
- *Populus tremuloides* / *Juniperus communis* / *Lupinus argenteus* Forest (CEGL000589, G3G4)
- *Populus tremuloides* / *Juniperus communis* Forest (CEGL000587, G4)
- *Populus tremuloides* / *Ligusticum filicinum* Forest (CEGL000591, G4Q)
- *Populus tremuloides* / *Lonicera involucrata* Forest (CEGL000592, G3)
- *Populus tremuloides* / *Lupinus argenteus* Forest (CEGL000593, GNR)
- *Populus tremuloides* / *Mahonia repens* Forest (CEGL000594, G3)
- *Populus tremuloides* / *Monardella odoratissima* Forest (CEGL003145, G3)
- *Populus tremuloides* / *Prunus virginiana* Forest (CEGL000596, G3G4)
- *Populus tremuloides* / *Pteridium aquilinum* Forest (CEGL000597, G4)
- *Populus tremuloides* / *Quercus gambelii* / *Symphoricarpos oreophilus* Forest (CEGL000598, GNR)
- *Populus tremuloides* / *Ribes montigenum* Forest (CEGL000600, G2)
- *Populus tremuloides* / *Rosa woodsii* Forest (CEGL003149, GNR)
- *Populus tremuloides* / *Rubus parviflorus* Forest (CEGL000602, G2)
- *Populus tremuloides* / *Rudbeckia occidentalis* Forest (CEGL000603, GNRQ)
- *Populus tremuloides* / *Salix scouleriana* Forest (CEGL000604, G4)
- *Populus tremuloides* / *Sambucus racemosa* Forest (CEGL000605, G2G3)
- *Populus tremuloides* / *Shepherdia canadensis* Forest (CEGL000606, G3G4)
- *Populus tremuloides* / *Spiraea betulifolia* Forest (CEGL000607, G4Q)
- *Populus tremuloides* / *Symphoricarpos albus* / *Elymus glaucus* Woodland (CEGL000946, G3)
- *Populus tremuloides* / *Symphoricarpos albus* Forest (CEGL000609, G3?)
- *Populus tremuloides* / *Symphoricarpos occidentalis* Forest [Provisional] (CEGL005848, GNR)

- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Bromus carinatus* Forest (CEGL000611, G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest (CEGL000612, G3G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Carex rossii* Forest (CEGL000613, G3G4)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Festuca thurberi* Forest (CEGL000614, G3?)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615, G3G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest (CEGL000616, G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Wyethia amplexicaulis* Forest (CEGL000617, G4Q)
- *Populus tremuloides* / *Symphoricarpos oreophilus* Forest (CEGL000610, G5)
- *Populus tremuloides* / Tall Forbs Forest (CEGL000618, G5)
- *Populus tremuloides* / *Thalictrum fendleri* Forest (CEGL000619, G5)
- *Populus tremuloides* / *Urtica dioica* Forest [Provisional] (CEGL005849, G2G3)
- *Populus tremuloides* / *Vaccinium myrtillus* Forest (CEGL000620, G3)
- *Populus tremuloides* / *Wyethia amplexicaulis* Forest (CEGL000622, G3)

Alliances:

- *Ceanothus velutinus* Shrubland Alliance (A.787)
- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Populus tremuloides* Woodland Alliance (A.610)

SPATIAL CHARACTERISTICS

Size: This system is not actually very extensive in the Oregon Cascades and probably non-existent in the Coast Ranges. It is not very extensive in western Washington either. Most patches may be too small to map. Many may be relict stands from another climate, just barely hanging on. In the Cascades this system occurs as a small-patch type, not large-patch.

Adjacent Ecological Systems:

- Rocky Mountain Bigtooth Maple Ravine Woodland (CES306.814)

DISTRIBUTION

Range: This system is more common in the central and southern Rocky Mountains extending south to the Sacramento Mountains, however, it occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada, as well as west into California. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Very small occurrences may be found in a few scattered locations of the Trans-Pecos of Texas.

Divisions: 204:C; 206:P; 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, TX, UT, WA, WY

Map Zones: 1:C, 3:C, 6:C, 7:C, 8:?, 9:C, 10:C, 12:C, 13:?, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:P, 25:C, 26:C, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315H:PP, 321A:CC, 322A:CC, 331A:CC, 331F:CC, 331G:CC, 331I:C?, 331J:CC, 331K:CP, 331N:CP, 332F:??, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242B:CP, M242C:CC, M242D:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CP, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 1:P, 3:C, 4:P, 5:P, 7:C, 8:C, 9:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 26:C, 81:P

SOURCES

References: Bartos 1979, Bartos and Campbell 1998, Bartos and Mueggler 1979, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, DeByle and Winokur 1985, DeVelice et al. 1986, Henderson et al. 1977, Hess and Wasser 1982, Johnston and Hendzel 1985, Keammerer 1974a, Mueggler 1988, Neely et al. 2001, Powell 1988a, Tuhy et al. 2002, Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722860#references

Description Author: M.S. Reid, mod. G. Kittel

Version: 20 Apr 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, Southeast, West

ClassifResp: West

1012 ROCKY MOUNTAIN BIGTOOTH MAPLE RAVINE WOODLAND (CES306.814)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ravine; Stream terrace (undifferentiated); Toeslope; Mineral: W/ A-Horizon <10 cm; Unconsolidated; Broad-Leaved Deciduous Tree; *Acer grandidentatum*; Colluvial slope

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Forest and Woodland (Treed); Toeslope/Valley Bottom; Temperate [Temperate Continental]; Mesotrophic Soil; Landslide

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2012; ESLF 4105; ESP 1012

CONCEPT

Summary: This ecological system occurs in cool ravines, on toeslopes and slump benches associated with riparian areas in the northern and central Wasatch Range and Tavaputs Plateau extending into southern Idaho, as well as in scattered localities in southwestern Utah, central Arizona and New Mexico and the Trans-Pecos of Texas. Substrates are typically rocky colluvial or alluvial soils with favorable soil moisture. These woodlands are dominated by *Acer grandidentatum* but may include mixed stands codominated by *Quercus gambelii* or with scattered conifers. Some stands may include *Acer negundo* or *Populus tremuloides* as minor components. It also occurs on steeper, north-facing slopes at higher elevations, often adjacent to Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) or Rocky Mountain Aspen Forest and Woodland (CES306.813).

Classification Comments: In the Trans-Pecos of Texas, this system is a cool ravine woodland type generally occupying lower slope positions. It forms a patchy narrow band on lower slopes that may include *Quercus muehlenbergii*, *Acer grandidentatum*, *Fraxinus* sp., *Prunus serotina*, and *Arbutus xalapensis*. Some of these stands may be included in North American Warm Desert Lower Montane Riparian Woodland and Shrubland (CES302.748) or the broader group North American Warm Desert Riparian Systems (CES302.612).

Related Concepts:

- Bigtooth Maple (418) (Shiflet 1994) Equivalent

MEMBERSHIP

Associations:

- *Abies concolor* / *Acer grandidentatum* Forest (CEGL000241, G4)
- *Acer grandidentatum* - *Quercus gravesii* Forest (CEGL004548, G1)
- *Acer grandidentatum* - *Quercus muehlenbergii* Forest (CEGL004547, G2?)
- *Acer grandidentatum* / *Calamagrostis rubescens* Forest (CEGL000558, G2Q)
- *Acer grandidentatum* / *Quercus gambelii* Forest (CEGL000559, G4G5)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Acer grandidentatum* Montane Forest Alliance (A.265)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Rocky Mountain Aspen Forest and Woodland (CES306.813)
- Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

Adjacent Ecological System Comments: It may occur on steeper, north-facing slopes at higher elevations, often adjacent to Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) or Rocky Mountain Aspen Forest and Woodland (CES306.813).

DISTRIBUTION

Range: Occurs in the northern and central Wasatch Range and Tavaputs Plateau extending into southern Idaho, as well as in scattered localities in southwestern Utah, central Arizona and New Mexico and the Trans-Pecos of Texas.

Divisions: 302:C; 304:?: 306:C

Nations: US

Subnations: ID, NM, TX, UT

Map Zones: 15:C, 16:C, 17:C, 18:C, 23:P, 24:P, 25:C, 26:C

USFS Ecomap Regions: 315A:PP, 321A:PP, 341A:CC, 342C:C?, 342D:CC, 342E:CC, 342J:CC, M313A:CC, M313B:CC, M331D:CC, M331E:CC, M341A:CP, M341B:CC, M341C:CP

TNC Ecoregions: 6:C, 9:C, 18:P, 21:P, 24:C

SOURCES

References: Comer et al. 2003, Gehlbach 1967, Ream 1964

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722859#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Southeast, West

ClassifResp: West

1049 ROCKY MOUNTAIN FOOTHILL LIMBER PINE-JUNIPER WOODLAND (CES306.955)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Forest and Woodland (Treed); Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Aridic; Long Disturbance Interval; F-Patch/High Intensity; Needle-Leaved Tree; *Pinus flexilis*, *Juniperus scopulorum*, *J. osteosperma*

Non-Diagnostic Classifiers: Escarpment; Montane [Lower Montane]; Hillslope bedrock outcrop; Ridgetop bedrock outcrop; Ridge/Summit/Upper Slope; Sideslope; Temperate [Temperate Continental]; Loam Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2049; ESLF 4236; ESP 1049

CONCEPT

Summary: This ecological system occurs in foothill and lower montane zones in the Rocky Mountains from northern Montana south to central Colorado and on escarpments across Wyoming extending out into the western Great Plains. Elevation ranges from 1000-2400 m. It occurs generally below continuous forests of *Pseudotsuga menziesii* or *Pinus ponderosa* and can occur in large stands well within the zone of continuous forests in the northeastern Rocky Mountains. It is restricted to shallow soils and fractured bedrock derived from a variety of parent material, including limestone, sandstone, dolomite, granite and colluvium. Soils have a high rock component (typically over 50% cover) and are coarse- to fine-textured, often gravelly and calcareous. Slopes are typically moderately steep to steep. At higher elevations, it is limited to the most xeric aspects on rock outcrops, and at lower elevations to the relatively mesic north aspects. Fire is infrequent and spotty because rocky substrates prevent a continuous vegetation canopy needed to spread. Vegetation is characterized by an open-tree canopy or patchy woodland that is dominated by either *Pinus flexilis*, *Juniperus osteosperma*, or *Juniperus scopulorum*. *Pinus edulis* is not present. A sparse to moderately dense short-shrub layer, if present, may include a variety of shrubs, such as *Arctostaphylos uva-ursi*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Cercocarpus montanus*, *Dasiphora fruticosa ssp. floribunda*, *Ericameria nauseosa*, *Juniperus horizontalis*, *Purshia tridentata*, *Rhus trilobata*, *Rosa woodsii*, *Shepherdia canadensis* (important in Montana stands), *Symphoricarpos albus*, or *Symphoricarpos oreophilus*. Herbaceous layers are generally sparse, but range to moderately dense, and are typically dominated by perennial graminoids such as *Bouteloua gracilis*, *Festuca idahoensis*, *Festuca campestris*, *Danthonia intermedia*, *Leucopoa kingii*, *Hesperostipa comata*, *Koeleria macrantha*, *Piptatherum micranthum*, *Poa secunda*, or *Pseudoroegneria spicata*. Within this ecological system, there may be small patches of grassland or shrubland composed of some of the above species. In Wyoming, some limber pine stands are found up to 2440 m (8000 feet) elevation and are still included in this system.

Related Concepts:

- Limber Pine: 219 (Eyre 1980) Intersecting
- Rocky Mountain Juniper: 220 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Juniperus osteosperma* / *Artemisia tridentata ssp. wyomingensis* Woodland (CEGL000730, G5?)
- *Juniperus osteosperma* / *Cercocarpus ledifolius* Woodland (CEGL000734, G3?)
- *Juniperus osteosperma* / *Cercocarpus montanus* Woodland (CEGL000735, G2G3)
- *Juniperus osteosperma* / *Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus scopulorum* - *Cercocarpus ledifolius* Woodland (CEGL000744, G3?)
- *Juniperus scopulorum* / *Artemisia nova* Woodland (CEGL000742, G2?)
- *Juniperus scopulorum* / *Artemisia tridentata* Woodland (CEGL000743, G3Q)
- *Juniperus scopulorum* / *Cercocarpus montanus* Woodland (CEGL000745, G2)
- *Juniperus scopulorum* / *Piptatherum micranthum* Woodland (CEGL000747, G3G4)
- *Juniperus scopulorum* / *Pseudoroegneria spicata* Woodland (CEGL000748, G4)
- *Juniperus scopulorum* / *Purshia tridentata* Woodland (CEGL000749, G2)
- *Juniperus scopulorum* / *Schizachyrium scoparium* Woodland (CEGL000750, G2)
- *Krascheninnikovia lanata* / *Phlox* spp. Dwarf-shrubland (CEGL001325, G3Q)
- *Pinus edulis* - *Juniperus osteosperma* / *Amelanchier utahensis* Woodland (CEGL002329, GNR)
- *Pinus flexilis* / *Cercocarpus ledifolius* Woodland (CEGL000804, G4)
- *Pinus flexilis* / *Cercocarpus montanus* - *Amelanchier utahensis* Woodland (CEGL005320, GNR)
- *Pinus flexilis* / *Festuca campestris* Woodland (CEGL000806, G3)
- *Pinus flexilis* / *Festuca idahoensis* Woodland (CEGL000805, G5)
- *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807, G5)
- *Pinus flexilis* / *Juniperus osteosperma* Woodland (CEGL000808, G3)

- *Pinus flexilis* / *Juniperus scopulorum* Woodland (CEGL000809, G3)
- *Pinus flexilis* / *Leucopoa kingii* Woodland (CEGL000810, G3)
- *Pinus flexilis* / *Pseudoroegneria spicata* Woodland (CEGL000813, G4?)
- *Pinus flexilis* / *Symphoricarpos oreophilus* Woodland (CEGL005321, GNR)
- *Pinus flexilis* Scree Woodland (CEGL000815, G3Q)

Alliances:

- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus flexilis* Woodland Alliance (A.540)

DISTRIBUTION

Range: This system occurs in foothill and lower montane zones in the Rocky Mountains from northern Montana south to central Colorado and on escarpments across Wyoming, extending out into the western Great Plains. Elevation ranges from 1000-2400 m. This system may also occur in southeastern Idaho, though it would not be common there. It is also very likely to occur north into Canada along the Front Range of Alberta, in similar ecological settings.

Divisions: 303:C; 306:C

Nations: CA?, US

Subnations: AB?, CO, MT, ND, SD, WY

Map Zones: 16:C, 19:C, 20:C, 21:P, 22:C, 28:C, 29:C, 30:C, 31:?, 33:C, 40:?

USFS Ecomap Regions: 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CP, 331N:CC, 332C:CC, 342A:CC, 342E:CC, 342F:CC, 342G:CC, M242D:PP, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331I:CC, M331J:CC, M332D:CC, M334A:??

TNC Ecoregions: 8:C, 9:C, 10:C, 20:C, 25:P, 26:C, 27:C

SOURCES

References: Anderson 1999b, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, DeVelice and Lesica 1993, Hansen and Hoffman 1988, Knight 1994, Knight et al. 1987, Steele et al. 1983, Thilenius et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722726#references

Description Author: G. Jones, K. Schulz, mod. G. Kittel

Version: 20 Apr 2006

Concept Author: G. Jones, K. Schulz

Stakeholders: Canada, Midwest, West

ClassifResp: West

1050 ROCKY MOUNTAIN LODGEPOLE PINE FOREST (CES306.820)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Acidic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic; Long Disturbance Interval; F-Patch/High Intensity [Seasonality/Fall Fire]; F-Landscape/High Intensity; Needle-Leaved Tree; *Pinus contorta*

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Forest and Woodland (Treed); Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2050; ESLF 4237; ESP 1050

CONCEPT

Summary: This ecological system is widespread in upper montane to subalpine elevations of the Rocky Mountains, Intermountain West region, north into the Canadian Rockies and east into mountain "islands" of north-central Montana. These are subalpine forests where the dominance of *Pinus contorta* is related to fire history and topo-edaphic conditions. Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests which developed following fires. This system includes *Pinus contorta*-dominated stands that, while typically persistent for >100-year time frames, may succeed to spruce-fir; in the southern and central Rocky Mountains it is seral to Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828). More northern occurrences are seral to Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830). Soils supporting these forests are typically well-drained, gravelly, coarse-textured, acidic, and rarely formed from calcareous parent materials. These forests are dominated by *Pinus contorta* with shrub, grass, or barren understories. Sometimes there are intermingled mixed conifer/*Populus tremuloides* stands, with the latter occurring with inclusions of deeper, typically fine-textured soils. The shrub stratum may be conspicuous to absent; common species include *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Linnaea borealis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Spiraea douglasii*, *Shepherdia canadensis*, *Vaccinium caespitosum*, *Vaccinium scoparium*, *Vaccinium membranaceum*, *Symphoricarpos albus*, and *Ribes* spp. In southern interior British Columbia, this system is usually an open lodgepole pine forest found extensively between 500 and 1600 m elevation in the Columbia Range. In the Interior Cedar Hemlock and Interior Douglas-fir zones, *Tsuga heterophylla* or *Pseudotsuga menziesii* may present.

Related Concepts:

- BIPa - Juniper - Cladonia (ESSFvx2/02) (Steen and Coupe 1997) Intersecting
- BIP1 - Cladonia (ESSFmm1/03) (DeLong 1996) Intersecting
- Lodgepole Pine: 218 (Eyre 1980) Broader
- LP Lodgepole pine, Interior Cedar Hemlock and Interior Douglas-fir zones (Ecosystems Working Group 1998) Broader
- P1 - Huckleberry - Cladonia (ESSFwc2/02) (Lloyd et al. 1990) Intersecting
- P1 - Huckleberry - Knight's plume (SBSmw/11) (Steen and Coupe 1997) Intersecting
- P1 - Huckleberry - Velvet-leaved blueberry (SBSmw/03) (Steen and Coupe 1997) Intersecting
- P1 - Juniper - Dwarf blueberry (SBSmc3/02) (Steen and Coupe 1997) Intersecting
- P1 - Juniper - Dwarf blueberry (SBSmc3/02) (DeLong et al. 1993) Intersecting
- P1 - Juniper - Ricegrass (SBSdk/02) (Steen and Coupe 1997) Intersecting
- P1 - Juniper - Ricegrass (SBSdk/02) (Banner et al. 1993) Intersecting
- P1 - Juniper - Ricegrass (SBSdk/02) (DeLong et al. 1993) Intersecting
- P1 - Labrador tea - Velvet-leaved blueberry (SBSdh1/05) (DeLong 1996) Intersecting
- P1 - Velvet-leaved blueberry - Cladonia (SBSdh1/02) (DeLong 1996) Intersecting
- PIB1 - Soopolallie - Kinnikinnick (MSdc2/04) (Steen and Coupe 1997) Intersecting
- SwP1 - Soopolallie - Twinflower (BWBSdk1/05) (MacKinnon et al. 1990) Intersecting

DESCRIPTION

Dynamics: *Pinus contorta* is an aggressively colonizing, shade-intolerant conifer which usually occurs in lower subalpine forests in the major ranges of the western United States. Establishment is episodic and linked to stand-replacing disturbances, primarily fire. The incidence of serotinous cones varies within and between varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire, and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a). Hoffman and Alexander (1980, 1983) report that in stands where *Pinus contorta* exhibits a multi-aged population structure, with regeneration occurring, there is typically a higher proportion of trees bearing nonserotinous cones.

MEMBERSHIP

Associations:

- *Ceanothus velutinus* Shrubland (CEGL002167, GNR)

- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Pinus contorta* / *Arnica cordifolia* Forest (CEGL000135, G4?)
- *Pinus contorta* / *Carex geyeri* Forest (CEGL000141, G4?)
- *Pinus contorta* / *Ceanothus velutinus* Forest (CEGL000145, G4)
- *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland (CEGL005921, G4G5)
- *Pinus contorta* / *Clintonia uniflora* Forest (CEGL005916, G5)
- *Pinus contorta* / *Heracleum maximum* Woodland (CEGL005915, G3?)
- *Pinus contorta* / *Linnaea borealis* Forest (CEGL000153, G5)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922, G4G5)
- *Pinus contorta* / *Menziesia ferruginea* Forest (CEGL005928, G3G4)
- *Pinus contorta* / *Osmorhiza berteroi* Forest (CEGL000155, G3Q)
- *Pinus contorta* / *Pedicularis racemosa* Forest (CEGL000156, G2Q)
- *Pinus contorta* / *Shepherdia canadensis* Forest (CEGL000163, G3G4)
- *Pinus contorta* / *Spiraea betulifolia* Forest (CEGL000164, G3G4)
- *Pinus contorta* / *Spiraea douglasii* Forest (CEGL002604, G3G4)
- *Pinus contorta* / *Symphoricarpos albus* Forest (CEGL000166, G3Q)
- *Pinus contorta* / *Thalictrum occidentale* Forest (CEGL000167, G4Q)
- *Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005923, G4?)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168, G5)
- *Pinus contorta* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005913, G4G5)
- *Pinus contorta* / *Vaccinium membranaceum* Forest (CEGL000170, G4?)
- *Pinus contorta* / *Vaccinium membranaceum* Rocky Mountain Forest (CEGL000169, G3G4)
- *Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest (CEGL000174, G3Q)
- *Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005924, G3G4)
- *Pinus contorta* / *Vaccinium scoparium* Forest (CEGL000172, G5)
- *Pinus contorta* / *Xerophyllum tenax* Forest (CEGL000175, G5)
- *Pinus contorta* var. *latifolia* / *Vaccinium scoparium* / *Carex inops* ssp. *inops* Forest (CEGL000173, G3)

Alliances:

- *Ceanothus velutinus* Shrubland Alliance (A.787)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Pinus contorta* Forest Alliance (A.118)
- *Pinus contorta* Woodland Alliance (A.512)

DISTRIBUTION

Range: This system occurs at upper montane to subalpine elevations of the Rocky Mountains, Intermountain West region, north into the Canadian Rockies, and east onto mountain "islands" of north-central Montana. In Washington, this system occurs mostly on the east side of the Cascade Crest. In Oregon, this system only occurs in the Blue Mountains; all Oregon Cascades lodgepole pine forests are included in other systems.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, BC, CO, ID, MT, NV, OR, UT, WA, WY

Map Zones: 1:C, 8:?, 9:C, 10:C, 16:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:?, 28:C, 29:C, 33:?

USFS Ecomap Regions: 331A:CC, 331G:CC, 331J:CC, 331K:C?, 342A:CC, 342B:C?, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342J:CC, M242B:CC, M242C:CC, M242D:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CP, M331G:CP, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 20:C, 26:C, 68:C

SOURCES

References: Alexander 1986, Alexander et al. 1987, Anderson 1999a, Arno et al. 1985, Barrows et al. 1977, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Despain 1973a, Despain 1973b, Ecosystems Working Group 1998, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnston 1997, Kingery 1998, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Moir 1969a, Nachlinger et al. 2001, Neely et al. 2001, Pfister et al. 1977, Steele et al. 1981, Whipple 1975, Williams and Smith 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722853#references

Description Author: R. Crawford, M.S. Reid, G. Kittel

Version: 20 Apr 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

1167 ROCKY MOUNTAIN POOR-SITE LODGEPOLE PINE FOREST (CES306.960)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Acidic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic; Long Disturbance Interval; F-Patch/High Intensity [Seasonality/Fall Fire]; F-Landscape/High Intensity; Needle-Leaved Tree; *Pinus contorta*

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2167; ESLF 4267; ESP 1167

CONCEPT

Summary: This ecological system is widespread but patchy in distribution in upper montane to subalpine elevations of the Rocky Mountains and Intermountain region. These are subalpine forests, occasionally found in the montane zone, where the dominance of *Pinus contorta* is related to topo-edaphic conditions and nutrient-poor soils. These include excessively well-drained pumice deposits, glacial till and alluvium on valley floors where there is cold-air accumulation, warm and droughty shallow soils over fractured quartzite bedrock, and shallow moisture-deficient soils with a significant component of volcanic ash. Pumice soils at lower elevations of the pumice zone of Oregon support this system. Soils on these sites are typically well-drained, gravelly, coarse-textured, acidic, and rarely formed from calcareous parent materials. Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands and then persist on these sites that are too extreme for other conifers to establish. In some cases, stands are open to dense and may be multi-aged, not just even-aged. These forests are dominated by *Pinus contorta* with shrub, grass, or barren understories. Sometimes there are intermingled mixed conifer/*Populus tremuloides* stands, with the latter occurring with inclusions of deeper, typically fine-textured soils. In central Oregon, *Pseudotsuga menziesii*, *Pinus ponderosa*, and *Abies concolor* may be present, and *Populus tremuloides* may be present as small patches. The shrub stratum may be conspicuous to absent; common species include *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Juniperus communis*, *Ceanothus velutinus*, *Linnaea borealis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Shepherdia canadensis*, *Vaccinium scoparium*, *Symphoricarpos albus*, and *Ribes* spp. Some open stands with very sparse understories can experience a form of mixed-severity burning via cigarette burning along downed logs (insufficient fuels between logs to carry fire). Depending on the arrangement and loading of logs to living trees, either mortality or fire-scarring may occur.

Classification Comments: The higher elevation *Pinus contorta* forests of the southern Cascades are included in Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland (CES206.912).

Related Concepts:

- Lodgepole Pine: 218 (Eyre 1980) Broader

DESCRIPTION

Dynamics: *Pinus contorta* is an aggressively colonizing, shade-intolerant conifer which usually occurs in lower subalpine forests in the major ranges of the western United States. Establishment is episodic and linked to stand-replacing disturbances, primarily fire. The incidence of serotinous cones varies within and between varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a). Hoffman and Alexander (1980, 1983) report that, in stands where *Pinus contorta* exhibits a multi-aged population structure with regeneration occurring, there is typically a higher proportion of trees bearing nonserotinous cones.

Past clearcutting has expanded this type into ponderosa pine forests south of Bend, Oregon, by creating frost pockets that favor lodgepole pine establishment.

MEMBERSHIP

Associations:

- *Pinus contorta* / *Achnatherum occidentale* Woodland (CEGL000165, G4Q)
- *Pinus contorta* / *Arctostaphylos uva-ursi* Forest (CEGL000134, G5)
- *Pinus contorta* / *Artemisia tridentata* / *Elymus elymoides* Woodland (CEGL000137, G3)
- *Pinus contorta* / *Artemisia tridentata* / *Festuca idahoensis* Woodland (CEGL000136, G3)
- *Pinus contorta* / *Calamagrostis rubescens* Forest (CEGL000139, G5)
- *Pinus contorta* / *Carex geyeri* Forest (CEGL000141, G4?)
- *Pinus contorta* / *Carex pensylvanica* Forest (CEGL000143, G3G4)
- *Pinus contorta* / *Carex rossii* Forest (CEGL000144, G5)
- *Pinus contorta* / *Danthonia californica* Forest (CEGL000146, G3Q)
- *Pinus contorta* / *Festuca idahoensis* Woodland (CEGL000149, G3)
- *Pinus contorta* / *Juniperus communis* Woodland (CEGL000764, G5)
- *Pinus contorta* / *Mahonia repens* Forest (CEGL000154, G4G5)
- *Pinus contorta* / *Purshia tridentata* - *Ribes cereum* Woodland (CEGL000161, G4)

- *Pinus contorta* / *Purshia tridentata* / *Carex pensylvanica* Forest (CEGL000159, G4)
- *Pinus contorta* / *Purshia tridentata* Woodland (CEGL000765, G3)
- *Pinus contorta* / *Vaccinium scoparium* Forest (CEGL000172, G5)
- *Pinus contorta* var. *latifolia* / *Purshia tridentata* / *Achnatherum occidentale* ssp. *occidentale* Woodland (CEGL000162, G3)
- *Pinus contorta* var. *latifolia* / *Purshia tridentata* / *Festuca idahoensis* Woodland (CEGL000160, G3)

Alliances:

- *Pinus contorta* Forest Alliance (A.118)
- *Pinus contorta* Woodland Alliance (A.512)

DISTRIBUTION

Range: This system is found in the upper montane to subalpine elevations of the Rocky Mountains from north-central Colorado north and west into Wyoming, Montana, Idaho, Oregon and Washington, as well as the Intermountain region (northeastern Nevada and north-central Utah). In north-central Montana (mapzone 20), it may occur on appropriate habitats (intrusive volcanics, very nutrient-poor) within "island" mountain ranges (Big Snowy and Highwood mountains). In central Wyoming, it may occur in the Ferris Mountains and possibly north into the Bighorns.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, BC?, CO?, ID, MT, NV?, OR, UT, WA, WY

Map Zones: 7:?, 8:?, 9:C, 10:C, 16:P, 19:C, 20:?, 21:C, 22:C, 28:C, 29:P

USFS Ecomap Regions: 342B:P?, 342C:PP, 342D:PP, 342H:PP, 342J:PP, M331A:CC, M331B:CC, M331D:CC, M331E:CP, M331H:C?, M331I:C?, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:??, M333B:??, M333C:??, M333D:??

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 20:C, 26:P, 68:C

SOURCES

References: Alexander 1986, Alexander et al. 1987, Anderson 1999a, Arno et al. 1985, Barrows et al. 1977, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Despain 1973a, Despain 1973b, Ecosystems Working Group 1998, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnston 1997, Kingery 1998, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Moir 1969a, Nachlinger et al. 2001, Neely et al. 2001, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Whipple 1975, Williams and Smith 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.786433#references

Description Author: M.S. Reid

Version: 23 Jan 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1055 ROCKY MOUNTAIN SUBALPINE DRY-MESIC SPRUCE-FIR FOREST AND WOODLAND (CES306.828)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: RM Subalpine Mesic Spruce-Fir; Long (>500 yrs) Persistence; Montane [Upper Montane]; Forest and Woodland (Treed); Acidic Soil; Ustic; Very Long Disturbance Interval [Seasonality/Summer Disturbance]; F-Patch/High Intensity; F-Landscape/High Intensity; Needle-Leaved Tree; *Abies lasiocarpa* - *Picea engelmannii*

Non-Diagnostic Classifiers: Montane [Montane]; Ridge/Summit/Upper Slope; Sideslope; Temperate [Temperate Continental]; Mesotrophic Soil; Shallow Soil; Mineral: W/ A-Horizon >10 cm; W-Patch/Medium Intensity; W-Landscape/Low Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2055; ESLF 4242; ESP 1055

CONCEPT

Summary: Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, and south into New Mexico and the Intermountain region. They also occur on mountain "islands" of north-central Montana. They are the matrix forests of the subalpine zone, with elevations ranging from 1275 m in its northern distribution to 3355 m in the south (4100-11,000 feet). They often represent the highest elevation forests in an area. Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. Despite their wide distribution, the tree canopy characteristics are remarkably similar, with *Picea engelmannii* and *Abies lasiocarpa* dominating either mixed or alone. *Pseudotsuga menziesii* may persist in occurrences of this system for long periods without regeneration. *Pinus contorta* is common in many occurrences, and patches of pure *Pinus contorta* are not uncommon, as well as mixed conifer/*Populus tremuloides* stands. In some areas, such as Wyoming, *Picea engelmannii*-dominated forests are on limestone or dolomite, while nearby codominated spruce-fir forests are on granitic or volcanic rocks. Upper elevation examples may have more woodland physiognomy, and *Pinus albicaulis* can be a seral component. What have been called "ribbon forests" or "tree islands" by some authors are included here; they can be found at upper treeline in many areas of the Rockies, including the central and northern ranges in Colorado and the Medicine Bow and Bighorn ranges of Wyoming. These are more typically islands or ribbons of trees, sometimes with a krummholz form, with open-meadow areas in a mosaic. These patterns are controlled by snow deposition and wind-blown ice. Xeric species may include *Juniperus communis*, *Linnaea borealis*, *Mahonia repens*, or *Vaccinium scoparium*. In the Bighorn Mountains, *Artemisia tridentata* is a common shrub. More northern occurrences often have taller, more mesic shrub and herbaceous species, such as *Empetrum nigrum*, *Rhododendron albiflorum*, and *Vaccinium membranaceum*. Disturbance includes occasional blowdown, insect outbreaks and stand-replacing fire. Mean return interval for stand-replacing fire is 222 years as estimated in southeastern British Columbia.

Classification Comments: It has been proposed to split out the tree island or ribbon forests of high timberline in the drier mountain ranges of north-central Colorado, southern Wyoming and north-central Wyoming (the Bighorns) into a new Southern Rocky Mountain Parkland system. With further discussion, this may be implemented, but for now these areas are still included in this existing system.

Similar Ecological Systems:

- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)
- Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

Related Concepts:

- DL Douglas-fir Lodgepole Pine (Ecosystems Working Group 1998) Broader. in ESSFdv1 dv2 xc xc2 xc4 xv2
- EF Engelmann Spruce - Sub-alpine Fir Dry Forested (Ecosystems Working Group 1998) Broader. Dry Grouseberry/Crowberry sites, Azalea/Rhododendron sites in ESSFdv dv1 dv2 xc xc 3 xc4 xv1 xv2
- Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) Broader

DESCRIPTION

Dynamics: *Picea engelmannii* can be very long-lived, reaching 500 years of age. *Abies lasiocarpa* decreases in importance relative to *Picea engelmannii* with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. *Picea engelmannii* can rapidly recolonize and dominate burned sites, or can succeed other species such as *Pinus contorta* or *Populus tremuloides*. Due to great longevity, *Pseudotsuga menziesii* may persist in occurrences of this system for long periods without regeneration. Old-growth characteristics in *Picea engelmannii* forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags. Landfire VDDT models: #RSPFI.

MEMBERSHIP

Associations:

- *Abies lasiocarpa* - *Picea engelmannii* / *Arnica cordifolia* Forest (CEGL000298, G5)

- *Abies lasiocarpa* - *Picea engelmannii* / *Arnica latifolia* Forest (CEGL000299, G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis rubescens* Forest (CEGL000301, G4G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Carex geyeri* Forest (CEGL000304, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311, G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Juniperus communis* Woodland (CEGL000919, G4G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Linnaea borealis* Forest (CEGL000315, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / Moss Forest (CEGL000321, G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Polemonium pulcherrimum* Forest (CEGL000373, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Symphoricarpos albus* Forest (CEGL000337, G3)
- *Abies lasiocarpa* - *Picea engelmannii* / *Thalictrum occidentale* Forest (CEGL000338, G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium myrtillus* Forest (CEGL000343, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* Forest (CEGL000344, G5)
- *Abies lasiocarpa* - *Picea engelmannii* Krummholz Shrubland (CEGL000985, G4)
- *Abies lasiocarpa* - *Picea engelmannii* Tree Island Forest (CEGL000329, GUQ)
- *Abies lasiocarpa* / *Carex rossii* Forest (CEGL000305, G4G5)
- *Abies lasiocarpa* / *Carex siccata* Forest (CEGL000303, G2)
- *Abies lasiocarpa* / *Jamesia americana* Forest (CEGL000312, G1)
- *Abies lasiocarpa* / *Lathyrus lanszwertii* var. *leucanthus* Forest (CEGL000313, G3G4)
- *Abies lasiocarpa* / *Mahonia repens* Forest (CEGL000318, G5)
- *Abies lasiocarpa* / *Osmorhiza berteroi* Forest (CEGL000323, G4)
- *Abies lasiocarpa* / *Packera sanguisorboides* Forest (CEGL000333, G3)
- *Abies lasiocarpa* / *Paxistima myrsinites* Woodland (CEGL000324, G4)
- *Abies lasiocarpa* / *Pedicularis racemosa* Forest (CEGL000325, G5)
- *Abies lasiocarpa* / *Physocarpus malvaceus* Forest (CEGL000326, G3)
- *Abies lasiocarpa* / *Saxifraga bronchialis* Scree Woodland (CEGL000924, G4)
- *Abies lasiocarpa* / *Spiraea betulifolia* Forest (CEGL000335, G4)
- *Abies lasiocarpa* / *Xerophyllum tenax* Forest (CEGL000346, G5)
- *Abies lasiocarpa* Scree Woodland (CEGL000925, G5?)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Picea (engelmannii X glauca, engelmannii)* / *Clintonia uniflora* Forest (CEGL000406, G4)
- *Picea engelmannii* / *Arnica cordifolia* Forest (CEGL000355, G3G4)
- *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL000360, G3)
- *Picea engelmannii* / *Erigeron eximius* Forest (CEGL000364, G5)
- *Picea engelmannii* / *Galium triflorum* Forest (CEGL002174, G4)
- *Picea engelmannii* / *Geum rossii* Forest (CEGL000366, G3?)
- *Picea engelmannii* / *Hypnum revolutum* Forest (CEGL000368, G3)
- *Picea engelmannii* / *Juniperus communis* Forest (CEGL005925, G3)
- *Picea engelmannii* / *Leymus triticoides* Forest (CEGL000362, G3)
- *Picea engelmannii* / *Linnaea borealis* Forest (CEGL002689, G4)
- *Picea engelmannii* / *Trifolium dasyphyllum* Forest (CEGL000377, G2?)
- *Picea engelmannii* / *Vaccinium myrtillus* Forest (CEGL000379, G4Q)
- *Picea engelmannii* / *Vaccinium scoparium* Forest (CEGL000381, G3G5)

Alliances:

- *Abies lasiocarpa* - *Picea engelmannii* - *Pinus flexilis* Krummholz Shrubland Alliance (A.811)
- *Abies lasiocarpa* - *Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Picea engelmannii* Forest Alliance (A.164)

DISTRIBUTION

Range: This system is found in the Cascades and Rocky Mountains from southern interior British Columbia east into Alberta, south into New Mexico and the Intermountain region. This type tends to be very limited in the northern Oregon Cascades.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 1:C, 6:?, 7:C, 9:C, 10:C, 12:C, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:P, 24:P, 25:C, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 315A:PP, 321A:CC, 331J:CC, 341A:CC, 341B:CC, 341D:CC, 341E:CP, 341F:CC, 341G:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242B:CC, M242C:CC, M242D:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC,

M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 26:C, 68:C

SOURCES

References: Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Anderson 1999a, Brand et al. 1976, Canadian Rockies Ecoregional Plan 2002, Clagg 1975, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Fitzgerald et al. 1994, Fitzhugh et al. 1987, Graybosch and Buchanan 1983, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Hopkins 1979a, Hopkins 1979b, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, Major et al. 1981, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1992, Nachlinger et al. 2001, Neely et al. 2001, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Romme 1982, Schaupp et al. 1999, Steele and Geier-Hayes 1995, Steele et al. 1981, Tuhy et al. 2002, Veblen 1986, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams et al. 1995, Wong and Iverson 2004, Wong et al. 2003, Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722845#references

Description Author: R. Crawford and M.S. Reid, mod. C. Chappell and G. Kittel

Version: 25 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

1056 ROCKY MOUNTAIN SUBALPINE MESIC-WET SPRUCE-FIR FOREST AND WOODLAND (CES306.830)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: RM Subalpine Dry-Mesic Spruce-Fir; Long (>500 yrs) Persistence; Montane [Upper Montane]; Forest and Woodland (Treed); Acidic Soil; Udic; Very Long Disturbance Interval [Seasonality/Summer Disturbance]; F-Patch/High Intensity; F-Landscape/Medium Intensity; *Abies lasiocarpa* - *Picea engelmannii*

Non-Diagnostic Classifiers: Montane [Montane]; Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Mesotrophic Soil; Shallow Soil; Mineral: W/ A-Horizon >10 cm

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2056; ESLF 4243; ESP 1056

CONCEPT

Summary: This is a high-elevation system of the Rocky Mountains, dry eastern Cascades and eastern Olympic Mountains dominated by *Picea engelmannii* and *Abies lasiocarpa*. It extends westward into the northeastern Olympic Mountains and the northeastern side of Mount Rainier in Washington, and as far east as mountain "islands" of north-central Montana. *Picea engelmannii* is generally more important in southern forests than those in the Pacific Northwest. Occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate. These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as small to large patches within the matrix of this mesic spruce-fir system and only in the most maritime of environments (the coldest and wettest of the more Continental subalpine fir forests). In the Olympics and northern Cascades, the climate is more maritime than typical for this system, but due to the lower snowfall in these rainshadow areas, summer drought may be more significant than snowpack in limiting tree regeneration in burned areas. *Picea engelmannii* is rare in these areas. Mesic understory shrubs include *Menziesia ferruginea*, *Vaccinium membranaceum*, *Rhododendron albiflorum*, *Amelanchier alnifolia*, *Rubus parviflorus*, *Ledum glandulosum*, *Phyllodoce empetriformis*, and *Salix* spp. Herbaceous species include *Actaea rubra*, *Maianthemum stellatum*, *Cornus canadensis*, *Erigeron eximius*, *Gymnocarpium dryopteris*, *Rubus pedatus*, *Saxifraga bronchialis*, *Tiarella* spp., *Lupinus arcticus* ssp. *subalpinus*, *Valeriana sitchensis*, and graminoids *Luzula glabrata* var. *hitchcockii* or *Calamagrostis canadensis*. Disturbances include occasional blowdown, insect outbreaks (30-50 years), mixed-severity fire, and stand-replacing fire (every 150-500 years). The more summer-dry climatic areas also have occasional high-severity fires.

Classification Comments: This system is similar to Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828) but is distinguished by its occurrence on mesic to wet microsites within the matrix of the drier (and warmer) subalpine spruce-fir or lodgepole pine forests. The microsites include north-facing slopes, swales or ravines, toeslopes, cold pockets, and other locations where available soil moisture is higher or lasts longer into the growing season. This system is NOT confined to the northern Rocky Mountains or Pacific Northwest (it is not geographically defined, rather by topographic settings in the subalpine).

While the name of this system suggests a Rocky Mountain distribution, floristic affinities of Engelmann spruce-subalpine fir forests in western Washington and the Oregon Cascades are such that the spruce-fir forests of those regions are included in this system. The subalpine fir-dominated forests of the northeastern Olympic Mountains and the northeastern side of Mount Rainier are included here. They are more similar to subalpine fir forests on the eastern slopes of the Cascades than they are to mountain hemlock forests.

Similar Ecological Systems:

- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Related Concepts:

- B1 - Devil's club - *Rhododendron* (ESSFmv3/05) (MacKinnon et al. 1990) Intersecting
- B1 - Gooseberry - Oak fern (ESSFdc2/06) (Steen and Coupe 1997) Intersecting
- B1 - Grouseberry - *Cladonia* (ESSFdc2/04) (Steen and Coupe 1997) Intersecting
- B1 - Horsetail - Feathermoss (ESSFmv3/07) (MacKinnon et al. 1990) Intersecting
- B1 - Huckleberry - Feathermoss (ESSFdc2/05) (Steen and Coupe 1997) Intersecting
- B1 - Oak fern - Knight's plume (ESSFmv3/04) (Banner et al. 1993) Intersecting
- B1 - Oak fern - Knight's plume (ESSFmv3/04) (MacKinnon et al. 1990) Intersecting
- B1 - *Rhododendron* - Feathermoss (ESSFmv3/01) (Banner et al. 1993) Intersecting
- B1 - *Rhododendron* - Feathermoss (ESSFmv3/01) (MacKinnon et al. 1990) Intersecting
- B1 - *Rhododendron* - Grouseberry (ESSFdc2/01) (Steen and Coupe 1997) Intersecting
- B1 - *Rhododendron* - Valerian (ESSFdc2/07) (Steen and Coupe 1997) Intersecting
- B1 - Trapper's tea (ESSFdc2/08) (Steen and Coupe 1997) Intersecting
- B1P1 - Crowberry - *Cladonia* (ESSFmv3/02) (Banner et al. 1993) Intersecting

- BIPI - Crowberry - Cladina (ESSFmv3/02) (MacKinnon et al. 1990) Intersecting
- BIPI - Rhododendron (ESSFmv3/08) (MacKinnon et al. 1990) Intersecting
- BISb - Labrador tea (ESSFmv3/03) (Banner et al. 1993) Intersecting
- BISb - Labrador tea (ESSFmv3/03) (MacKinnon et al. 1990) Intersecting
- EF Engelmann Spruce - Sub-alpine Fir Dry Forested (Ecosystems Working Group 1998) Broader. Rhododendron sites, Azalea/ Rhododendron sites, in ESSFdc1 dc2 mw wc1 wc2 wc4 xc ICHmk1 mk2 mw2 mw3 mw5 vk1 wk1
- Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) Broader
- EW Engelmann Spruce - Mountain Hemlock (Ecosystems Working Group 1998) Broader. in ESSFdc2 dv1 mw; IH in ESSFdc1 dc2 wc1 wc2 wc4
- Mountain Hemlock: 205 (Eyre 1980) Intersecting. Mountain hemlock in the northern Rockies of MT, ID and northeast WA is included in this ecological system.
- no data (Essfdc3/) (BCMF 2006) Intersecting
- Se - Trapper's tea - Glow moss (ESSFvx2/09) (Steen and Coupe 1997) Intersecting
- Se - Willow - Glow moss (ESSFvx2/10) (Steen and Coupe 1997) Intersecting

DESCRIPTION

Dynamics: Landfire VDDT models: #RSPFI and #RABLA.

MEMBERSHIP

Associations:

- *Abies lasiocarpa* - *Picea engelmannii* / *Acer glabrum* Forest (CEGL000294, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Actaea rubra* Forest (CEGL000295, G4?)
- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL000300, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005892, G4G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* - *Vaccinium scoparium* Forest (CEGL005894, G2G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893, G4G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005896, G4?)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Woodland (CEGL005897, G3G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895, G4G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Ribes (montigenum, lacustre, inerme)* Forest (CEGL000331, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Salix (brachycarpa, glauca)* Krummholz Shrubland (CEGL000986, GUQ)
- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* - *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005920, G2G3)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005918, G3G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917, GNR)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Thalictrum occidentale* Forest (CEGL005919, G3G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914, G4G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Valeriana sitchensis* Woodland (CEGL005823, G2?)
- *Abies lasiocarpa* - *Picea engelmannii* / *Xerophyllum tenax* - *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005898, G4G5)
- *Abies lasiocarpa* - *Picea engelmannii* Ribbon Forest (CEGL000328, GUQ)
- *Abies lasiocarpa* / *Caltha leptosepala* ssp. *howellii* Forest (CEGL000302, G3)
- *Abies lasiocarpa* / *Clematis columbiana* var. *columbiana* Forest (CEGL000306, G3?)
- *Abies lasiocarpa* / *Coptis occidentalis* Forest (CEGL000308, G4)
- *Abies lasiocarpa* / *Cornus canadensis* Forest (CEGL000309, G3G4)
- *Abies lasiocarpa* / *Erigeron eximius* Forest (CEGL000310, G5)
- *Abies lasiocarpa* / *Gymnocarpium dryopteris* Forest (CEGL002611, GNRQ)
- *Abies lasiocarpa* / *Ledum glandulosum* Forest (CEGL000314, G4)
- *Abies lasiocarpa* / *Phyllodoce empetriformis* Woodland (CEGL000920, G4Q)
- *Abies lasiocarpa* / *Rhododendron albiflorum* Woodland (CEGL000330, G4)
- *Abies lasiocarpa* / *Rubus parviflorus* Forest (CEGL000332, G5)
- *Abies lasiocarpa* / *Vaccinium membranaceum* / *Valeriana sitchensis* Forest (CEGL002612, G4)
- *Abies lasiocarpa* / *Vaccinium membranaceum* Forest (CEGL000342, G4)
- *Betula papyrifera* - Conifer / *Clintonia uniflora* Woodland (CEGL005904, G3G4)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Picea (engelmannii X glauca, engelmannii)* / *Packera streptanthifolia* Forest (CEGL000414, G4)
- *Picea engelmannii* / *Acer glabrum* Forest (CEGL000354, G2)
- *Picea engelmannii* / *Maianthemum stellatum* Forest (CEGL000415, G4?)
- *Picea engelmannii* / Moss Forest (CEGL000371, G4)
- *Picea engelmannii* / *Packera cardamine* Forest (CEGL000375, G2)
- *Picea engelmannii* / *Physocarpus malvaceus* Forest (CEGL002676, G3)

- *Picea engelmannii* / *Ribes montigenum* Forest (CEGL000374, G5?)
- *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Clintonia uniflora* Forest (CEGL005906, G3?)
- *Populus tremuloides* - *Abies lasiocarpa* / *Amelanchier alnifolia* Forest (CEGL000524, G3?)
- *Populus tremuloides* - *Abies lasiocarpa* / *Carex geyeri* - *Calamagrostis rubescens* Forest (CEGL000525, G3?)
- *Populus tremuloides* - *Abies lasiocarpa* / *Juniperus communis* Forest (CEGL000527, G3G4)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504, G3)
- *Tsuga mertensiana* / *Luzula glabrata* var. *hitchcockii* Forest (CEGL000505, G5)
- *Tsuga mertensiana* / *Menziesia ferruginea* Forest (CEGL000506, G4)
- *Tsuga mertensiana* / *Rhododendron albiflorum* Forest (CEGL000508, GNR)
- *Tsuga mertensiana* / *Streptopus amplexifolius* Forest (CEGL000511, G2)
- *Tsuga mertensiana* / *Vaccinium membranaceum* Forest (CEGL000514, G4)
- *Tsuga mertensiana* / *Xerophyllum tenax* Forest (CEGL000516, G4)

Alliances:

- *Abies lasiocarpa* - *Picea engelmannii* - *Pinus flexilis* Krummholz Shrubland Alliance (A.811)
- *Abies lasiocarpa* - *Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa* - *Populus tremuloides* Forest Alliance (A.422)
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Betula papyrifera* Woodland Alliance (A.603)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Picea engelmannii* Forest Alliance (A.164)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Tsuga mertensiana* Forest Alliance (A.146)
- *Tsuga mertensiana* Seasonally Flooded Forest Alliance (A.186)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)

DISTRIBUTION

Range: This system is found at high elevations of the Rocky Mountains, extending west into the northeastern Olympic Mountains and the northeastern side of Mount Rainier in Washington, and as far east as mountain "islands" of north-central Montana.

Divisions: 204:C; 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 1:C, 6:?, 7:C, 8:?, 9:C, 10:C, 12:C, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:P, 23:P, 24:P, 25:C, 27:C, 28:C, 29:C

USFS Ecomap Regions: 242A:CC, 313A:CC, 313B:CC, 315A:??, 331J:CC, 341A:CC, 341B:CC, 341D:CC, 341E:CP, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CP, 342D:CC, 342E:CC, 342H:CC, 342I:C?, 342J:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 1:C, 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 26:C, 68:C

SOURCES

References: Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Anderson 1999a, Brand et al. 1976, Canadian Rockies Ecoregional Plan 2002, Clagg 1975, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Fitzgerald et al. 1994, Graybosch and Buchanan 1983, Henderson et al. 1989, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, Major et al. 1981, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1996, Neely et al. 2001, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Romme 1982, Schaupp et al. 1999, Steele and Geier-Hayes 1995, Steele et al. 1981, Tuhy et al. 2002, Veblen 1986, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams et al. 1995, Wong and Iverson 2004, Wong et al. 2003, Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722843#references

Description Author: R. Crawford, C. Chappell, M.S. Reid, G. Kittel

Version: 19 Apr 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1057 ROCKY MOUNTAIN SUBALPINE-MONTANE LIMBER-BRISTLECONE PINE WOODLAND (CES306.819)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Upper Treeline; Ridge/Summit/Upper Slope; Calcareous; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; W-Patch/High Intensity; W-Landscape/High Intensity; Needle-Leaved Tree; *Pinus flexilis*, *P. aristata*

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Forest and Woodland (Treed); Temperate [Temperate Continental]; Alkaline Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2057; ESLF 4244; ESP 1057

CONCEPT

Summary: This ecological system occurs throughout the Rocky Mountains, south of Montana, on dry, rocky ridges and slopes near upper treeline above the matrix spruce-fir forest. It extends down to the lower montane in the northeastern Great Basin mountains where dominated by *Pinus flexilis*. Sites are harsh, exposed to desiccating winds, with rocky substrates and a short growing season that limit plant growth. Higher-elevation occurrences are found well into the subalpine-alpine transition on wind-blasted, mostly west-facing slopes and exposed ridges. Calcareous substrates are important for *Pinus flexilis*-dominated communities in the northern Rocky Mountains and possibly elsewhere. The open tree canopy is often patchy and is strongly dominated by *Pinus flexilis* or *Pinus aristata* with the latter restricted to southern Colorado, northern New Mexico and the San Francisco Mountains in Arizona. In the Wyoming Rockies and northern Great Basin, *Pinus albicaulis* is found in some occurrences, but is a minor component. Other trees such as *Juniperus* spp., *Pinus contorta*, *Pinus ponderosa*, or *Pseudotsuga menziesii* are occasionally present. *Arctostaphylos uva-ursi*, *Cercocarpus ledifolius*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Ribes montigenum*, or *Vaccinium* spp. may form an open shrub layer in some stands. The herbaceous layer, if present, is generally sparse and composed of xeric graminoids, such as *Calamagrostis purpurascens*, *Festuca arizonica*, *Festuca idahoensis*, *Festuca thurberi*, or *Pseudoroegneria spicata*, or more alpine plants.

Classification Comments: This system is distinguished from lower montane and foothill limber pine stands in Wyoming and Montana. The foothill system (Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)) is found at the lower treeline, below the zone of continuous *Pinus ponderosa* or *Pseudotsuga menziesii* woodlands and forest, and extends out into the eastern portions of these states in the foothill zones of mountain ranges, along rock outcrops, breaks along rivers, and on sheltered sites where soil moisture is slightly higher than surrounding grasslands.

This system needs to be more clearly distinguished from Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807), which also includes woodlands of *Pinus flexilis* and *Pinus albicaulis* and occurs in similar environmental settings of the northern Rocky Mountains, particularly northwestern Wyoming, Montana, and north into Alberta and British Columbia. There is a proposal to include the dry, subalpine *Pinus albicaulis* woodlands of the Blue Mountains (Oregon) and northern Nevada into this system, Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819). For Landfire, these *Pinus albicaulis* woodlands were included in the subalpine parkland system, but ecologically and floristically they are more similar to Rocky Mountain dry subalpine woodlands.

Related Concepts:

- Bristlecone Pine: 209 (Eyre 1980) Broader
- Limber Pine: 219 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Pinus aristata* / *Festuca arizonica* Woodland (CEGL000759, G4)
- *Pinus aristata* / *Festuca thurberi* Woodland (CEGL000760, G5)
- *Pinus aristata* / *Juniperus communis* Woodland (CEGL002894, GU)
- *Pinus aristata* / *Ribes montigenum* Woodland (CEGL000761, G3)
- *Pinus aristata* / *Trifolium dasyphyllum* Woodland (CEGL000762, G2)
- *Pinus aristata* / *Vaccinium myrtillus* Woodland (CEGL002895, GU)
- *Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland (CEGL000802, G4)
- *Pinus flexilis* / *Calamagrostis purpurascens* Woodland (CEGL000803, G4)
- *Pinus flexilis* / *Cercocarpus ledifolius* Woodland (CEGL000804, G4)
- *Pinus flexilis* / *Dasiphora fruticosa* ssp. *floribunda* / *Distichlis spicata* Woodland (CEGL000812, G1)
- *Pinus flexilis* / *Festuca campestris* Woodland (CEGL000806, G3)
- *Pinus flexilis* / *Festuca idahoensis* Woodland (CEGL000805, G5)
- *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807, G5)
- *Pinus flexilis* / *Juniperus osteosperma* Woodland (CEGL000808, G3)

- *Pinus flexilis* / *Juniperus scopulorum* Woodland (CEGL000809, G3)
- *Pinus flexilis* / *Leucopoa kingii* Woodland (CEGL000810, G3)
- *Pinus flexilis* / *Mahonia repens* Woodland (CEGL000811, G3?)
- *Pinus flexilis* / *Pseudoroegneria spicata* Woodland (CEGL000813, G4?)
- *Pseudotsuga menziesii* - *Pinus flexilis* / *Leucopoa kingii* Woodland (CEGL000906, G4Q)

Alliances:

- *Pinus aristata* Woodland Alliance (A.537)
- *Pinus flexilis* Temporarily Flooded Woodland Alliance (A.564)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

DISTRIBUTION

Range: This system occurs throughout the Rocky Mountains south of Montana on dry, rocky ridges and slopes near upper treeline, including the Uinta and northern Wasatch mountains, and the Jarbridge Mountains in northeastern Nevada. It also occurs farther east, in the Bighorn Range of north-central Wyoming, although it is not common there.

Divisions: 303:C; 304:C; 306:C

Nations: CA, US

Subnations: CO, ID?, MT?, NM, NV, OR?, UT, WA?, WY

Map Zones: 9:C, 12:P, 15:P, 16:C, 18:C, 23:P, 24:C, 25:C, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313B:CC, 331J:CC, 341G:PP, 342J:??, M242B:CP, M242C:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CP, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332G:CC, M341A:CC, M341B:CC

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 20:C, 21:C, 26:C, 68:P

SOURCES

References: Baker n.d., Beasley and Klemmedson 1980, Brunstein and Yamaguchi 1992, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Knight 1994, Krebs 1972, LaMarche and Mooney 1972, Lanner and Vander Wall 1980, Neely et al. 2001, Ranne 1995, Ranne et al. 1997, Steele et al. 1983

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722854#references

Description Author: NatureServe Western Ecology Team

Version: 05 Oct 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1058 SIERRA NEVADA SUBALPINE LODGEPOLE PINE FOREST AND WOODLAND (CES206.912)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Mediterranean [Mediterranean Xeric-Oceanic]; Shallow Soil; Xeric; Short Disturbance Interval [Periodicity/Irregular Disturbance]; *Pinus contorta*

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Acidic Soil; Sand Soil Texture; F-Patch/High Intensity; Avalanche; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2058; ESLF 4245; ESP 1058

CONCEPT

Summary: This ecological system is widespread in glacial basins at upper montane to subalpine elevations of the central and northern Sierra Nevada and Transverse and Peninsular ranges where cold-dry conditions exist (1800-2450 m [6000-8000 feet] in the north and 2450-3600 m [8000-12,000 feet] in the south). It also occurs on extensive broad ridges and pumice plateaus of the southern Cascades in Oregon (the broad ridges that form the Cascade crest in southern Oregon tend to be dominated by extensive stands of lodgepole pine). These forests and woodlands are dominated by *Pinus contorta* var. *murrayana* with shrub, grass or barren understories. Soils are often shallow and coarse-textured. Avalanche as well as tree mortality from insect outbreak and disease, drought and associated wildfire are drivers of community structure and composition. Understories are open, with scattered shrubs and herbaceous species, which do not carry fire should one get started. Trees can be very large and old and can attain diameters of 1.2 m (4 feet). Associated plant species include *Arctostaphylos nevadensis*, *Ceanothus cordulatus*, *Cercocarpus ledifolius* (although not that common, just occasional in drier sites), *Chrysolepis sempervirens*, *Phyllodoce breweri*, and *Ribes montigenum*. Common graminoids include *Poa wheeleri*, *Carex filifolia*, *Carex rossii*, and *Carex exserta*. Fire-return intervals are many hundreds of years. This system occurs in less severe settings than Mediterranean California Subalpine Woodland (CES206.910) and Northern California Mesic Subalpine Woodland (CES206.911) and is made up of trees that are not usually krummholz. Avalanches are less of a factor except in association with the volcanic peaks. Low-elevation stands of *Pinus contorta* in the pumice zone of Oregon are included in Rocky Mountain Poor-Site Lodgepole Pine Forest (CES306.960).

Similar Ecological Systems:

- Mediterranean California Subalpine Woodland (CES206.910)
- Northern California Mesic Subalpine Woodland (CES206.911)

Related Concepts:

- Lodgepole Pine: 218 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Pinus contorta* var. *murrayana* / *Artemisia tridentata* Forest (CEGL005812, G3?)
- *Pinus contorta* var. *murrayana* / *Carex exserta* Forest (CEGL008667, G4)
- *Pinus contorta* var. *murrayana* / *Carex rossii* Forest (CEGL002749, G3?)
- *Pinus contorta* var. *murrayana* / *Ledum glandulosum* Forest (CEGL008668, G3)
- *Pinus contorta* var. *murrayana* / *Ligusticum grayi* Forest (CEGL002747, G4?)
- *Pinus contorta* var. *murrayana* / *Penstemon newberryi* Woodland (CEGL002748, G3?)
- *Pinus contorta* var. *murrayana* / Sparse Understory Forest (CEGL003069, G4?)
- *Pinus contorta* var. *murrayana* / Sparse Understory Woodland (CEGL003070, G3G4)

Alliances:

- *Pinus contorta* Forest Alliance (A.118)
- *Pinus contorta* Woodland Alliance (A.512)

DISTRIBUTION

Range: This system occurs in glacial basins at upper montane to subalpine elevations of the central and northern Sierra Nevada and Transverse and Peninsular ranges where cold-dry conditions exist (1800-2450 m [6000-8000 feet] in the north and 2450-3600 m [8000-12,000 feet] in the south). It also extends south into Baja California, Mexico, in the San Pedro Martir Mountains.

If present in Oregon, the most likely location is the southern Oregon Cascades. The broad ridges that form the Cascade Crest in southern Oregon tend to be dominated by extensive stands of lodgepole pine (south of Crater Lake and north maybe to Mount Bachelor). There are also relatively large areas of lodgepole pine along the broad crest from Mt. Jefferson to a little ways north of Olallie Butte that may also fit this type better than the Rocky Mountain lodgepole pine type, as these stands are more likely dominated by *Pinus contorta* var. *murrayana* than var. *latifolia*. Understory species are probably different from those listed, however.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), NV, OR

Map Zones: 4:C, 6:C, 7:C, 12:C

USFS Ecomap Regions: 341D:CC, 342B:??, M242B:CC, M242C:CC, M261A:CP, M261D:CC, M261E:CC, M261G:CC

TNC Ecoregions: 4:C, 5:C, 12:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722769#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid and L. Evers

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

1172 SIERRAN-INTERMONTANE DESERT WESTERN WHITE PINE-WHITE FIR WOODLAND (CES204.101)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Very Shallow Soil; Aridic; Short Disturbance Interval; F-Patch/Low Intensity; F-Landscape/Low Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2172; ESLF 4269; ESP 1172

CONCEPT

Summary: This interior Pacific Northwest ecological system occurs on the Modoc Plateau and Warner Mountains of California, north into the Fremont National Forest along the east slope of the southern Cascades in Oregon, and may also occur in isolated high-elevation ranges of northern Nevada. These forests and woodlands range from just above the zone of ponderosa pine in the montane zone, to the upper montane zone. Elevations range from 1370 m to over 2135 m (4500-7000 feet). Occurrences are found on all slopes and aspects, although more frequently on drier areas, including northwest- and southeast-facing slopes, but also occurs on northerly slopes and ridges. This ecological system generally occurs on basalts, andesite, glacial till, basaltic rubble, colluvium, or volcanic ash-derived soils, and sometimes on granitics (Carson Range). These soils have characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. Climatically, this system occurs somewhat in the rainshadow of the Sierras and Cascades and has a more continental regime, similar to the northern Great Basin. This system tends to be more woodland than forest in character, and the undergrowth is more open and drier, with little shrub or herbaceous cover. Tree regeneration is less prolific than in other mixed-montane conifer systems of the Cascades, Sierras and California Coast Ranges. *Pinus monticola* is the dominant conifer in most places, but *Abies concolor* var. *lowiana* is usually present, at least in the understory, and occasionally as the dominant in the canopy, replacing *Pinus monticola*, particularly at lower elevations, and *Pinus ponderosa* is also often present. In the Warner Mountains, the *Abies concolor* var. *lowiana* stands range from 1675 to 2135 m (5500-7000 feet) in elevation, and the mixed *Pinus monticola* - *Abies concolor* is usually above 2135 m (7000 feet). Mixed stands with *Pinus contorta*, in moister locations, as well as *Pinus jeffreyi* and sometimes *Populus tremuloides* occasionally occur. Southern stands (around Babbitt Peak and in the Carson Range) can sometime have *Abies magnifica* in them, sometimes replacing *Abies concolor*. These forests and woodlands are marked by the absence of *Pseudotsuga menziesii*, *Pinus lambertiana*, and *Calocedrus decurrens*, and the generally drier, continental climatic conditions. In addition, the overall floristic affinities are with the Great Basin rather than Pacific Northwest. Understories are typically open, with moderately low shrub cover and diversity, and include *Arctostaphylos patula*, *Arctostaphylos nevadensis*, *Chrysolepis sempervirens*, *Ceanothus* sp., and *Ribes viscosissimum*. Common herbaceous taxa include *Arnica cordifolia*, *Festuca* sp., *Poa nervosa*, *Carex inops*, *Pyrola picta*, and *Hieracium albiflorum*. In openings, *Wyethia mollis* can be abundant.

Classification Comments: An alternative name could be Modoc Plateau Western White Pine - White Fir Woodland. This system is very similar to Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916), Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915) and Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805). Justification for splitting this system includes the following: it is *Abies concolor* var. *lowiana* (as opposed to being grand fir, which is found further east and north; hence it's probably not the northern Rocky Mountain system); it lacks Douglas-fir completely which is an important component of the Californian mixed conifer systems in the Sierras; and the understory composition suggests it is drier (due to: lower elevations? volcanic-derived ash/tuff soils? rainshadow of the Cascades?) than the Californian systems.

Similar Ecological Systems:

- Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916)
- Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Related Concepts:

- Western White Pine: 215 (Eyre 1980) Intersecting. White pine is a major component.
- White Fir: 211 (Eyre 1980) Intersecting. White fir (*Abies concolor* ssp. *lowiana*) is a major component of this ecological system.

DESCRIPTION

Dynamics: The open nature of the stands suggests regeneration and establishment is slow and sporadic. Stand-replacing events are not frequent; most fire is probably partial stand disturbance. These stands are relatively high elevation, and there are generally widely spaced large and somewhat fire-resistant individuals. Also the discontinuous understory and only patchy regeneration suggests non-stand-replacing fire as the norm., rather patchy burns with isolated trees surviving regularly. Local windthrow, insects, disease (blister rust), and individual lightning strikes probably make up most of the disturbances.

MEMBERSHIP

Associations:

- *Abies concolor* - *Pinus monticola* / *Ribes viscosissimum* Forest (CEGL000260, G2)
- *Pinus monticola* / *Achnatherum occidentale* Woodland (CEGL008622, G3)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Pinus monticola* Woodland Alliance (A.532)

DISTRIBUTION

Range: This ecological system is found in the transition zone from the northern Sierra Nevada of California and Oregon, east into the Modoc Plateau and Intermountain region of northwestern Nevada. It is found in the Fremont National Forest east of Lake View in Oregon, and in the Modoc Plateau and Warner Mountains of California. It continues farther south in California to the Diamond Mountains south of Honey Lake (a northeast extension of the Sierras), on Babbitt Peak between Lake Tahoe and Sierra Valley, and also in the Carson Range in Nevada east of Lake Tahoe. Scattered stands may occur on Hart Mountain and Steens Mountain in Oregon and possibly a few isolated places in the northern Great Basin and the Jarbridge Mountains of Nevada.

Divisions: 204:C; 304:P

Nations: US

Subnations: CA, NV, OR

Map Zones: 7:C, 9:?

USFS Ecomap Regions: M242C:CC, M261D:CP, M261E:CC, M261G:CC

TNC Ecoregions: 4:C, 6:C

SOURCES

References: Hopkins 1979a, Volland 1985, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791107#references

Description Author: M.S. Reid

Version: 23 Jan 2006

Concept Author: M.S. Reid

Stakeholders: West

ClassifResp: West

1333 SOUTH FLORIDA HARDWOOD HAMMOCK (CES411.287)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Alkaline Soil; Broad-Leaved Evergreen Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2333; ESLF 4139; ESP 1333

CONCEPT

Summary: This rockland tropical hammock system, as currently defined, occurs only in extreme southern Florida. It consists of upland hardwood forest on elevated ridges of limestone in three discrete major regions; the Keys, southeastern Big Cypress, and the Miami Rock Ridge. Tropical hardwood species are diagnostic of the system, although few are common or dominant in all regions where these hammocks occur (Snyder et al. 1990). Among the species likely to be encountered throughout are *Bursera simaruba*, *Coccoloba diversifolia*, and *Eugenia axillaris*. The northward ranges of these species are limited by the incidence of frosts (Drew and Schomer 1984). *Quercus laurifolia* is one of the few temperate species which attains prominence in this system. These forests tend to have a dense canopy that produces deeper shade, less evaporation, and lower air temperature than surrounding vegetation. This microclimate, in combination with high water tables, tends to keep humidity levels high and the community quite mesic (FNAI 1990). A number of orchid and bromeliad species thrive in such conditions. Unlike most coastal plain systems, fire is a major threat to South Florida Hardwood Hammock (CES411.287). For this reason, many examples occur alongside natural firebreaks, such as the leeward side of exposed limestone (Robertson 1955), moats created by limestone solution (Duever et al. 1986), and elevated outcrops above marshes, scrub cypress, or sometimes mangrove swamps (Snyder et al. 1990).

Related Concepts:

- Coastal Rock Barren (FNAI 1990) Intersecting
- Rockland Hammock (FNAI 1990) Finer
- Tropical Hammock (Snyder et al. 1990) Equivalent

DESCRIPTION

Environment: This system occurs in three discrete regions of south Florida. Underlying geology and soils are somewhat different among these regions, and the juxtaposition of the system may be somewhat unique. Generally, soils are highly organic with uneven and widely ranging thickness (Snyder et al. 1990). Unlike most coastal plain systems, fire is a major threat to South Florida Hardwood Hammock (CES411.287). For this reason, many examples occur alongside natural firebreaks, such as the leeward side of exposed limestone (Robertson 1955), moats created by limestone solution (Duever et al. 1986), and elevated outcrops above marshes, scrub cypress, or sometimes mangrove swamps (Snyder et al. 1990).

Vegetation: There tends not to be strong dominance in these forests, so the principal species list can be long. Some typical dominant tree species, in no real order, are *Bursera simaruba*, *Coccoloba diversifolia*, *Metopium toxiferum*, *Swietenia mahagoni*, *Zanthoxylum fagara*, *Gymnanthes lucida* (= *Ateramnus lucidus*), *Piscidia piscipula*, and *Pithecellobium keyense* (T. Armentano pers. comm.). Other species can include *Lysiloma latisiliquum*, *Nectandra coriacea*, *Ficus aurea*, *Sideroxylon foetidissimum*, *Eugenia foetida*, *Guapira discolor*, *Coccoloba uvifera*, *Thrinax morrisii*, *Thrinax radiata*, *Erithalis fruticosa*, *Krugiodendron ferreum*, *Casasia clusiifolia*, *Erithalis fruticosa*, *Byrsonima lucida*, and *Capparis flexuosa*.

MEMBERSHIP

Associations:

- *Bursera simaruba* - *Swietenia mahagoni* - *Lysiloma latisiliquum* / *Nectandra coriacea* - *Coccoloba diversifolia* Forest (CEGL007003, G1G2)
- *Casasia clusiifolia* - *Guapira discolor* - *Pithecellobium keyense* - *Metopium toxiferum* / *Solanum bahamense* / *Hymenocallis latifolia* Forest (CEGL007005, G1)
- *Conocarpus erectus* - *Sideroxylon celastrinum* - *Erithalis fruticosa* - *Manilkara jaimiqui ssp. emarginata* Forest (CEGL007058, G1)
- *Ficus aurea* - *Sideroxylon foetidissimum* - *Bursera simaruba* / *Eugenia foetida* - *Guapira discolor* - *Nectandra coriacea* Forest (CEGL007001, G1)
- *Metopium toxiferum* - *Eugenia foetida* - *Coccoloba uvifera* - *Thrinax morrisii* / *Erithalis fruticosa* Forest (CEGL007008, G2)
- *Metopium toxiferum* - *Eugenia foetida* - *Krugiodendron ferreum* - *Swietenia mahagoni* / *Capparis flexuosa* Forest (CEGL007007, G2)
- *Metopium toxiferum* - *Thrinax morrisii* - *Byrsonima lucida* / *Schizachyrium* spp. Woodland (CEGL003503, G1)
- *Morella cerifera* - *Ilex cassine* - *Quercus virginiana* - *Serenoa repens* Shrubland (CEGL003788, G2)
- *Opuntia stricta* - *Acanthocereus tetragonus* - *Evolvulus convolvuloides* - *Indigofera oxycarpa* Shrubland (CEGL003872, G1)
- *Pteridium caudatum* Herbaceous Vegetation (CEGL004259, GNR)
- *Quercus virginiana* - (*Sabal palmetto*) Tropical Shell Midden Woodland (CEGL008411, G2?)

- *Sideroxylon foetidissimum* - *Sideroxylon salicifolium* - *Ficus aurea* - *Quercus virginiana* - *Celtis laevigata* Forest (CEGL007004, G1Q)
- *Strumpfia maritima* Florida Keys Shrubland (CEGL003794, G1)
- *Thrinax radiata* - *Casasia clusiifolia* - *Erihalis fruticosa* Forest (CEGL004711, G1Q)

Alliances:

- *Bursera simaruba* - *Coccoloba diversifolia* - *Nectandra coriacea* - *Eugenia axillaris* Forest Alliance (A.33)
- *Casasia clusiifolia* - *Guapira discolor* Forest Alliance (A.34)
- *Conocarpus erectus* - *Sideroxylon celastrinum* Saturated Forest Alliance (A.78)
- *Metopium toxiferum* - *Eugenia foetida* Forest Alliance (A.38)
- *Metopium toxiferum* Woodland Alliance (A.465)
- *Morella cerifera* - *Ilex cassine* Shrubland Alliance (A.722)
- *Opuntia stricta* - *Acanthocereus tetragonus* Shrubland Alliance (A.880)
- *Pteridium caudatum* Herbaceous Alliance (A.1578)
- *Quercus virginiana* - *Juniperus virginiana* - (*Sabal palmetto*) Woodland Alliance (A.479)
- *Strumpfia maritima* Shrubland Alliance (A.726)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: This system is endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Armentano pers. comm., Comer et al. 2003, Drew and Schomer 1984, Duever et al. 1986, FNAI 1990, Robertson 1955, Ross et al. 1992, Snyder et al. 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723201#references

Description Author: R. Evans, mod. M. Pyne

Version: 31 Jan 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1360 SOUTH FLORIDA PINE ROCKLAND (CES411.367)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Circumneutral Soil; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2360; ESLF 4263; ESP 1360

CONCEPT

Summary: This system includes pinelands of extreme south Florida growing on limestone. The uniqueness of the flora associated with this type has long been recognized, including the number of endemic and West Indian species. It has been estimated that nearly one-third of the taxa found in this system are restricted to it, including half of south Florida's endemic plants (Stout and Marion 1993). Unlike pinelands elsewhere in the southeastern coastal plain, *Pinus elliottii* var. *densa* is the only native pine species in this system. Understory vegetation consists of many hardwood species, including a number with tropical origins, and the herbaceous flora is species-rich and fire-adapted.

Similar Ecological Systems:

- South Florida Pine Flatwoods (CES411.381)--is also dominated nearly exclusively by *Pinus elliottii* var. *densa* in the canopy, but is on more acidic substrates (e.g., sand) and lacks much of the diversity and tropical characteristics of the understory.

Related Concepts:

- Coastal Rock Barren (FNAI 1990) Intersecting
- Pine Forest (Duever et al. 1986) Broader
- Pine Rockland (FNAI 1990) Equivalent

DESCRIPTION

Environment: Along the southeast coast of Florida this system occurs on Miami Oolitic Limestone, while in the Big Cypress region (southwest Florida) it is found on outcrops of Tamiami Limestone.

Vegetation: *Pinus elliottii* var. *densa* is the only native pine species in this system. It has been estimated that nearly one-third of the taxa found in this system are restricted to it, including half of south Florida's endemic plants (Stout and Marion 1993). The range of this system is largely outside the natural range of *Pinus serotina*, *Pinus elliottii* var. *elliottii*, and *Pinus palustris*.

Dynamics: In the absence of fire, this system may be replaced by hardwoods species within several decades (Stout and Marion 1993).

MEMBERSHIP

Associations:

- *Pinus elliottii* var. *densa* / *Coccothrinax argentata* - *Thrinax morrisii* Woodland (CEGL003532, G1)
- *Pinus elliottii* var. *densa* / *Sabal palmetto* / *Schizachyrium rhizomatum* - *Muhlenbergia filipes* - *Rhynchospora divergens* Tropical Woodland (CEGL003533, G1G2)
- *Pinus elliottii* var. *densa* / *Sabal palmetto* / *Serenoa repens* Woodland (CEGL003534, G2?)
- *Pinus elliottii* var. *densa* / *Serenoa repens* - *Tetrazygia bicolor* - *Guettarda scabra* Woodland (CEGL003538, G1)
- *Pinus elliottii* var. *densa* / *Sideroxylon salicifolium* - *Chrysobalanus icaco* - *Ilex cassine* Woodland (CEGL003535, G2?)

Alliances:

- *Pinus elliottii* Saturated Tropical Woodland Alliance (A.493)
- *Pinus elliottii* Tropical Woodland Alliance (A.491)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: Davis (1943) mapped this system, which occurred primarily on the Miami ridge bordering the Everglades, with disjunct examples found in the Big Cypress Swamp. McPherson's (1986) map of Big Cypress shows "pine forest," which includes both pine rocklands and pine flatwoods, scattered across the unit. It may be possible to differentiate based on soil type or geology. In the Florida Keys it is found on Big Pine Key, No Name Key, Little Pine Key, Cudjoe Key, and Upper Sugarloaf Key.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Davis 1943, McPherson 1986, Stout and Marion 1993, USFWS 1998b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723149#references

Description Author: R. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Forest and Woodland**Spatial Scale & Pattern:** Large patch**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland**Diagnostic Classifiers:** Pimple mounds; Forest and Woodland (Treed); Broad-Leaved Deciduous Tree**FGDC Crosswalk:** Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy**National Mapping Codes:** EVT 2326; ESLF 4132; ESP 1326

CONCEPT

Summary: This system represents hardwood-dominated "xerohydric flatwoods" of limited areas of the most inland portions of the East Gulf Coastal Plain in western Kentucky, as well as in the nearby Shawnee Hills in the western Interior Low Plateau. The core of the area from which this system was initially described is referred to as the Jackson Purchase or "Jackson Plain," where these areas have long been recognized as a distinctive subdivision within this region (Davis 1923, Bryant and Martin 1988). There is some local variability in the expression of this system along a hydrologic/microtopographic gradient. The elevated ridges are composed of somewhat coarser-textured soils and retain less moisture than do the lower areas, although both occur in a tight local mosaic. The soils appear to have well-developed subsurface hardpans, the impermeability of which contributes to shallowly perched water tables during portions of the year when precipitation is greatest and evapotranspiration is lowest (not due to overbank flooding). Thus, soil moisture fluctuates widely throughout the growing season, from saturated to very dry, a condition sometimes referred to as xerohydric (Evans 1991). Fire was an important natural process in this system, and well-burned examples tend to be relatively open-canopied with well-developed herbaceous layers (M. Evans pers. comm.).

Classification Comments: The component associations are poorly known and described. More work is needed to clarify which types are present.

Similar Ecological Systems:

- South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480)

Related Concepts:

- Flatwoods (Evans 1991) Broader

DESCRIPTION

Environment: Examples of this system occur along the northeastern flank of the Upper East Gulf Coastal Plain ecoregion where loess deposits thin out and gravelly or sandy soils predominate. Examples occur on relatively high flat areas that are not directly affected by overbank flooding. These environments include ancient Quaternary or Tertiary post-glacial meltwater lakebeds and high terraces of the Upper Gulf Coastal Plain. The most typical soil is Okaw Silt Loam. The same system is found in the Shawnee Hills of Kentucky (M. Evans pers. comm. 2006). The lakes were originally formed by glacial damming of the Ohio River.

Vegetation: Stands of this system are dominated by *Quercus stellata*, a somewhat fire-tolerant oak. In addition, *Quercus alba*, *Carya ovata*, *Carya glabra*, and *Quercus velutina* may be present. The presence of *Quercus falcata* indicates longer fire-return times. The presence of *Quercus imbricaria* indicates that the stands were formerly more open. *Pinus* spp. are not prevalent in this area, but could invade from nearby plantations. Herbaceous cover is sparse to moderate; leaf litter is the dominant ground cover. Some shrubs include *Crataegus viridis*, *Ilex decidua*, and *Ulmus alata*. Characteristic grasses could include *Schizachyrium scoparium*, *Sorghastrum nutans*, and *Andropogon* spp. Some other typical herbs include *Manfreda virginica*, *Croton willdenowii*, *Danthonia spicata*, *Porteranthus stipulatus*, and *Pycnanthemum tenuifolium* (Hendricks et al. 1991). Lower areas (drainage ways and depressions) have *Quercus michauxii*, *Quercus pagoda*, *Quercus phellos*, *Liquidambar styraciflua*, or even *Taxodium distichum*. Local herb dominance in depressions is of wetland species such as *Juncus* spp. and *Carex* spp. For this related and possibly juxtaposed wetland vegetation, see South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480).

MEMBERSHIP

Associations:

- *Quercus stellata* / (*Danthonia spicata*, *Croton willdenowii*) Woodland (CEGL005057, G1)
- *Quercus stellata* / *Cinna arundinacea* Flatwoods Forest (CEGL002405, G2G3)

Alliances:

- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus stellata* Flatwoods Forest Alliance (A.261)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

Adjacent Ecological System Comments: East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483).

DISTRIBUTION

Range: This system occurs in limited areas of the most inland portions of the East Gulf Coastal Plain in western Kentucky and adjacent Tennessee (the "Jackson Purchase" or "Jackson Plain" region; 222Cb; 74b in part), as well as in the nearby "Shawnee Hills" of the Interior Low Plateau (222Dh, 222Di; 72c) of Kentucky and adjacent Indiana.

Divisions: 203:C

Nations: US

Subnations: IL?, IN, KY, TN

Map Zones: 46:P, 47:C, 49:?

USFS Ecomap Regions: 223D:CC, 223E:CC, 231H:CC

TNC Ecoregions: 43:C, 44:C

SOURCES

References: Bryant and Martin 1988, Comer et al. 2003, Davis 1923, Evans 1991, Hendricks et al. 1991, M. Evans pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723107#references

Description Author: R. Evans and M. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: R. Evans and M. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1321 SOUTH-CENTRAL INTERIOR MESOPHYTIC FOREST (CES202.887)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Sideslope; Unglaciaded; Eutrophic Soil; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2321; ESLF 4127; ESP 1321

CONCEPT

Summary: These high-diversity, predominately deciduous forests occur on deep and enriched soils (in some cases due to, or enhanced by, the presence of limestone or related base-rich geology), in non-montane settings and usually in somewhat protected landscape positions such as coves or lower slopes. The core distribution of this system lies in the Cumberland and Allegheny plateaus, extending into the adjacent southern Ridge and Valley and portions of the Interior Low Plateau where it is located entirely south of the glacial boundary. Dominant species include *Acer saccharum*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Tilia americana*, *Quercus rubra*, *Magnolia acuminata*, and *Juglans nigra*. *Tsuga canadensis* may be a component of some stands. Trees may grow very large in undisturbed areas. The herb layer is very rich, often with abundant spring ephemerals. Many examples may be bisected by small streams.

Classification Comments: Southern and Central Appalachian Cove Forest (CES202.373) (Ecoregions 51 and 59) is being treated as a separate system. The concept of this type (CES202.887) is more-or-less consistent with the "Mixed Mesophytic Communities" of both the Mixed Mesophytic Forest Region and the non-coastal plain portion of the Western Mesophytic Forest Region, extending north into unglaciaded portions of the Beech-Maple Forest Region, of Braun (1950) and Greller (1988). There is much variability in different examples of this system across its range, with the composition of some occurrences in the escarpment of the Cumberland Plateau approaching that of examples of Southern and Central Appalachian Cove Forest (CES202.373). The Allegheny Front is adopted as the divide between these two similar systems: material to the west goes to this system, and material to the east goes to Southern and Central Appalachian Cove Forest (CES202.373). In limited areas of the region, some stands may contain hemlock (*Tsuga canadensis*). These are noteworthy on a local basis, as the tree is less well distributed in the range of this system than it is in corresponding environments at higher elevation in the Appalachians or to the north.

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)--found to the north and east.
- North-Central Interior Beech-Maple Forest (CES202.693)--is an equivalent system of glaciaded terrain to the north.
- Ozark-Ouachita Mesic Hardwood Forest (CES202.043)
- Southern and Central Appalachian Cove Forest (CES202.373)--is found in adjacent regions to the east.

Related Concepts:

- Acidic Mesophytic Forest (Evans 1991) Finer
- Bluegrass Mesophytic Cane Forest (Evans 1991) Finer
- Calcareous Mesophytic Forest (Evans 1991) Finer
- Rich mesophytic forest (Edinger et al. 2002) Finer

DESCRIPTION

Environment: These high-diversity deciduous forests occur on deep and enriched soils, usually in somewhat protected landscape positions such as coves or lower slopes.

Vegetation: Dominant tree species include *Acer saccharum*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Tilia americana*, *Quercus rubra*, *Magnolia acuminata*, and *Juglans nigra*. *Tsuga canadensis* may be a component of some stands. The herb layer is very rich, often with abundant spring ephemerals.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Carya ovata* - *Juglans nigra* / *Symphoricarpos orbiculatus* / *Galium circaezans* Forest (CEGL004741, G3G4)
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237, G4?)
- *Acer saccharum* - *Liriodendron tulipifera* - *Fraxinus americana* / *Staphylea trifolia* Forest (CEGL006201, G4?)
- *Fagus grandifolia* - *Acer saccharum* - *Liriodendron tulipifera* Unglaciaded Forest (CEGL002411, G4?)
- *Fagus grandifolia* - *Liriodendron tulipifera* / *Euonymus americanus* / *Athyrium filix-femina* ssp. *asplenioides* Forest (CEGL007201, G4)
- *Fagus grandifolia* - *Quercus alba* / *Cornus florida* Forest (CEGL007881, G4)
- *Fagus grandifolia* Ridge and Valley Forest (CEGL007200, G3G4Q)
- *Juglans nigra* / *Verbesina alternifolia* Forest (CEGL007879, GNA)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / (*Magnolia tripetala*) Forest (CEGL005222, G4?)

- *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Forest (CEGL007220, GNA)
- *Quercus alba* - (*Liriodendron tulipifera*, *Liquidambar styraciflua*) / *Calycanthus floridus* / *Athyrium filix-femina* Forest (CEGL008428, G3G4)
- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233, G4)
- *Quercus alba* - *Fagus grandifolia* / *Hydrangea quercifolia* - *Viburnum acerifolium* / *Carex picta* - *Polystichum acrostichoides* Forest (CEGL007213, G3G4)
- *Quercus alba* - *Fagus grandifolia* Western Allegheny Plateau Forest (CEGL006144, GNR)
- *Quercus rubra* - *Acer saccharum* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - (*Cladrastis kentukea*) Forest (CEGL007698, G3)
- *Quercus rubra* - *Tilia americana* var. *heterophylla* - *Carya carolinae-septentrionalis* / *Acer (barbatum, leucoderme)* / *Hydrangea quercifolia* Forest (CEGL008488, G2G3)
- *Tsuga canadensis* - (*Liriodendron tulipifera*, *Fagus grandifolia*) / (*Magnolia macrophylla*, *Ilex opaca*) / *Polystichum acrostichoides* Forest (CEGL004767, G1G2)
- *Tsuga canadensis* - *Fagus grandifolia* - *Acer saccharum* / (*Hamamelis virginiana*, *Kalmia latifolia*) Forest (CEGL005043, G3?)

Alliances:

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Juglans nigra* Forest Alliance (A.1932)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)
- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DISTRIBUTION

Range: This system occurs in southeastern Ohio east to Virginia, West Virginia, Kentucky, Tennessee, Georgia, and Alabama, with disjunct occurrences in unglaciated southwestern Pennsylvania and southwestern New York. This range is more-or-less consistent with the "Mixed Mesophytic" and "Western Mesophytic" (non-coastal plain portion only) forest regions of Braun (1950) and Greller (1988), although it does extend into unglaciated portions of the "Beech-Maple" region to the north. Thus, this system is most extensive in the Cumberland and Allegheny plateaus, as well as the unglaciated Interior Low Plateau, and becomes relatively limited in extent towards its western limit in the Ozark Hills of Illinois, and towards its northern limit in southwestern New York.. It is replaced in the Upper East Gulf Coastal Plain by other systems. Its range also includes the southern Ridge and Valley from Tennessee (and adjacent southwestern Virginia) to Alabama. Parts of the Cumberland Mountains (EPA 69 in Kentucky and Tennessee) are instead occupied by Southern and Central Appalachian Cove Forest (CES202.373). North-Central Interior Beech-Maple Forest (CES202.693) replaces this one in EPA 72b of Indiana.

Divisions: 202:C

Nations: US

Subnations: AL, GA, IL, IN, KY, NY, OH, PA, TN, VA, WV

Map Zones: 47:C, 48:C, 49:C, 53:C, 57:C, 61:C, 62:C, 63:C

USFS Ecomap Regions: 211G:CC, 221E:CC, 221F:C?, 221H:CC, 223D:CC, 223E:CC, 223F:CC, 231C:CC, 231D:CC, M221C:CC

TNC Ecoregions: 44:C, 49:C, 50:C, 60:C

SOURCES

References: Braun 1950, Comer et al. 2003, Greller 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722791#references

Description Author: M. Pyne and R. Evans

Version: 20 Aug 2007

Concept Author: M. Pyne and R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1337 SOUTHEAST FLORIDA COASTAL STRAND AND MARITIME HAMMOCK (CES411.369)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2337; ESLF 4143; ESP 1337

CONCEPT

Summary: This ecological system occurs as a narrow band of hardwood forest and shrublands along the Atlantic coast of southeastern Florida (approximately Volusia County southward). It is found on stabilized, old, coastal dunes, often with substantial shell components. The vegetation is characterized by hardwood species with tropical affinities. As such, the northern extent of this type is limited by periodic freezes and cold tolerance of tropical constituent species, such as *Guapira discolor* and *Exothea paniculata* (Johnson and Muller 1993a). This system is closely related to both inland tropical hammocks and southwest Florida maritime hammocks, and may share some species overlap with each.

Classification Comments: This system may be distinguished from southwest Florida maritime hammocks by geographic location, presence of certain indicator species lacking from southwest type (*Guapira discolor* and *Exothea paniculata*), and relatively harsher coastal exposure. It is distinguished from maritime hammocks further north which contain temperate species including *Persea borbonia*, *Quercus virginiana*, *Magnolia grandiflora*, and *Juniperus virginiana* var. *silicicola* (Johnson and Muller 1993a). Thatch palms (*Thrinax morrisii*, *Thrinax radiata*) are found in rockland hammocks, but absent from maritime hammocks.

Similar Ecological Systems:

- Southwest Florida Coastal Strand and Maritime Hammock (CES411.368)

Related Concepts:

- Coastal Strand (FNAI 1990) Intersecting
- Maritime Hammock (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Ficus aurea* - *Sideroxylon foetidissimum* - *Bursera simaruba* / *Eugenia foetida* - *Guapira discolor* - *Nectandra coriacea* Forest (CEGL007001, G1)
- *Quercus geminata* - *Quercus myrtifolia* - *Serenoa repens* - *Sideroxylon tenax* - *Ximenia americana* Shrubland (CEGL003822, G1)
- *Quercus virginiana* - *Sabal palmetto* - *Persea borbonia* / *Myrcianthes fragrans* - *Ardisia escallonoidea* - *Psychotria nervosa* Forest (CEGL007033, G1)
- *Scaevola plumieri* - *Coccoloba uvifera* / *Uniola paniculata* Shrubland (CEGL003781, G1?)
- *Serenoa repens* - *Coccoloba uvifera* - *Pithecellobium keyense* - *Dalbergia ecastaphyllum* Shrubland (CEGL003782, G1)
- *Serenoa repens* - *Sabal palmetto* - *Coccoloba uvifera* - *Sideroxylon tenax* - *Myrcianthes fragrans* - *Myrsine floridana* Shrubland (CEGL003811, G2)

Alliances:

- *Bursera simaruba* - *Coccoloba diversifolia* - *Nectandra coriacea* - *Eugenia axillaris* Forest Alliance (A.33)
- *Coccoloba uvifera* Shrubland Alliance (A.715)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Serenoa repens* Temperate Shrubland Alliance (A.750)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 232G:CC, 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723147#references

Description Author: R. Evans, after Johnson and Muller

Version: 16 Dec 2002
Concept Author: R. Evans, after Johnson and Muller

Stakeholders: Southeast
ClassifResp: Southeast

1351 SOUTHEASTERN INTERIOR LONGLEAF PINE WOODLAND (CES202.319)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2351; ESLF 4254; ESP 1351

CONCEPT

Summary: This system encompasses the fire-maintained non-Coastal Plain woodlands and forests of the outer Piedmont of Georgia and the Carolinas and the Talladega upland region (quartzite-slate transition) of Alabama, where *Pinus palustris* is a dominant or codominant canopy species. Examples occur on rolling to somewhat mountainous upland slopes in North Carolina, South Carolina, Georgia, and Alabama. They are believed to naturally be open woodlands with grassy ground cover, but many are now closed forests with dense shrubs or with little ground cover. *Pinus palustris* is either dominant, codominant, or present in circumstances that indicate former dominance or codominance. *Pinus echinata*, *Pinus taeda*, *Quercus falcata*, *Quercus stellata*, *Quercus prinus*, *Quercus coccinea*, and *Quercus velutina* are frequent associates, often codominating. Some of the most frequently encountered grasses include *Schizachyrium scoparium*, *Sorghastrum nutans*, *Andropogon* spp., *Chasmanthium laxum*, *Panicum virgatum*, *Piptochaetium avenaceum*, and *Danthonia spicata*.

Classification Comments: This system is closely related to the upland longleaf pine systems of the Coastal Plain, with which it shares the ecological importance of fire, much of its flora and presumably fauna, and probably canopy dynamics. It is distinguished by the distinctive Piedmont soils, by some floristic and compositional differences, and by the distinctive Piedmont/Talladega upland landscape with its greater topographic relief. It probably had less frequent natural fire and a somewhat more mixed canopy, with additional pine species in addition to oaks.

This system is distinguished from all other Piedmont and interior systems in having *Pinus palustris*, an indicator of frequent fire, as a dominant species. However, universal logging and fire suppression have blurred the distinction and have made many former examples indistinguishable from one of these other systems. This system should be recognized where there remains evidence of its past occurrence in the form of remnant flora.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

DESCRIPTION

Environment: This system occurs in upland settings, which may range from gently rolling to rugged and mountainous. Geologic substrates vary. Most portions are dry to dry-mesic, but occasional moist areas and seepage wetlands occur. The primary influence on the system is frequent fire, associated with a location near a fire-prone portion of the Coastal Plain or with other factors. Apparently once widespread along the Fall Zone, remnants are now largely limited to two clusters, in eastern Alabama and adjacent Georgia and in south-central North Carolina. The former occurs on rugged terrain associated with the extension of geologic belts of the Blue Ridge. The latter is on gently to moderately rolling topography of metasedimentary and volcanic rocks.

Vegetation: Vegetation consists of open woodlands or forests. *Pinus palustris* is either dominant, codominant, or present in circumstances that indicate former dominance or codominance. *Pinus echinata*, *Pinus taeda*, *Quercus falcata*, *Quercus stellata*, *Quercus prinus*, *Quercus coccinea*, and *Quercus velutina* are frequent associates, often codominating. Alteration of fire regimes and universal logging have made the natural condition of the vegetation somewhat uncertain. Almost certainly *Pinus palustris* was more abundant than it usually is at present, but very likely some component of other pines and oaks was present. Under conditions of frequent fire, understories and shrub layers were sparse and the grassy herb layer dense. Some of the most frequently encountered grasses include *Schizachyrium scoparium*, *Sorghastrum nutans*, *Andropogon* spp., *Chasmanthium laxum*, and *Panicum virgatum*. Other frequently dominant species, such as *Piptochaetium avenaceum* and *Danthonia spicata*, are not characteristic of Coastal Plain longleaf pine systems. Many other grasses and forbs are shared with the upland longleaf pine systems of the Coastal Plain. There is no evidence that *Aristida stricta* or *Aristida beyrichiana* were present in stands of this system, as these species are confined to the coastal plains. In remnant examples, where fire suppression has affected vegetation structure, the ground cover is often shrubby, with dense ericaceous shrubs leaving little space for herbs. Examples that have been burned recently often have ground cover dominated by shrubs and hardwood sprouts, with somewhat increased herb cover.

Dynamics: The dynamics of this system are strongly dominated by fire. Fires probably once occurred at frequencies somewhat lower than in the Coastal Plain but more frequently than in any other Piedmont system. Fires would be fairly low in intensity and would kill few individual plants in the fire-adapted vegetation. Modern fire suppression has allowed other pines and oaks to increase in density, along with shrubs, and has resulted in the loss of the herb layer. Reproduction of *Pinus palustris* has been largely eliminated by the lack of fire. Where the canopy was also logged, *Pinus palustris* has often been completely eliminated, leaving the system indistinguishable from logged Southern Piedmont Dry Oak-(Pine) Forest (CES202.339). Because most of the canopy species are fairly

resilient to fire, and many have the ability to sprout, reintroduction of fire returns this system to its natural composition and structure only gradually. Despite frequent fire, canopy dynamics were probably naturally dominated by gap-phase regeneration, with trees reproducing in small to medium-sized gaps created by wind storms and hot spots in fires. Fire would cause canopy gaps to persist longer. *Pinus palustris* and most of the other canopy species are long-lived.

MEMBERSHIP

Associations:

- *Pinus palustris* - *Pinus echinata* - (*Pinus virginiana*) / *Quercus marilandica* - (*Quercus prinus*) / *Vaccinium pallidum* Woodland (CEGL008437, G2)
- *Pinus palustris* - *Pinus echinata* / *Quercus coccinea* - *Quercus georgiana* Woodland (CEGL004432, G1Q)
- *Pinus palustris* - *Pinus echinata* / *Schizachyrium scoparium* - *Manfreda virginica* Serpentine Woodland (CEGL003608, G1)
- *Pinus palustris* - *Pinus taeda* - *Pinus serotina* / *Chasmanthium laxum* - *Panicum virgatum* Piedmont Woodland (CEGL003663, G1)
- *Quercus prinus* - *Pinus palustris* Forest (CEGL004060, G2G3)

Alliances:

- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)

SPATIAL CHARACTERISTICS

Spatial Summary: This system was once a large-patch to matrix system, locally dominating the landscape matrix. Remnants are mostly large patches, some up to hundreds of acres or possibly even more.

Size: This system naturally occurs as a large-patch system, or as matrix system in limited areas. Contiguous examples or complexes of related patches of thousands of acres probably once occurred. Remnants are mostly large to medium patches. Occurrences over 1000 acres are present in Alabama, and patches up to 400 acres are present in North Carolina.

Adjacent Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Examples are interfingered or associated with various mesic and floodplain or bottomland systems. Upland systems such as Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) sometimes occur adjacent to remnants, especially on more rugged terrain. It is not always clear which oak-hickory forests are true examples of that system and which represent longleaf pine systems that have been degraded beyond recognition.

DISTRIBUTION

Range: This system once ranged throughout the southern two-thirds of the Piedmont, from central North Carolina to Alabama, where it extends into the adjacent Ridge and Valley. More extensive areas are now largely, if not exclusively, restricted to south-central North Carolina (outer Piedmont) and to eastern Alabama (Talladega upland). Smaller remnants are found in very limited areas of South Carolina and Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC

Map Zones: 48:C, 54:C, 59:C

TNC Ecoregions: 50:C, 52:C

SOURCES

References: Anderson 1999a, Comer et al. 2003, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723180#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 22 May 2008

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1318 SOUTHERN AND CENTRAL APPALACHIAN COVE FOREST (CES202.373)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2318; ESLF 4124; ESP 1318

CONCEPT

Summary: This system consists of mesophytic hardwood or hemlock-hardwood forests of sheltered topographic positions in the Southern Blue Ridge and central Appalachian Mountains. Examples are generally found on concave slopes that promote moist conditions. The system includes a mosaic of acidic and "rich" coves that may be distinguished by individual plant communities based on perceived differences in soil fertility and species richness (rich examples have higher diversity and density in the herbaceous layer). Both acidic and rich coves may occur in the same site, with the acidic coves potentially creeping out of the draw-up to at least midslope on well-protected north-facing slopes. Characteristic species in the canopy include *Aesculus flava*, *Acer saccharum*, *Fraxinus americana*, *Tilia americana*, *Liriodendron tulipifera*, *Halesia tetraptera*, *Tsuga canadensis*, *Fagus grandifolia*, *Magnolia acuminata*, and *Magnolia fraseri*.

Classification Comments: This system is best distinguished from others in its range by the combination of sheltered topography, low elevation, and mesophytic flora with high species richness. Canopies can sometimes become depauperate after repeated logging. It is presently defined as not including rich, mesophytic "cove" forests of the Cumberland Plateau and Interior Low Plateau, even though some of these approach or exceed Appalachian examples in their species composition and or their "coveyness." This will be interpreted as variability within South-Central Interior Mesophytic Forest (CES202.887). The Allegheny Front is adopted as the divide between these two similar systems: material to the west goes to South-Central Interior Mesophytic Forest (CES202.887), and material to the east goes to this system.

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)
- South-Central Interior Mesophytic Forest (CES202.887)--found in adjacent regions to the west, out of the mountains, with a more matrix landscape character.
- Southern Piedmont Mesic Forest (CES202.342)--found in adjacent regions to the east.

DESCRIPTION

Environment: This system occurs below 1525 m (5000 feet) elevation and generally below 1375 m (4500 feet) in low topographic positions such as valley bottoms and ravines. This cove type has two primary components, an acidic cove of lower soil fertility that ranges from the lowest slope positions up the slope on north-facing protected slopes, and a rich, high-fertility cove forest that tends to occur only at the lowest slope positions. Both are sheltered from wind and may be shaded by topography, promoting moist conditions. Local slopes are usually concave. Bedrock may be of virtually any type. Acidic rocks, such as felsic igneous and metamorphic rocks, support rich cove forests in a more limited range of sites than do basic rocks, such as mafic metamorphic rocks or marble. Soils may be rocky or fine-textured, and may be residual, alluvial, or colluvial. In the southern Appalachians, the hemlock "phase" of this ("acidic cove forest") often occurs between "richer" examples of Southern and Central Appalachian Cove Forest (CES202.373) in the lowest areas and Southern Appalachian Oak Forest (CES202.886) on the midslopes.

Vegetation: Vegetation consists of forests dominated by various combinations of mesophytic species, usually with many different species of primarily deciduous trees present. *Liriodendron tulipifera*, *Tilia americana*, *Tilia americana* var. *heterophylla*, *Fraxinus americana*, *Aesculus flava*, *Betula lenta*, *Magnolia acuminata*, *Magnolia fraseri*, *Halesia tetraptera*, *Prunus serotina*, and *Tsuga canadensis* are the most frequent dominant canopy species. Canopies are generally very diverse, with all species potentially occurring in one 20x50-meter plot in rich cove areas. A well-developed herb layer, often very dense and usually high in species richness, is present in all but the acid coves. Well-developed and fairly diverse subcanopy and shrub layers are often also present in all but the acid coves. Ulrey (1999) listed *Caulophyllum thalictroides*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Laportea canadensis*, *Osmorhiza claytonii*, *Sanguinaria canadensis*, *Viola canadensis*, *Acer saccharum*, *Aesculus flava*, *Carya cordiformis*, and *Tilia americana* var. *heterophylla* as characteristic species.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration on a fine scale. Occasional extreme wind or ice events may disturb larger patches. Natural fire dynamics are not well-known and probably only occurred in years that were extremely dry. Fires may have occurred at moderate frequency but were probably usually low enough in intensity to have only limited effects. Most of the component species are among the less fire-tolerant in the region.

MEMBERSHIP

Associations:

- *Acer (nigrum, saccharum)* - *Tilia americana* / *Asimina triloba* / *Jeffersonia diphylla* - *Caulophyllum thalictroides* Forest

(CEGL008412, G4G5)

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237, G4?)
- *Aesculus flava* - *Acer saccharum* - (*Fraxinus americana*, *Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest (CEGL007695, G3G4)
- *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982, G2G3)
- *Caltha palustris* - *Impatiens capensis* - *Viola cucullata* Herbaceous Vegetation [Provisional] (CEGL006258, GNR)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Herbaceous Vegetation (CEGL004296, G3)
- *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata* var. *humilis* Herbaceous Vegetation (CEGL004293, G3)
- *Liriodendron tulipifera* - *Aesculus flava* - (*Fraxinus americana*, *Tilia americana*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710, G4)
- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543, G5)
- *Liriodendron tulipifera* - *Quercus rubra* - *Magnolia acuminata* / *Cornus florida* Forest (CEGL008510, G5?)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - (*Aesculus flava*) / *Actaea racemosa* Forest (CEGL007291, G4?)
- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102, G4)
- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233, G4)
- *Quercus rubra* - *Tilia americana* var. *heterophylla* - *Halesia tetraptera* var. *monticola* / *Collinsonia canadensis* - *Tradescantia subaspera* Forest (CEGL007878, G3?)
- *Tilia americana* var. *heterophylla* - *Acer saccharum* - *Aesculus flava* / *Cystopteris bulbifera* Forest (CEGL006472, G3G4)
- *Tilia americana* var. *heterophylla* - *Fraxinus americana* - (*Ulmus rubra*) / *Sanguinaria canadensis* - (*Aquilegia canadensis*, *Asplenium rhizophyllum*) Forest (CEGL007711, G2G3)
- *Tsuga canadensis* - (*Fagus grandifolia*, *Tilia americana* var. *heterophylla*) / *Magnolia tripetala* Forest (CEGL008407, G4)
- *Tsuga canadensis* - *Halesia tetraptera* - (*Fagus grandifolia*, *Magnolia fraseri*) / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693, G2)
- *Tsuga canadensis* - *Quercus prinus* - *Liriodendron tulipifera* / *Kalmia latifolia* - (*Rhododendron catawbiense*) Forest (CEGL008512, G4)
- *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136, G3G4)

Alliances:

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* Forest Alliance (A.266)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* Saturated Herbaceous Alliance (A.1688)
- *Impatiens (capensis, pallida)* - *Monarda didyma* Saturated Herbaceous Alliance (A.1690)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Pinus strobus* - *Tsuga canadensis* Forest Alliance (A.127)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system commonly occurring in a landscape mosaic with several other systems.

Size: Most individual patches are tens to sometimes a few hundred acres. Because it frequently occurs in mosaics with other systems, separation distance for occurrences has a strong effect on the size of occurrences. Complexes of thousands of acres of this system are possible.

Adjacent Ecological Systems:

- Southern and Central Appalachian Bog and Fen (CES202.300)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Appalachian Seepage Wetland (CES202.317)
- Southern Appalachian Spray Cliff (CES202.288)

Adjacent Ecological System Comments: This system is usually bordered by Southern Appalachian Oak Forest (CES202.886) in the Southern Blue Ridge. The border with adjacent systems is gradational. It may also contain small embedded patches of Southern Appalachian Montane Cliff and Talus (CES202.330) or other small-patch systems. In the southern Appalachians, the "richer" phase of Southern and Central Appalachian Cove Forest (CES202.373) occurs downslope from the hemlock "phase" ("acidic cove forests") and tends to be more mesic and more species-rich than the hemlock-dominated areas. Southern Appalachian Oak Forest (CES202.886) occurs upslope from this system and tends to be drier and even less diverse than the hemlock areas, which may grade into Southern Appalachian Low-Elevation Pine Forest (CES202.332) in especially dry occurrences.

DISTRIBUTION

Range: This system occurs in the southern and central Appalachian Mountains, ranging into the Cumberland Mountains of Kentucky and Tennessee. This range is more-or-less consistent with the "Oak-Chestnut" forest region of Braun (1950) and Greller (1988), versus the "Mixed Mesophytic" and "Western Mesophytic" forest regions to the west.

Divisions: 202:C

Nations: US

Subnations: GA, KY, MD, NC, SC, TN, VA, WV

Map Zones: 53:C, 57:C, 61:C, 62:C

USFS Ecomap Regions: M221A:CC, M221B:CC, M221C:CC, M221D:CC

TNC Ecoregions: 50:C, 51:C, 52:P, 59:C, 61:P

SOURCES

References: Comer et al. 2003, Ulrey 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723143#references

Description Author: M. Schafale, M. Pyne, R. White, R. Evans, mod. S. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale, M. Pyne, R. White, R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1353 SOUTHERN APPALACHIAN LOW-ELEVATION PINE FOREST (CES202.332)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Acidic Soil; Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2353; ESLF 4256; ESP 1353

CONCEPT

Summary: This system consists of shortleaf pine- and Virginia pine-dominated forests in the lower elevation Southern Appalachians and adjacent Piedmont and Cumberland Plateau, extending into the Interior Low Plateau of Indiana, Kentucky and Tennessee. Examples can occur on a variety of topographic and landscape positions, including ridgetops, upper and midslopes, as well as lower elevations (generally below 700 m [2300 feet]) in the Southern Appalachians such as mountain valleys. Examples occur on a variety of acidic bedrock types. Frequent, low-intensity fires coupled with severe fires (Harrod and White 1999) may have been the sole factor determining the occurrence of this system rather than hardwood forests under natural conditions. Under current conditions, stands are dominated by *Pinus echinata* or *Pinus virginiana*. *Pinus rigida* may sometimes be present. Hardwoods are sometimes abundant, especially dry-site oaks such as *Quercus falcata*, *Quercus prinus*, and *Quercus coccinea*, but also *Carya glabra*, *Acer rubrum*, and others. The shrub layer may be well-developed, with *Vaccinium pallidum*, *Gaylussacia baccata*, or other acid-tolerant species most characteristic. Herbs are usually sparse but may include *Pityopsis graminifolia* and *Tephrosia virginiana*.

Classification Comments: This system and its component associations are among the least studied in the southern Appalachians (Harrod and White 1999). Settlement, universal logging, pine beetle outbreaks, and fire suppression potentially have altered their character and blurred their boundaries more than most systems in the region. The situation is further complicated by the potential for pine-dominated forests to have been both created and destroyed in different places by these disturbances. Obviously successional pine forests associated with the recovery of heavily logged or plowed slopes and valleys are grouped into the matrix Central and Southern Appalachian Montane Oak Forest (CES202.596).

The relationship between this system and Southern Appalachian Montane Pine Forest and Woodland (CES202.331) may need further clarification. Southern Appalachian Low-Elevation Pine Forest (CES202.332) is distinguished by its occurrence as large patches on lower terrain (generally below 700 m [2300 feet]) and less extreme topography. The vegetation of the two systems may overlap due to the factors outlined above, but pitch pine and Table Mountain pine are more typical of the former, while shortleaf pine and Virginia pine are more typical of the latter.

Presently the shortleaf pine-dominated vegetation of the Interior Low Plateau (ILP), including examples in southern Indiana and the Tennessee portion of Land Between the Lakes, is included in this system. Frost (1998) treats the ILP region in a different fire-return-interval class than the core range of this system, although local variation may overwhelm the broad regional differences. If more detailed information becomes available to document important ecological differences between these areas, a new system may be required.

This system (CES202.332) at its western extent in central Tennessee and Kentucky would be distinguished from equivalent Ozarkian systems (e.g., Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)) by the presence of *Pinus virginiana* and *Quercus prinus*, which do not cross the Mississippi River.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)
- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Related Concepts:

- Appalachian Pine-Oak Forest (Evans 1991) Finer

DESCRIPTION

Environment: Occurs on ridge tops, upper and mid slopes, in mountain valleys and the lower ranges. Bedrock may be a variety of types, but the system may be limited to acidic substrates. Fire is undoubtedly a very important influence.

Vegetation: Vegetation consists of closed to open forests or woodlands dominated by *Pinus echinata* or *Pinus virginiana*. *Pinus rigida* may sometimes be present. Hardwoods are sometimes abundant, especially dry-site oaks such as *Quercus falcata*, *Quercus prinus*, and *Quercus coccinea*, but also *Carya glabra*, *Acer rubrum*, and others. An extensive hardwood component may partly be the result of fire suppression. The shrub layer may be well-developed, with *Vaccinium pallidum*, *Gaylussacia baccata*, or other acid-tolerant species most characteristic. Herbs are usually sparse but may include *Pityopsis graminifolia* and *Tephrosia virginiana*.

Herbs probably were more abundant and shrubs less dense when fires occurred more frequently, and the communities of this system may have been grassy under more natural conditions, with *Schizachyrium scoparium* being a typical component, possibly with *Danthonia* sp.

Dynamics: Little is known about the dynamics of this system. Fire is clearly an important influence, and may be the sole factor determining the occurrence of this system rather than hardwood forests under natural conditions. Fires probably were frequent and of low intensity, or a mix of low and higher intensity. Fire probably is important for determining the balance of the two pine species, the component of hardwoods, and the overall vegetation structure. *Pinus echinata* is fairly resilient to fire once mature, while *Pinus virginiana* individuals are fairly susceptible to fire but well-adapted to establishing in areas opened by intense fire. Southern pine beetles are an important factor in this system, at least under present conditions. Beetle outbreaks can kill all the pines without creating the conditions for the pines to regenerate. Effects of logging and past clearing as well as fire suppression make understanding of this system's natural character and dynamics difficult. An extensive hardwood component may partly be the result of fire suppression. Some pine-dominated areas appear to be successional stands established in former hardwood forests after logging or cultivation, and would not be expected to have the same dynamics or ecosystem characteristics as natural pine forests maintained by fire. In natural pine forests, logging may allow pines to regenerate or may change the composition to weedy hardwoods. It might alter canopy composition as well as structure.

MEMBERSHIP

Associations:

- *Pinus echinata* - *Quercus* (*prinus*, *falcata*) / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest (CEGL007493, G3G4)
- *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest (CEGL008427, G3G4)
- *Pinus echinata* - *Quercus prinus* - *Quercus stellata* / *Vaccinium pallidum* / *Pityopsis graminifolia* var. *latifolia* Woodland (CEGL004445, G2?)
- *Pinus echinata* - *Quercus prinus* / *Rhododendron minus* / *Vaccinium pallidum* Forest (CEGL007496, G2G3)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Vaccinium pallidum* Woodland (CEGL003765, G4?)
- *Pinus echinata* - *Quercus stellata* - *Quercus prinus* - *Carya glabra* / (*Danthonia spicata*, *Piptochaetium avenaceum*) Forest (CEGL007500, G3?)
- *Pinus echinata* / *Schizachyrium scoparium* Appalachian Woodland (CEGL003560, G2)
- *Pinus echinata* / *Vaccinium* (*pallidum*, *stamineum*) - *Kalmia latifolia* Forest (CEGL007078, G4?)
- *Pinus echinata* Early-Successional Forest (CEGL006327, GNA)
- *Pinus strobus* / *Kalmia latifolia* - (*Vaccinium stamineum*, *Gaylussacia ursina*) Forest (CEGL007100, G2G3)
- *Pinus virginiana* - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest (CEGL008500, G3G4)
- *Pinus virginiana* - *Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Pinus virginiana* Successional Forest (CEGL002591, GNA)

Alliances:

- *Pinus echinata* - *Quercus* (*alba*, *falcata*, *stellata*, *velutina*) Forest Alliance (A.394)
- *Pinus echinata* - *Quercus* (*coccinea*, *prinus*) Forest Alliance (A.395)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Pinus echinata* Forest Alliance (A.119)
- *Pinus echinata* Woodland Alliance (A.515)
- *Pinus strobus* Forest Alliance (A.128)
- *Pinus virginiana* Forest Alliance (A.131)

SPATIAL CHARACTERISTICS

Spatial Summary: Probably naturally a large-patch system, covering thousands of acres. Most remnants in relatively natural condition are probably small patches

Size: Natural size distribution not well-known, but probably a large-patch system with patches or complexes covering hundreds to thousands of acres. The current distribution of patch size is also not well-known. Size of defined occurrences may be strongly affected by standards for condition and separation distances. In some parts of the Interior Low Plateau, this system consists of smaller patches or linear strips along acidic (sandstone, cherty limestone) cliffines.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: Probably usually bordered and intermixed with Southern Appalachian Oak Forest (CES202.886). Southern and Central Appalachian Cove Forest (CES202.373) may be present in more mesic areas. This system may also intergrade into Southern Appalachian Montane Pine Forest and Woodland (CES202.331) at high elevations.

DISTRIBUTION

Range: This system is found primarily in the Appalachian regions of Kentucky and the Southern Blue Ridge in northern Georgia, western North Carolina, southeastern Tennessee, the Cumberlands of Alabama, parts of the Interior Low Plateau (e.g., the Knobs Region of Kentucky and southern Indiana and the western Highland Rim of Tennessee), and southwestern Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, IN, KY, NC, SC, TN, VA

Map Zones: 47:C, 48:C, 53:C, 54:C, 57:C, 59:C

USFS Ecomap Regions: 221H:CC, 221J:CC, 223D:CC, 223E:CC, 231A:CC, 231C:CC, 231D:CC, 231I:CC, M221A:CC, M221C:CC, M221D:CC

TNC Ecoregions: 44:C, 50:C, 51:C, 52:C

SOURCES

References: Comer et al. 2003, Frost 1998, Harrod and White 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723171#references

Description Author: M. Schafale, R. Evans, R. White, mod. M. Pyne

Version: 22 Sep 2008

Concept Author: M. Schafale, R. Evans, R. White

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1352 SOUTHERN APPALACHIAN MONTANE PINE FOREST AND WOODLAND (CES202.331)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2352; ESLF 4255; ESP 1352

CONCEPT

Summary: This system consists of predominantly evergreen woodlands (or more rarely forests) occupying very exposed, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops in the Central Appalachians, Southern Ridge and Valley and Southern Blue Ridge. They occur at moderate to upper elevations (450-1200 m [1500-4000 feet]), with the more southerly examples at the higher elevations. In the Southern Blue Ridge, this system is best developed above 700 m (2300 feet) in elevation. The underlying rock is acidic and sedimentary or metasedimentary (e.g., quartzites, sandstones and shales). The soils are very infertile, shallow and droughty. A thick, poorly decomposed duff layer, along with dead wood and highly volatile ericaceous shrubs, creates a strongly fire-prone habitat. Most examples are dominated by *Pinus pungens*, often with *Pinus rigida* and/or *Pinus virginiana*, and occasionally *Tsuga caroliniana*. The canopy is usually patchy to open, but areas of closed canopy may be present, especially where *Tsuga caroliniana* is prominent. Fire is a very important ecological process in this system. Pines may be able to maintain dominance due to edaphic conditions, such as very shallow soil or extreme exposure in some areas which can produce sustained drought conditions, but most sites appear eventually to succeed to oak dominance in the absence of fire. Fire is also presumably a strong influence on vegetation structure, producing a more open woodland canopy structure and more herbaceous ground cover.

Classification Comments: This system is related to Central Appalachian Pine-Oak Rocky Woodland (CES202.600), which is distinguished by a mixed or deciduous canopy and absence of *Pinus pungens*. Stands with *Pinus echinata* present are generally accommodated by Southern Appalachian Low-Elevation Pine Forest (CES202.332). The relationship between these two systems may need further clarification. This system is distinguished by occurrence as small patches on the most extreme topography, as well as by the species of pines dominating. However, *Pinus echinata* may codominate in Southern Appalachian Low-Elevation Pine Forest (CES202.332) at times. Sites that would support this system under a natural fire regime, but which have lost the pines by logging, southern pine beetle or senescence in the absence of fire, should probably be regarded as degraded examples of this system. However, they become virtually indistinguishable from Southern Appalachian Oak Forest (CES202.886) and Central Appalachian Pine-Oak Rocky Woodland (CES202.600) over time.

Similar Ecological Systems:

- Central Appalachian Pine-Oak Rocky Woodland (CES202.600)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Related Concepts:

- Pine Savanna/Woodland (Evans 1991) Finer

DESCRIPTION

Environment: This system occurs on ridgetops, usually only on the sharpest and narrowest spur ridges, and adjacent convex upper slopes. These sites are the extreme of convex landforms. Rapid drainage of rainfall and exposure to wind, sun and lightning are probably the important characteristics. Bedrock may be of any acidic type, including felsic igneous and metamorphic rocks, sandstone and quartzite. Soils are shallow and rocky residual soils. Fire appears to be an important factor.

Vegetation: Vegetation consists of open forests or woodlands dominated by *Pinus pungens*, often with *Pinus rigida* or less commonly *Tsuga caroliniana*, and sometimes with *Pinus virginiana* or rarely *Pinus echinata* codominant. In examples that have not had fire in a long time, *Quercus prinus*, *Quercus coccinea*, or other oaks are usually present and are sometimes abundant, as are *Nyssa sylvatica* and *Acer rubrum*. *Castanea dentata* may also have once been abundant. A dense heath shrub layer is almost always present. *Kalmia latifolia* is the most typical dominant, but species of *Rhododendron*, *Vaccinium*, or *Gaylussacia* may be dominant. Herbs are usually sparse but probably were more abundant and shrubs less dense when fires occurred more frequently.

Dynamics: Fire is apparently a very important process in this system (Harrod and White 1999). Pines may be able to maintain dominance due to shallow soils and extreme exposure in some areas, but most sites appear eventually to succeed to oak dominance in the absence of fire. Fire is also presumably a strong influence on vegetation structure, producing a more open woodland canopy structure and more herbaceous ground cover. Occurrence in highly exposed sites may make this system more prone to ignition, but most fires probably spread from adjacent oak forests. Fires could be expected to show more extreme behavior in this system than in oak forests under similar conditions, due to the flammability of the vegetation and the dry, windy and steep location. Both intense catastrophic fires and lower-intensity fires probably occurred naturally. Natural occurrences probably include both even-aged and

uneven-aged canopies.

Southern pine beetles are an important factor in this system, at least under present conditions. Beetle outbreaks can kill all the pines without creating the conditions for the pines to regenerate. If the pines are lost, the distinction between this system and Southern Appalachian Oak Forest (CES202.886) or Central Appalachian Pine-Oak Rocky Woodland (CES202.600) becomes blurred.

MEMBERSHIP

Associations:

- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996, G4)
- *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097, G3)
- *Pinus rigida - (Pinus pungens) / Rhododendron catawbiense - Kalmia latifolia / Galax urceolata* Woodland (CEGL004985, G2)
- *Pinus rigida / Schizachyrium scoparium - Sorghastrum nutans - Baptisia tinctoria* Woodland (CEGL003617, G2?)
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Tsuga caroliniana - Pinus (rigida, pungens, virginiana)* Forest (CEGL006178, G2)
- *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139, G2)

Alliances:

- *Pinus (rigida, pungens, virginiana) - Quercus prinus* Woodland Alliance (A.677)
- *Pinus pungens - (Pinus rigida)* Woodland Alliance (A.521)
- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus virginiana* Forest Alliance (A.131)
- *Tsuga caroliniana* Forest Alliance (A.144)

SPATIAL CHARACTERISTICS

Spatial Summary: Large- to small-patch system, occurring as a frequent part of the landscape mosaic.

Size: Occurs as a large- to small-patch system. Contiguous bodies probably once covered dozens to 100 or more acres. Patches often occur in complexes with other systems. Size of defined occurrences may be strongly affected by separation distances for occurrences.

Adjacent Ecological Systems:

- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: This system is almost always bordered and intermixed with Southern Appalachian Oak Forest (CES202.886). Distinctions are made more difficult by the suppression of fire and subsequent invasion of less fire-tolerant species such as *Acer rubrum* and *Nyssa sylvatica*. Generally speaking, communities with a heavy component of pine (at least 25 or 50% of canopy, and with some *Pinus pungens*) are categorized as Southern Appalachian Montane Pine Forest and Woodland (CES202.331), whereas communities with a much smaller component of pines are considered Southern Appalachian Oak Forest (CES202.886). At the highest elevations that this system is seen, it may intergrade with Southern Appalachian Grass and Shrub Bald (CES202.294).

DISTRIBUTION

Range: This system is centered on the Southern Blue Ridge, from northern Georgia and South Carolina north through Virginia, with outlying occurrences north through the Central Appalachians to a small incursion in the northern Blue Ridge of south-central Pennsylvania.

Divisions: 202:C

Nations: US

Subnations: GA, KY, MD, NC, OH, PA, SC, TN, VA, WV

Map Zones: 53:C, 54:C, 57:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: M221D:CC

TNC Ecoregions: 49:C, 50:C, 51:C, 52:C, 59:C

SOURCES

References: Comer et al. 2003, Harrod and White 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723172#references

Description Author: M. Schafale, R. Evans, M. Pyne, R. White, mod. S.C. Gawler

Version: 05 May 2008

Concept Author: M. Schafale, R. Evans, M. Pyne, R. White

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1309 SOUTHERN APPALACHIAN NORTHERN HARDWOOD FOREST (CES202.029)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Broad-Leaved Tree

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2309; ESLF 4115; ESP 1309

CONCEPT

Summary: This system consists of hardwood forests of the higher elevation zones of the Southern Appalachians, generally above 1372 m (4500 feet) elevation. Included are classic northern hardwood forests, dominated by various combinations of mesophytic hardwoods, which interfinger with high-elevation oak forests downslope or on more exposed aspects. The combination of elevation and aspect provides habitat for this system. Included in this system are limited areas locally known as "beech gaps" and "boulderfields." Stands are dominated by various combinations of Appalachian mesophytic trees, including *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, *Acer saccharum*, and *Tsuga canadensis*. *Prunus serotina* and *Tilia americana* var. *heterophylla* are occasionally abundant. *Quercus rubra* may be present but is not dominant. In Kentucky, this system is of extremely limited extent, being restricted to areas above about 1100-1160 m (3600-3800 feet) elevation on Black Mountain, the highest elevation in Kentucky, which is apparently higher in elevation than adjacent areas in Tennessee and Virginia.

Classification Comments: This system does not include high-elevation *Quercus rubra* associations, which are placed in related Central and Southern Appalachian Montane Oak Forest (CES202.596). Even though they may occur in the same elevational zone as the mesophytic northern hardwood forests, they occupy a different habitat (drier and more exposed aspects), and comprise a different set of plant associations. They differ from the mesophytic northern hardwood forests in the dominance of oaks and the probable importance of fire as a process. The border of this system with adjacent systems is usually gradational. The transition to Central and Southern Appalachian Spruce-Fir Forest (CES202.028) that often adjoins at higher elevation is marked by a gradual shift in canopy dominance from hardwoods to conifers. The transition to lower elevation hardwood forest systems is similarly marked by a gradual turnover of dominant trees but may be more subtle because more species are shared. The transition to Southern and Central Appalachian Cove Forest (CES202.373) is particularly gradual, being marked mainly by the addition of species without loss of species. The non-forested systems that occur in the same elevational zone may have transition zones of open woody vegetation, though some have sharp borders. In relatively undisturbed stands, the canopy composition and structure are the best way to determine the boundary of this system.

This system is similar to the northern hardwood forests of the northeastern U.S., i.e., Laurentian-Acadian Northern Hardwoods Forest (CES201.564), but differs in having a southern mountain climate (shorter winters, less extreme cold temperatures, shorter summer days), lacking a history of glaciation, and in having a flora and fauna with many southern Appalachian endemics. A few characteristic dominants of the northern hardwoods are lacking, including *Betula papyrifera* and *Populus tremuloides*. It differs from Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) in its more montane setting and its flora and fauna having many southern Appalachian endemics. The northern hardwoods in the Ridge and Valley are primarily included in CES202.593. The northern boundary of this system follows a gradual northward transition through central and northern Virginia.

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)
- Central and Southern Appalachian Montane Oak Forest (CES202.596)--generally occupies more exposed and drier aspects and becomes more prominent at lower elevations.
- Southern Appalachian Oak Forest (CES202.886)

Related Concepts:

- Northern Hardwood Forest (Schafale and Weakley 1990) Broader

DESCRIPTION

Environment: The habitat for this system in the Southern Blue Ridge includes cooler, moister slopes and more-or-less concave landforms, at elevations from 1220-1680 m (4000-5500 feet), occasionally extending up to nearly 1830 m (6000 feet). It is most prevalent on north- to east-facing slopes, but can occur on a variety of landforms and aspects within this elevational range, tending to be more predominant towards its upper limits, where it transitions to spruce- or spruce-hardwood-dominated types. Elevation and orographic effects make the climate cool and wet, with significant moisture input from fog as well as high rainfall. Strong winds, ice glaze, and extreme cold may occur but are less important than in Central and Southern Appalachian Spruce-Fir Forest (CES202.028). Soils are generally very rocky, with the matrix ranging from well-weathered parent material to coarse colluvial boulder deposits. Soils are probably moist but not saturated most of the time. Any kind of bedrock may be present. Limited areas support boulderfields. In related areas of Kentucky (in the highest elevations of the Cumberlands), this system is of extremely limited extent. Its elevational range is lower than in the Southern Blue Ridge, being restricted to areas above about 1100-1160 m (3600-3800 feet) elevation on

Black Mountain. These are the highest elevations in Kentucky and are apparently higher in elevation than adjacent areas in Tennessee and Virginia, which apparently lack examples of this system.

Vegetation: Vegetation consists of forests dominated by various combinations of *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, *Acer saccharum*, and *Tsuga canadensis*. *Prunus serotina* and *Tilia americana* var. *heterophylla* are occasionally abundant. *Quercus rubra* may be present but is not dominant; it dominates the warmer, more exposed aspects in this elevational range, and these stands are part of Central and Southern Appalachian Montane Oak Forest (CES202.596), not Southern Appalachian Northern Hardwood Forest (CES202.029). Lower strata usually include a dense herb layer and often a well-developed deciduous shrub layer as well. Limited areas may have a dense evergreen shrub layer. Plant species richness ranges from fairly high to very low.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration on a fine to medium scale. Occasional extreme wind or ice events disturb larger patches on exposed slopes. Fire appears to be uncommon under natural conditions, perhaps extremely rare in the more mesic portions. In contrast, fire may be important in regeneration of *Quercus rubra* in stands of Central and Southern Appalachian Montane Oak Forest (CES202.596), and may be crucial in maintaining its dominance in these drier sites. Many *Quercus rubra* forests now appear to be succeeding to mesophytic hardwoods in the absence of fire. Little is known about natural fire behavior. Fires are likely to be low in intensity because of limited flammability of the vegetation and prevailing moist conditions, but most of the component tree species are probably not very tolerant of fire.

MEMBERSHIP

Associations:

- *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Acer spicatum* / *Caulophyllum thalictroides* - *Laportea canadensis* Forest (CEGL004973, G3)
- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861, G3G4Q)
- *Betula alleghaniensis* - *Acer saccharum* - *Aesculus flava* / *Acer pensylvanicum* / *Trillium grandiflorum* Forest (CEGL004417, G2G3Q)
- *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285, G3G4)
- *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124, G2G3)
- *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest (CEGL006246, G1)
- *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130, G1)

Alliances:

- *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* Forest Alliance (A.266)
- *Tsuga canadensis* - *Betula alleghaniensis* Forest Alliance (A.412)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch to local matrix system, dominating the landscape of fairly high mountain ranges and occurring as a broad elevational zone on the highest. Small-patch systems may be embedded. It may be interfingering with Central and Southern Appalachian Montane Oak Forest (CES202.596) particularly between 1220-1372 m (4000-4500 feet) elevation.

Size: The size of patches is variable, being interfingering with montane oak vegetation in some cases, or occurring in larger more continuous patches in others. In the highest ranges, it occupies a broad elevational zone on the flanks. On somewhat lower mountain ranges, it dominates the mountaintops. Natural patches covered thousands to maybe 10,000 to 20,000 acres. A few remnant patches of thousands of acres remain, along with patches of hundreds of acres.

Adjacent Ecological Systems:

- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- High Allegheny Wetland (CES202.069)
- Southern and Central Appalachian Bog and Fen (CES202.300)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Appalachian Seepage Wetland (CES202.317)

Adjacent Ecological System Comments: Central and Southern Appalachian Montane Oak Forest (CES202.596) most typically interfingers at intermediate elevations and adjoins at lower ones. Central and Southern Appalachian Spruce-Fir Forest (CES202.028) may adjoin or interfinger at higher elevation. Small-patch systems such as Southern Appalachian Rocky Summit (CES202.327), Southern Appalachian Seepage Wetland (CES202.317), Southern and Central Appalachian Bog and Fen (CES202.300), and Southern Appalachian Grass and Shrub Bald (CES202.294) may be embedded.

DISTRIBUTION

Range: This system is primarily found in the Southern Blue Ridge, where it ranges from northwestern Georgia, western North Carolina and eastern Tennessee northward to southern Virginia. In Kentucky, this system is restricted to the Cumberland Mountains in the extreme southeastern corner of that state.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, TN, VA

Map Zones: 53:C, 57:C, 61:C

USFS Ecomap Regions: 221A:CC, 221B:CC, 221E:CC, 231A:CC, M221A:CC, M221Bc:CCC, M221C:CC, M221D:CC

TNC Ecoregions: 50:C, 51:C, 59:P

SOURCES

References: Comer et al. 2003, Lohman and Watson 1943, Schafale and Weakley 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722676#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne and S. Gawler

Version: 06 Jun 2008

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1315 SOUTHERN APPALACHIAN OAK FOREST (CES202.886)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Unglaciaded; Broad-Leaved Deciduous Tree; *Quercus* - *Carya*

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2315; ESLF 4121; ESP 1315

CONCEPT

Summary: This system consists of predominantly dry-mesic (to dry) forests occurring on open and exposed topography at lower to mid elevations in the Southern Blue Ridge and Southern Ridge and Valley ecoregions. This is the upland forest that characterizes much of the lower elevations of these areas. Substrates of stands included in this system can range from acidic to circumneutral or basic, and the vegetation varies accordingly. Bedrock may be of any type. Soils are usually deep residual soils but are often rocky. Some shallow soils and colluvium may be present locally within the group, but shallow soils tend to produce environments that are more extreme and have a larger component of various pine species. Typically, the vegetation consists of forests dominated by oaks, especially *Quercus prinus*, *Quercus alba*, *Quercus rubra*, *Quercus velutina*, and *Quercus coccinea*, with varying amounts of *Carya* spp., *Nyssa sylvatica*, *Acer rubrum*, and other species such as *Pinus strobus* and *Fraxinus americana*. Historically, *Castanea dentata* was a dominant or codominant in many of these communities until its virtual elimination by the chestnut blight fungus (*Cryphonectria parasitica*) during the early 1900s. Some areas (usually on drier sites) now have dense evergreen ericaceous shrub layers of *Kalmia latifolia*, with *Rhododendron* spp. on more mesic sites. Some other areas have deciduous ericad layers, sometimes consisting of *Vaccinium* spp. or *Gaylussacia* spp. This system concept also includes many successional communities that have been impacted by logging or agriculture, such as types dominated by *Liriodendron tulipifera*, *Pinus* spp., and *Robinia pseudoacacia*. This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration. Most oaks are long-lived with typical age of mortality ranging from 200 to 400 years. Scarlet and black oaks are shorter lived with typical ages being approximately 50 to 100 years, while white oaks can live as long as 600 years.

Classification Comments: This system is distinguished from the oak forests of the Piedmont by substantial floristic differences that probably are determined by biogeography as well as climate and topography. Compositional differences were more pronounced in the past, when *Castanea dentata* was a major species in this system and not in Piedmont oak forests. This system is distinguished from most other systems in its primary range by the canopy dominance of oaks (other than strong dominance by red oak) without a large component of yellow pines (*Pinus echinata*, *Pinus virginiana*, *Pinus pungens*) in the canopy. It shares those characteristics with Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359), which might be thought of as a subtype of this system on the more exposed and acidic substrates. The environment is intermediate within the region in topography and moisture. Northward this system grades into Northeastern Interior Dry-Mesic Oak Forest (CES202.592), which occurs in similar environmental conditions. This southern Appalachian system is characterized by the presence, in most occurrences, of plant species of southern Appalachian affinity, such as *Magnolia fraseri*, *Gaylussacia ursina*, *Rhododendron calendulaceum*, etc.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--may represent a narrower concept subset of this.
- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Central Appalachian Dry Oak-Pine Forest (CES202.591)
- Northeastern Interior Dry-Mesic Oak Forest (CES202.592)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

DESCRIPTION

Environment: Occurs on open slopes, ridgetops, lower elevation peaks, and higher parts of broad valley bottoms, at low to moderate elevations. Bedrock may be of any type. Soils are usually deep residual soils, but are often rocky. Some shallow soils, colluvium, and other soils may be present locally within the system, but shallow soils tend to produce environments that are more extreme and have a larger component of *Pinus* spp. than this system. Moisture levels are intermediate for the region. Soil chemistry and topography are important determinants of different associations within the system. Topography, elevation, and soil depth are the most important factors separating this system from others.

Vegetation: Vegetation consists of forests dominated by *Quercus* species, most typically *Quercus prinus*, *Quercus alba*, and *Quercus coccinea*, with varying amounts of *Carya* spp., *Acer rubrum*, and other species. Less typical are stands dominated by other species, such as *Pinus strobus*, or other hardwood species. *Castanea dentata* was once dominant or codominant in many of these forests. Subcanopies and shrub layers are usually well-developed. Some associations have dense evergreen shrub layers, while others have open shrub layers. Herbs, forbs and ferns are usually sparse to moderate in density.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase

regeneration. Extreme wind or ice storms occasionally create larger canopy openings. Fire occurred fairly frequently in presettlement times, though there is some dispute whether most of the fires were natural or anthropogenic in origin (Abrams 1992, Delcourt and Delcourt 1997). Fires were usually low-intensity surface fires. The dominant species are fairly fire-tolerant, making most fires non-catastrophic. Fire may be important for favoring oak dominance over more mesophytic tree species within some of the topographic range of this system. Fire also can be expected to have a moderate effect on vegetation structure, producing a somewhat more open canopy and less dense understory and shrub layer than currently seen in most examples. Fire frequency or intensity may be important for determining the boundary between this system and both the more mesic and the drier systems. Virtually all examples have been strongly affected by the introduction of the chestnut blight, which killed all of the *Castanea dentata* trees, eliminating it as a canopy dominant. Past logging affected most occurrences by changing canopies to an even-aged, or more even-aged, structure. Extreme wind or ice storms occasionally create larger canopy openings. Virtually all examples have been strongly affected by introduction of chestnut blight, which killed all the American chestnut trees, eliminating it as a canopy dominant. The introduction, and now widespread establishment, of gypsy moth (*Lymantria dispar*) that favors oaks as food has also affected these forests by causing widespread mortality of overstory trees depending on topographic position and precipitation amounts around defoliation events. Past logging, and now lack of fire, has affected most occurrences by changing canopies to an even-aged, or more even-aged, structure with an understory of shade-tolerant but fire-intolerant species such as *Pinus strobus*, *Acer rubrum*, and *Acer pensylvanicum*. The removal of American chestnut from the overstory of these forests is thought to have benefited *Carya* spp., and their persistence and continued recruitment in contemporary oak-hickory forests may reflect fire exclusion in recent decades.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *rubrum* - *Betula (alleghaniensis, lenta)* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Forest (CEGL008558, GNA)
- *Pinus strobus* - *Quercus (coccinea, prinus)* / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest (CEGL007519, G4)
- *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest (CEGL007517, G3G4)
- *Quercus (prinus, coccinea)* / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271, G5)
- *Quercus alba* - *Quercus (rubra, prinus)* / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230, G5)
- *Quercus alba* - *Quercus coccinea* - *Quercus falcata* / *Kalmia latifolia* - *Vaccinium pallidum* Forest (CEGL007691, G2G3)
- *Quercus alba* - *Quercus falcata* / *Vaccinium (arboreum, hirsutum, pallidum)* Forest (CEGL008567, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240, G4)
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* / *Collinsonia canadensis* - *Podophyllum peltatum* - *Amphicarpaea bracteata* Forest (CEGL007692, G3)
- *Quercus alba* / *Kalmia latifolia* Forest (CEGL007295, G2Q)
- *Quercus muehlenbergii* - *Quercus (alba, rubra)* - *Carya cordiformis* / *Viburnum prunifolium* Forest (CEGL004793, G3G4)
- *Quercus prinus* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431, G4G5)
- *Quercus prinus* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267, G4G5)
- *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268, G4?)
- *Quercus prinus* - *Quercus rubra* - *Carya* spp. - *Fraxinus americana* / *Cercis canadensis* / *Solidago sphecelata* Forest (CEGL008549, G3?)
- *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286, G4)
- *Quercus prinus* - *Quercus velutina* / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL008522, G4?)
- *Quercus rubra* - *Acer rubrum* / *Pyrolaria pubera* / *Thelypteris noveboracensis* Forest (CEGL006192, G4?)
- *Quercus rubra* - *Quercus muehlenbergii* / *Hamamelis virginiana* / *Polymnia canadensis* Forest (CEGL007215, G1Q)
- *Sassafras albidum* - *Quercus* spp. Forest (CEGL004096, G5)
- *Vitis aestivalis* Vine-Shrubland (CEGL003890, G2G3)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia fraseri* Forest Alliance (A.2009)
- *Pinus strobus* - *Quercus (alba, rubra, velutina)* Forest Alliance (A.401)
- *Pinus strobus* - *Quercus (coccinea, prinus)* Forest Alliance (A.402)
- *Quercus alba* - (*Quercus rubra, Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus alba* Montane Forest Alliance (A.271)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus prinus* - (*Quercus coccinea, Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus prinus* - *Quercus rubra* Forest Alliance (A.250)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)
- *Sassafras albidum* Forest Alliance (A.2019)
- *Vitis aestivalis* Vine-Shrubland Alliance (A.911)

SPATIAL CHARACTERISTICS

Spatial Summary: Matrix system, covering a majority of the landscape over large areas.

Size: Occurs as a large-patch to matrix system. Contiguous bodies of tens of thousands of acres once occurred. The oak forests

probably make up slightly more than 50% of the landscape in all but the higher elevations of the region. Size of existing occurrences may be strongly affected by separation distances for occurrences. A few remaining occurrences over 10,000 acres are probably present.

Adjacent Ecological Systems:

- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)

Adjacent Ecological System Comments: This system is almost always bordered by Southern and Central Appalachian Cove Forest (CES202.373) in more mesic sites. It is often bordered by Southern Appalachian Low-Elevation Pine Forest (CES202.332) on more exposed topography. It may grade into Central and Southern Appalachian Montane Oak Forest (CES202.596) at the highest elevations. Various rock outcrop systems may be present as embedded small patches.

DISTRIBUTION

Range: This system ranges throughout the southern Appalachians, from northern Georgia and South Carolina north into the Southern Blue Ridge of Virginia to the Roanoke River in the Blue Ridge, and slightly farther south in the Ridge and Valley. It occurs in very limited montane outliers in the Piedmont, and possibly on Pine/Black mountain in Kentucky.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA, WV

Map Zones: 53:C, 57:C, 59:C, 61:P

USFS Ecomap Regions: 231Aa:CCC, M221C:CC, M221D:CC

TNC Ecoregions: 50:C, 51:C, 52:C

SOURCES

References: Abrams 1992, Comer et al. 2003, Delcourt and Delcourt 1997, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722792#references

Description Author: M. Schafale, R. Evans, M. Pyne, R. White, mod. S.C. Gawler

Version: 01 Oct 2007

Concept Author: M. Schafale, R. Evans, M. Pyne, R. White

Stakeholders: East, Southeast

ClassifResp: Southeast

1335 SOUTHERN ATLANTIC COASTAL PLAIN DRY AND DRY-MESIC OAK FOREST (CES203.241)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Long Disturbance Interval; Broad-Leaved Tree

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2335; ESLF 4141; ESP 1335

CONCEPT

Summary: This system encompasses oak-dominated forests of somewhat fire-sheltered dry to dry-mesic sites in the Mid-Atlantic and South Atlantic coastal plains from southeastern Virginia to Georgia. Sites where this system occurs are somewhat protected from most natural fires by some combination of steeper topography, isolation from the spread of fire, and limited flammability of the vegetation. If fires were more frequent, the vegetation would likely be replaced by more fire-tolerant southern pines, especially *Pinus palustris*.

Classification Comments: There remains some uncertainty how this system and other dry and dry-mesic hardwood systems should be divided. There is a broad gradient in climate and species composition from north to south and west. The boundaries at the north edge of the Mid-Atlantic Coastal Plain ecoregion and at the break between the South Atlantic Coastal Plain and East Gulf Coastal Plain ecoregions are boundaries of convenience to create breaks in this broad gradient. Better boundaries may be possible. Differences from comparable systems in the Piedmont are sometimes fairly subtle, and species that differentiate them in one part of the range may not work in other parts. In particular, some species that are excluded from the Coastal Plain farther south are common components farther north. The boundary with Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242) and with adjacent *Pinus palustris*-dominated systems may be blurred by fire suppression.

Related Concepts:

- Dry Oak-Hickory Forest (Schafale and Weakley 1990) Broader
- Dry-Mesic Oak-Hickory Forest (Schafale and Weakley 1990) Broader. The Schafale and Weakley (1990) types (Dry and Dry-Mesic Oak-Hickory Forest) include both their Coastal Plain and Piedmont manifestations.
- Oak-Hickory Forest (Bennett and Nelson 1991) Finer

DESCRIPTION

Environment: This system occurs in dry-mesic to dry but not xeric sites, generally on upper to midslopes in bluff systems, but occasionally it occurs on broader uplands or on the highest parts of non-flooded river terraces. Soils are generally acidic, though calcareous soils occur occasionally (as in *Carya glabra* - *Tilia americana* var. *caroliniana* - *Acer barbatum* / *Trillium maculatum* Forest (CEGL004747)). Soils are loamy to clayey and well-drained but not excessively drained. Similar sites with coarse sandy soils tend to support other ecological systems, in part due to the influence of more frequent fire. Sites are somewhat protected from most natural fires by steep topography and by limited flammability of the vegetation. Fires that penetrate them are generally low in intensity and have fairly limited ecological effect.

Vegetation: Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba*, *Quercus falcata*, and *Quercus stellata*. In the northern part of the range, *Quercus rubra* may be a component, while in the southern part, evergreen species such as *Quercus nigra* or *Quercus hemisphaerica* become more prominent. Hickories (*Carya* spp.) are also prominent, including *Carya alba*, *Carya glabra*, and *Carya pallida*. Other woody plants may include *Tilia americana* var. *caroliniana*, *Acer barbatum*, *Aesculus pavia*, *Osmanthus americanus* var. *americanus*, *Ilex glabra*, *Ilex opaca*, *Vaccinium arboreum*, *Vaccinium elliotii*, and *Clethra alnifolia*. Some typical herbs are *Trillium maculatum* and *Chasmanthium sessiliflorum*. There is some variation in composition with aspect and degree of exposure to fire. *Pinus echinata* may be present in some stands, particularly on drier south- and west-facing slopes but is typically not dominant. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. More mesophytic species such as *Fagus grandifolia* and *Magnolia grandiflora* are absent or are confined to the understory. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for some examples of this system as well, where occasional fires may allow them to regenerate. A well-developed shrub layer may be present, with *Vaccinium* spp. and *Gaylussacia* spp. most typical. The herb layer is generally sparse, and species richness tends to be low. In examples where fires have occurred, the understory is open and savanna-like and dominated by grasses and forbs rather than shrubs.

Dynamics: Fire is naturally infrequent in this system, which is the important factor separating it from adjacent *Pinus palustris*-dominated systems. If fire does penetrate, it is likely to be low in intensity and have limited ecological effects. However, there is some evidence that this system has expanded into areas once occupied by longleaf pine as fire has been suppressed. There may have been a shifting boundary between these systems, driven by variation in fire frequency. These forests probably generally exist naturally as old-growth forests, with canopy dynamics dominated by gap-phase regeneration. However, exposure to occasional fires and hurricanes may create more frequent and larger canopy disturbances than analogous systems inland.

MEMBERSHIP

Associations:

- *Carya glabra* - *Tilia americana* var. *caroliniana* - *Acer barbatum* / *Trillium maculatum* Forest (CEGL004747, G2G3)
- *Quercus alba* - *Carya alba* / *Vaccinium elliotii* Forest [Provisional] (CEGL007224, G5?)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Carya glabra* / Mixed Herbs Coastal Plain Forest (CEGL007226, G4?)
- *Quercus alba* - *Quercus (margaretiae, rubra, stellata)* / *Vaccinium pallidum* Sandhill Forest (CEGL007766, G2?)
- *Quercus alba* - *Quercus nigra* - *Quercus falcata* / *Ilex opaca* / *Clethra alnifolia* - *Arundinaria gigantea* ssp. *tecta* Forest (CEGL007862, G4?)
- *Quercus falcata* - *Quercus stellata* - *Carya alba* / *Vaccinium* spp. Coastal Plain Forest (CEGL007246, G4?)
- *Quercus hemisphaerica* - *Magnolia grandiflora* - *Carya (glabra, pallida)* / *Vaccinium arboreum* / *Chasmanthium sessiliflorum* Forest (CEGL004788, G3G4)
- *Quercus hemisphaerica* - *Pinus taeda* - (*Quercus nigra*) / *Osmanthus americanus* var. *americanus* / *Ilex glabra* Forest (CEGL007022, G2G3)

Alliances:

- *Acer barbatum* - *Fraxinus americana* - (*Juglans nigra*) Forest Alliance (A.214)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus hemisphaerica* - *Carya glabra* Forest Alliance (A.372)
- *Quercus hemisphaerica* Forest Alliance (A.53)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, occurring in mosaics with other small-patch systems, or as small isolated patches surrounded by wetlands.

Size: Generally occurs as small to medium patches, of a few to dozens of acres. Mosaics may contain up to several hundred acres in close proximity.

Adjacent Ecological Systems:

- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

Adjacent Ecological System Comments: Most commonly associated with Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242). Naturally grades to adjacent *Pinus palustris*-dominated systems on drier or flatter sites, but virtually no examples remain with this association intact.

DISTRIBUTION

Range: This system ranges from southeastern Virginia (south of the James River) south to southeastern Georgia in the Atlantic Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Bennett and Nelson 1991, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723244#references

Description Author: R. Evans and M. Schafale, mod. M. Pyne

Version: 04 Feb 2009

Concept Author: R. Evans and M. Schafale

Stakeholders: East, Southeast

ClassifResp: Southeast

1382 SOUTHERN ATLANTIC COASTAL PLAIN MARITIME FOREST (CES203.537)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2382; ESLF 4325; ESP 1382

CONCEPT

Summary: This system encompasses a range of woody vegetation present on stabilized upland dunes of barrier islands and near-coastal strands, from central South Carolina (approximately Cooper River) southward to approximately Volusia County, Florida. It includes vegetation whose structure and composition are influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast. Examples are known from the barrier islands of Georgia and Florida, such as Big Talbot Island, Florida, and probably Sapelo Island, Georgia. Most typical stands are dominated by oaks, primarily *Quercus virginiana* and/or *Quercus geminata*. Vegetation may also include different woodland communities often dominated by southern pine species. *Pinus palustris*, *Pinus serotina*, and *Pinus elliottii* var. *elliottii* are all important in documented examples. These examples tend to have densely shrubby subcanopies and understories with species such as *Quercus virginiana*, *Quercus geminata*, *Quercus hemisphaerica*, *Quercus chapmanii*, *Quercus myrtifolia*, and *Magnolia grandiflora*. Unlike maritime vegetation to the north, this system may be more heavily influenced by natural fire regimes that may help to explain the predominance of the fire-tolerant pine species. It has been postulated that the natural fire frequency is from 20-30 years.

Similar Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)--occurs to north.
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Related Concepts:

- Maritime Hammock (FNAI 1990) Broader
- Shell Mound (FNAI 1990) Intersecting

DESCRIPTION

Environment: The primary range of this system coincides with the Sea Islands, a chain of more than 100 low islands off the Atlantic coast of South Carolina, Georgia, and northern Florida, extending from the Cooper River to the St. Johns River. Many of these islands have a long history of human use and occupation, including Spanish missions and garrisons in the 16th century. In addition, the Sea Islands were the first important cotton-growing area in North America. The degree to which this system has been altered by these events is unknown.

Vegetation: Most typical stands are dominated by oaks, primarily *Quercus virginiana* and/or *Quercus geminata*. Vegetation may also include different woodland communities often dominated by southern pine species. *Pinus palustris*, *Pinus serotina*, and *Pinus elliottii* var. *elliottii* are all important in documented examples. These examples tend to have densely shrubby subcanopies and understories with species such as *Quercus virginiana*, *Quercus geminata*, *Quercus hemisphaerica*, *Quercus chapmanii*, *Quercus myrtifolia*, and *Magnolia grandiflora*.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa biflora* - (*Liquidambar styraciflua*, *Fraxinus* sp.) Maritime Swamp Forest (CEGL004082, G2)
- *Ceratiola ericoides* - *Quercus geminata* - *Ximenia americana* / *Cladonia* spp. - *Cladonia* spp. Shrubland (CEGL003862, G2)
- *Juniperus virginiana* var. *silicicola* - *Zanthoxylum clava-herculis* - *Quercus virginiana* - (*Sabal palmetto*) / *Sageretia minutiflora* - (*Sideroxylon tenax*) Woodland (CEGL003525, G2?)
- *Pinus elliottii* var. *elliottii* - (*Pinus palustris*) / *Ilex vomitoria* - *Serenoa repens* - *Morella cerifera* Woodland (CEGL004658, G2G3)
- *Pinus palustris* - *Pinus serotina* / *Quercus chapmanii* - *Quercus myrtifolia* - *Quercus geminata* - *Lyonia ferruginea* Woodland (CEGL003662, G2?)
- *Quercus geminata* - (*Quercus virginiana*) / *Serenoa repens* - *Lyonia fruticosa* Forest (CEGL007020, G2?)
- *Quercus geminata* - *Quercus myrtifolia* - *Serenoa repens* - *Persea borbonia* Shrubland (CEGL003821, G2)
- *Quercus virginiana* - (*Pinus elliottii* var. *elliottii*, *Sabal palmetto*) / *Persea borbonia* - *Callicarpa americana* Forest (CEGL007032, G2)
- *Quercus virginiana* - *Quercus hemisphaerica* - *Pinus taeda* / *Persea palustris* - *Ilex vomitoria* Forest (CEGL007027, G2)
- *Sabal palmetto* - (*Juniperus virginiana* var. *silicicola*) Woodland (CEGL003526, G2?)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)

- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)
- *Quercus geminata* Forest Alliance (A.52)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Quercus virginiana* - *Juniperus virginiana* - (*Sabal palmetto*) Woodland Alliance (A.479)
- *Sabal palmetto* Temperate Woodland Alliance (A.481)

DISTRIBUTION

Range: This system occurs from central South Carolina (Cooper River) southward to approximately Volusia County, Florida (ca. 28 degrees 30 minutes N latitude).

Divisions: 203:C

Nations: US

Subnations: FL, GA, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232C:CC

TNC Ecoregions: 56:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723065#references

Description Author: R. Evans, mod. M. Pyne

Version: 30 May 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1343 SOUTHERN ATLANTIC COASTAL PLAIN MESIC HARDWOOD FOREST (CES203.242)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2343; ESLF 4150; ESP 1343

CONCEPT

Summary: This upland system of the Atlantic Coastal Plain ranges from southern New Jersey south to Georgia in a variety of moist but non-wetland sites that are naturally sheltered from frequent fire. Such sites include lower slopes and bluffs along streams and rivers in dissected terrain, mesic flats between drier pine-dominated uplands and floodplains, and local topographic high areas within bottomland terraces or nonriverine wet flats. Soil textures are variable in both texture and pH. The vegetation consists of forests dominated by combinations of trees that include a significant component of mesophytic deciduous hardwood species, such as *Fagus grandifolia* or *Acer barbatum*. Its southern limit is generally exclusive of the natural range of *Pinus glabra* as mapped by Kossuth and Michael (1990) and *Magnolia grandiflora* as mapped by Outcalt (1990). Upland and bottomland oaks at the mid range of moisture tolerance are usually also present, particularly *Quercus alba*, but sometimes also *Quercus pagoda*, *Quercus falcata*, *Quercus michauxii*, *Quercus shumardii*, or *Quercus nigra*. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for some examples of this system. Understories are usually well-developed. Shrub and herb layers may be sparse or moderately dense. Within its range, *Sabal minor* may be a prominent shrub. Species richness may be fairly high in basic sites but is fairly low otherwise.

Classification Comments: There remains some uncertainty how this system and other mesic hardwood systems should be divided. There is a broad gradient in climate and species composition from north to south and west. The boundaries at the northern edge of its range (the Chesapeake Bay Lowlands TNC ecoregion) and at the break between the South Atlantic Coastal Plain and East Gulf Coastal Plain ecoregions are boundaries of convenience to create breaks in this broad gradient. At the southern end, the boundary has been better determined (April 2006) to exclude areas within the combined ranges of *Pinus glabra* and *Magnolia grandiflora*, making this system deciduous rather than mixed evergreen-deciduous. Differences from mesic forests of the Piedmont are sometimes fairly subtle, and species that differentiate them in one part of the range many not work in other parts. In particular, some species that are excluded from the Coastal Plain farther south are common components farther north. In MD and DC, this system can extend into the Piedmont, straddling the fall zone where the Coastal Plain and Piedmont meet. Besides the variation across the range of this system, there are two sets of distinctions within it that may be worthy of consideration for defining separate systems. Acidic and basic substrates have substantial floristic differences. Variants on upland slopes, nonriverine swamp islands, and high ridges in bottomlands could be recognized as separate systems, or the latter two could be treated as part of the systems that surround them. However, the difference between ecological processes in uplands and wetlands separates those surrounded by wetland systems from the surrounding systems. This is especially true in the case of floodplains, which have flood-carried nutrient input as well as wetness as a difference. Floristic differences may exist between these variants, but they are subtle and do not appear to be definitive.

Similar Ecological Systems:

- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Northern Atlantic Coastal Plain Hardwood Forest (CES203.475)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)
- Southern Piedmont Mesic Forest (CES202.342)

DESCRIPTION

Environment: This system occurs in a variety of moist non-wetland sites that are naturally sheltered from frequent fire. Most common are lower slope and bluff examples along streams and rivers in dissected terrain, but some examples occur on mesic flats between drier pine-dominated uplands and floodplains or on local high areas within bottomland terraces or nonriverine wet flats. Soils cover the full range of mineral soil textures, except the coarsest sands. Soils are not saturated for any significant time during the growing season and seldom, if ever, are extremely dry. Soils developed from calcareous materials or rich alluvium may be basic; others are strongly acidic. Sites are protected from most natural fires by steep topography or by surrounding extensive areas of non-flammable vegetation.

Vegetation: Stands of this system include a significant component of mesophytic species such as *Fagus grandifolia* or *Acer barbatum*. Upland and bottomland oaks at the mid range of moisture tolerance are usually also present, particularly *Quercus alba*, but sometimes also *Quercus falcata*, *Quercus michauxii*, *Quercus shumardii*, or *Quercus nigra*. Other hardwood components include *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Carya cordiformis*, *Nyssa sylvatica*, and *Magnolia tripetala*. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past removal of the hardwood canopy and subsequent invasion. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for

some examples of this system. Understories are usually well-developed. Shrub and herb layers may be sparse or moderately dense, with the herb layer being forb-dominated. Some typical smaller trees and shrubs include *Cornus florida*, *Symplocos tinctoria*, *Oxydendrum arboreum*, *Hamamelis virginiana*, *Morus rubra*, and *Stewartia malacodendron*. Within its range, *Sabal minor* may be a prominent shrub. Some stands may contain *Arundinaria gigantea*. Some typical herbs include *Mitchella repens* and *Hexastylis arifolia*. Species richness may be fairly high in basic sites but is fairly low otherwise.

Dynamics: Fire is naturally infrequent to absent in this system. If fire does penetrate, it is likely to be low in intensity but may have significant ecological effects. These forests probably generally exist naturally as old-growth forests, with canopy dynamics dominated by gap-phase regeneration. However, exposure to occasional fires and hurricanes may create more frequent and larger canopy disturbances than analogous systems inland.

MEMBERSHIP

Associations:

- *Celtis laevigata* - *Tilia americana* var. *caroliniana* / *Aesculus pavia* Forest (CEGL007282, G1G2)
- *Fagus grandifolia* - *Acer barbatum* - *Quercus muehlenbergii* / *Sanguinaria canadensis* Forest (CEGL007181, G2?)
- *Fagus grandifolia* - *Liriodendron tulipifera* - *Carya cordiformis* / *Lindera benzoin* / *Podophyllum peltatum* Forest (CEGL006055, G4?)
- *Fagus grandifolia* - *Quercus* (*alba*, *rubra*) - *Liriodendron tulipifera* / (*Ilex opaca* var. *opaca*) / *Polystichum acrostichoides* Forest (CEGL006075, G5)
- *Fagus grandifolia* - *Quercus alba* - (*Acer barbatum*) / Mixed Herbs Forest (CEGL007206, G4)
- *Fagus grandifolia* - *Quercus alba* - *Quercus laurifolia* / *Galax urceolata* Forest (CEGL007863, G4?)
- *Fagus grandifolia* - *Quercus nigra* Forest (CEGL007211, G3)
- *Fagus grandifolia* - *Quercus rubra* / *Cornus florida* / *Polystichum acrostichoides* - *Hexastylis virginica* Forest (CEGL008465, G3G4)
- *Liquidambar styraciflua* - *Acer rubrum* - (*Nyssa biflora*) / *Woodwardia virginica* Forest (CEGL007848, G2G3)
- *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Forest (CEGL007220, GNA)
- *Pinus taeda* - *Quercus alba* - *Chamaecyparis thuyoides* / *Kalmia latifolia* - *Hamamelis virginiana* - *Lyonia lucida* Forest (CEGL004304, G1G2)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Quercus* (*michauxii*, *nigra*) / *Ilex opaca* / *Chasmanthium laxum* Forest (CEGL007845, G3G4)
- *Quercus alba* - *Quercus velutina* - *Carya alba* / *Cornus florida* / *Chimaphila maculata* Forest (CEGL007278, G3G4)
- *Quercus falcata* - *Quercus phellos* / *Ilex opaca* Forest (CEGL006390, GNR)
- *Quercus falcata* - *Tilia americana* var. *caroliniana* - *Magnolia grandiflora* / *Ilex vomitoria* Forest (CEGL007470, G2G3)
- *Quercus muehlenbergii* / *Cercis canadensis* / *Dichantherium boscii* - *Bromus pubescens* - *Erigeron pulchellus* var. *pulchellus* - *Aquilegia canadensis* Forest (CEGL007748, G1)
- *Quercus pagoda* - *Carya cordiformis* / *Chasmanthium sessiliflorum* - *Verbesina virginica* Forest (CEGL004092, G2?)
- *Tsuga canadensis* / *Ilex opaca* / *Hieracium venosum* Forest (CEGL006600, GNR)

Alliances:

- *Carya glabra* - *Tilia americana* var. *caroliniana* - *Celtis laevigata* Forest Alliance (A.223)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system, occurring in mosaics with other small-patch systems, or as small isolated patches surrounded by wetlands.

Size: Generally occurs as small to large patches, of a few to dozens of acres. Mosaics may contain up to several hundred acres in close proximity.

Adjacent Ecological Systems:

- Central Appalachian Dry Oak-Pine Forest (CES202.591)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Northern Atlantic Coastal Plain Hardwood Forest (CES203.475)
- Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241)
- Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: Most commonly associated with Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak

Forest (CES203.241) and various floodplain systems. Less commonly associated with Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304). Floodplain systems often occur below this system. In MD and DC, where this system occurs along the fall zone, it may be found below ridges and hilltops supporting Central Appalachian Dry Oak-Pine Forest (CES202.591) and adjacent to steep slopes supporting Northern Atlantic Coastal Plain Hardwood Forest (CES203.475).

DISTRIBUTION

Range: This system ranges from Delaware south to central Georgia in the Atlantic Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: DC, DE, GA, MD, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 221D:CC, 232B:CC, 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 52:C, 56:C, 57:C, 58:C, 61:C, 62:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723243#references

Description Author: R. Evans, mod. M. Pyne and J. Teague

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1330 SOUTHERN COASTAL PLAIN DRY UPLAND HARDWOOD FOREST (CES203.560)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2330; ESLF 4136; ESP 1330

CONCEPT

Summary: This is one of three hardwood-dominated systems found in the East Gulf Coastal Plain and adjacent areas of central Florida. This type is found in the Southern Coastal Plain and Southeastern Plains (EPA Level III Ecoregion 75 and parts of 65). Examples attributable to this type are typically deciduous or mixed evergreen oak-dominated forests, often with a pine component present. Although the southern portion of the range of this system overlaps Southern Coastal Plain Oak Dome and Hammock (CES203.494), the latter is dominated by evergreen oak species, and the two should not be confused. The core range of this type extends northward to the approximate historical range of longleaf pine; although most deciduous species do not mimic this range, this boundary does appear to be a reasonable demarcation boundary north of which *Quercus alba* becomes more abundant and south of which *Quercus hemisphaerica* is more diagnostic. Like all hardwood systems of this region, examples occur within a landscape matrix historically occupied by pine-dominated uplands and consequently only occurred in fire-sheltered locations in naturally small to large patches. Examples of this system tend to occur on sites intermediate in moisture tendency (mostly dry to dry-mesic), although occasional xeric stands may also be included. Toward the northern range limits of this system, it may have been less restricted to small patches in fire-protected locations, and may have been formerly more prevalent on the landscape even in areas heavily influenced by fire.

Important tree species vary geographically and according to previous disturbance. *Quercus hemisphaerica* is a typical species in many examples, with *Quercus stellata*, *Quercus falcata*, and *Quercus alba* less frequently encountered, but dominant in some stands. The overstory of some examples may be quite diverse, with hickories and other hardwood species often present. Typically mesic sites, as indicated by species indicative of these conditions, are covered under other systems. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. *Pinus glabra* or *Pinus echinata* may also be present in some examples. Stands may be found on slopes above rivers and adjacent to sinkholes, as well as other fire-infrequent habitats.

Classification Comments: As currently conceived, the Alabama range of this type extends throughout the Southern Hilly Gulf Coastal Plain (Ecoregion 65d), as mapped by the U.S. Environmental Protection Agency (EPA 2004) northward across the Black Belt and into the Fall Line Hills (Ecoregion 65i) to approximately Tuscaloosa (A. Schotz pers. comm.). To the north it is eventually replaced by East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483), but along this northern range it occurs in a mosaic with CES203.483 as well as East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506). In Mississippi the range extends almost to the same latitude, but this range is confined to Ecoregion 65d.

Similar Ecological Systems:

- Southern Coastal Plain Oak Dome and Hammock (CES203.494)

Related Concepts:

- Upland Hardwood Forest (FNAI 1990) Finer
- Upland Mixed Forest (FNAI 1990) Finer

DESCRIPTION

Environment: Topographically, these sites tend to occur on upper to mid slopes, but occasionally on broader uplands with reduced fire frequencies. A range of soils may be present from loamy and clayey to coarse sands, but are generally well-drained but not excessively drained. Soils are generally acidic, though calcareous soils occur occasionally. Sites are somewhat protected from most natural fires by steep topography and by limited flammability of the vegetation. Fires that penetrate them are generally low in intensity and have fairly limited ecological effect.

Vegetation: Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba*, *Quercus falcata*, *Quercus stellata*, *Quercus margarettiae*, and other species. There is some variation between the composition of northern versus southern examples in which evergreen species such as *Quercus nigra* and *Quercus hemisphaerica* become more prominent. Hickories (*Carya alba*, *Carya glabra*) may be present. There is some variation in composition with aspect and degree of exposure to fire. More mesophytic species such as *Fagus grandifolia* and *Magnolia grandiflora* are absent or are confined to the understory. *Pinus echinata* may be present in some stands, particularly on drier south- and west-facing slopes, but is typically not dominant. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. Some examples of this system will have pine (*Pinus echinata*, *Pinus glabra*, *Pinus taeda*) as a natural component, where occasional fires may allow them to regenerate. In most examples, the understory is well-developed. A well-developed shrub layer may be present, with *Vaccinium* spp. and *Gaylussacia* spp. most typical. The herb layer is generally sparse; species richness tends to be low but may be richer if fire has played a role in shaping the structure and composition of the stand. The most likely grass taxa (found in open-understory examples)

are *Schizachyrium scoparium*, *Andropogon* spp., *Chasmanthium* spp., *Dichanthelium* spp., and *Danthonia sericea*.

Dynamics: Sites where this system occurs almost invariably grade into pine-dominated systems, especially longleaf pine and to a lesser extent shortleaf pine. If these sites were burned more frequently, the vegetation would likely be replaced by more fire-tolerant southern pines.

MEMBERSHIP

Associations:

- *Quercus alba* - *Carya alba* / *Vaccinium elliottii* Forest [Provisional] (CEGL007224, G5?)
- *Quercus falcata* - *Quercus stellata* - *Carya alba* / *Vaccinium* spp. Coastal Plain Forest (CEGL007246, G4?)
- *Quercus hemisphaerica* - *Carya glabra* - *Magnolia grandiflora* / *Sabal etonia* Forest (CEGL003792, G2?)
- *Quercus hemisphaerica* - *Carya glabra* / *Oxydendrum arboreum* / *Sebastiania fruticosa* / *Carex baltzellii* Forest (CEGL007023, G2G3)
- *Quercus hemisphaerica* - *Magnolia grandiflora* - *Carya (glabra, pallida)* / *Vaccinium arboreum* / *Chasmanthium sessiliflorum* Forest (CEGL004788, G3G4)
- *Quercus hemisphaerica* - *Quercus (falcata, nigra)* / *Ilex opaca* - *Vaccinium arboreum* / *Cnidioscolus stimulosus* Forest (CEGL007751, G4)
- *Quercus velutina* - *Carya pallida* - (*Pinus echinata*) / *Vaccinium arboreum* / *Yucca filamentosa* Forest (CEGL008553, G3G4)

Alliances:

- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus hemisphaerica* - *Carya glabra* Forest Alliance (A.372)
- *Quercus hemisphaerica* Forest Alliance (A.53)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

SPATIAL CHARACTERISTICS

Spatial Summary: Examples occur within a landscape matrix historically occupied by pine-dominated uplands and therefore typically occur in somewhat fire-sheltered locations in naturally small to large patches. Toward the northern range limits of this system, it may have been less restricted to small patches in fire-protected locations, and may have been formerly more prevalent on the landscape even in areas heavily influenced by fire.

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: East Gulf Coastal Plain and adjacent areas of central Florida ranging northward into central Mississippi and Alabama.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS

Map Zones: 46:C, 55:C, 56:C, 99:C

USFS Ecomap Regions: 231B:CC, 232B:CC, 232C:CC, 232D:CC, 232J:CC, 232K:CC, 232L:CC

TNC Ecoregions: 43:C, 53:C, 55:C

SOURCES

References: Comer et al. 2003, EPA 2004, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723044#references

Description Author: M. Pyne and R. Evans

Version: 05 Jul 2006

Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1328 SOUTHERN COASTAL PLAIN LIMESTONE FOREST (CES203.502)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Circumneutral Soil; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2328; ESLF 4134; ESP 1328

CONCEPT

Summary: This system represents deciduous forests of the East Gulf Coastal Plain where limestone or other calcareous substrates occur near enough to the surface to influence vegetation composition. Examples are most common in the Black Belt region of Alabama and Mississippi, but are also present in more isolated patches in other portions of the region, including western Alabama, eastern Georgia, and southwestern middle Tennessee. Generally, the vegetation consists of forests and woodlands on well-developed, deep soils. Related vegetation surrounding rock outcrops and calcareous prairies is accommodated within other ecological systems. **Classification Comments:** Examples have been found in the Atlantic Coastal Plain which has led to a range expansion. South Carolina Heritage (B. Pittman/K. Boyle pers. comm.) has an ongoing study related to these communities in that state.

DESCRIPTION

Environment: Stands typically occur on ridges and upper to middle slopes of the southern coastal plains where limestone or other calcareous substrates occur near enough to the surface to influence vegetation composition.

Vegetation: Typical stands are dominated by oaks and hickories, particularly species which are indicative of finer-textured soils and/or a higher base status in the soil (e.g., *Carya carolinae-septentrionalis*, *Quercus muehlenbergii*, *Quercus pagoda*, *Quercus shumardii*, *Quercus stellata*). Other hardwood trees include *Fraxinus americana*, *Liquidambar styraciflua*, *Acer barbatum*, and *Aesculus glabra*. The rare *Carya myristiciformis* may also be found in some stands. Understory trees may include *Fraxinus americana* and *Juniperus virginiana* var. *virginiana*. Early-successional or fire-suppressed stands may exhibit greater dominance by *Juniperus virginiana*. More nutrient-rich or fire-sheltered stands may exhibit dominance or codominance by *Fraxinus americana*, *Tilia americana* (most commonly var. *caroliniana*, but var. *heterophylla* along the Chattahoochee River), and/or *Acer barbatum*. Understory trees may include smaller examples of canopy species in addition to *Aesculus pavia* var. *pavia*, *Cercis canadensis*, *Cornus florida*, *Ostrya virginiana*, and *Ulmus alata*. Shrubs and woody vines may include *Arundinaria gigantea*, *Berchemia scandens*, *Bignonia capreolata*, *Cocculus carolinus*, *Cornus drummondii*, *Crataegus* spp., *Euonymus americanus*, *Euonymus atropurpureus*, *Frangula caroliniana*, *Hydrangea quercifolia*, *Ilex decidua*, *Menispermum canadense*, *Parthenocissus quinquefolia*, *Ptelea trifoliata*, *Sideroxylon lycioides*, *Staphylea trifolia*, *Symphoricarpos orbiculatus*, *Toxicodendron radicans*, *Viburnum* spp., and *Vitis* spp. Some typical herbs include *Chasmanthium laxum*, *Chasmanthium sessiliflorum*, *Dichantherium boscii*, *Lithospermum tuberosum*, *Polystichum acrostichoides*, *Sanicula* spp., *Solidago auriculata*, *Spigelia marilandica*, *Trillium* spp., and *Verbesina virginica*. The ground layers of some stands may exhibit dominance by native warm-season grasses and other graminoids, including *Schizachyrium scoparium*, *Andropogon* spp., *Danthonia* spp., and *Carex cherokeensis*. In addition, *Tillandsia usneoides* may be present as an epiphyte.

MEMBERSHIP

Associations:

- *Acer barbatum* - *Aesculus glabra* - *Carya myristiciformis* - *Quercus shumardii* - *Quercus muehlenbergii* Forest (CEGL004671, G1G2)
- *Fraxinus americana* - *Juglans nigra* - *Ulmus rubra* / *Acer barbatum* - *Ostrya virginiana* / *Ptelea trifoliata* Forest (CEGL007180, G2)
- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Quercus* (*pagoda*, *shumardii*) - *Liquidambar styraciflua* / *Verbesina virginica* - *Solidago auriculata* Forest (CEGL008585, G3G4)
- *Quercus muehlenbergii* - (*Quercus sinuata*) - *Carya* spp. / *Sabal minor* / *Carex cherokeensis* - *Chasmanthium sessiliflorum* Forest (CEGL004023, G2)
- *Quercus muehlenbergii* - *Quercus shumardii* - *Carya* (*carolinae-septentrionalis*, *ovata*) Forest (CEGL007808, G3)
- *Quercus shumardii* - *Fraxinus americana* - *Carya* spp. / *Juniperus virginiana* var. *virginiana* Forest (CEGL004685, G2?)
- *Quercus shumardii* - *Quercus pagoda* - *Fraxinus americana* / *Ostrya virginiana* - *Cornus florida* / *Trillium ludovicianum* Forest (CEGL007272, G1)
- *Tilia americana* (var. *caroliniana*, var. *heterophylla*) - *Acer barbatum* - *Fraxinus americana* / *Arundinaria gigantea* / *Tillandsia usneoides* Forest (CEGL008557, G2G3)

Alliances:

- *Acer barbatum* - *Fraxinus americana* - (*Juglans nigra*) Forest Alliance (A.214)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)

- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: This system occurs in the East Gulf (and rarely the Atlantic) Coastal Plain, most commonly in the Black Belt region of Alabama and Mississippi. It is also present in more isolated patches in other portions of the region, including western Alabama, eastern Georgia, and marginally in southwestern middle Tennessee.

Divisions: 203:C

Nations: US

Subnations: AL, GA?, MS, TN

Map Zones: 46:C, 55:C, 99:C

USFS Ecomap Regions: 231B:CC, 232B:CC, 232J:CC, 232K:CC

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723086#references

Description Author: A. Schotz and R. Evans, mod. M. Pyne

Version: 31 Jan 2008

Concept Author: A. Schotz and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1357 SOUTHERN COASTAL PLAIN MESIC SLOPE FOREST (CES203.476)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Slope; Long Disturbance Interval; Broad-Leaved Evergreen Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2357; ESLF 4260; ESP 1357

CONCEPT

Summary: This forested system of the southern East Gulf and Atlantic coastal plains occurs on steep slopes, bluffs, or sheltered ravines where fire is naturally rare, generally within the natural range of *Pinus glabra* as mapped by Kossuth and Michael (1990) and *Magnolia grandiflora* as mapped by Outcalt (1990). Stands are mesic, and vegetation typically includes species such as *Fagus grandifolia*, *Magnolia grandiflora*, *Illicium floridanum*, and other species rarely encountered outside this system in the region. Related forests which occur on deep loess soils along the western margin of the region are classified as East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556). Some component associations are also found in temporarily flooded floodplains adjacent to these slopes, but this is primarily an upland system. The system also includes essentially upland vegetation of Pleistocene terraces, although these are conceptually transitional to creek floodplain systems.

Classification Comments: East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477) is a similar mesic forest system to the north of this one in the Upper East Gulf Coastal Plain that has greater dominance by deciduous trees. The systems of the loess bluffs to the west of this one, bordering the Mississippi River Alluvial Plain, are treated as distinct and are more extensive and continuous in their extent both vertically and latitudinally [see East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481) and East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)]. To the north of the combined ranges of *Pinus glabra* and *Magnolia grandiflora* in the Atlantic Coastal Plain, this system is replaced by Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242).

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)
- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)
- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

Related Concepts:

- Slope Forest (FNAI 1990) Intersecting

DESCRIPTION

Environment: This system is restricted to steep slopes, bluffs, or sheltered ravines where fire is naturally rare. This mesic habitat is confined to very limited, fire-sheltered areas within the natural ranges of *Pinus glabra* (Kossuth and Michael 1990) and *Magnolia grandiflora* (Outcalt 1990). This system occurs in a variety of moist, non-wetland sites that are naturally sheltered from frequent fire. These are typically narrow bands of vegetation between floodplain forests and upland communities dominated by *Pinus palustris* (Batista and Platt 1997). Most common are lower slope, bluff, and ravine examples along streams and rivers in dissected terrain, but some examples occur on mesic flats between drier pine-dominated uplands and floodplains or on local high areas within bottomland terraces or nonriverine wet flats. There may be larger patches where side-drains join larger streams. Under closed-canopy conditions, fire may only partially penetrate this system from adjacent uplands. Soils are typically deep, fine-textured, and moderately well-drained. Soils cover the full range of mineral soil textures, except for the coarsest sands. Soils are not saturated for any significant time during the growing season and seldom, if ever, are extremely dry. Soils developed from calcareous materials or rich alluvium may be basic; others are strongly acidic. Richer and more mesic stands occur in more strongly concave and finer-textured areas. Sites are normally protected from most natural fires by steep topography or by surrounding extensive areas of non-flammable vegetation. This system occurs in a region of mild winters, high annual rainfall and high evapotranspiration, as well as a high likelihood of hurricane landfall (Ware et al. 1993). These forests may represent relicts derived from the early Tertiary flora (Batista and Platt 1997).

Vegetation: Stands are mesic, and vegetation typically includes species such as *Fagus grandifolia*, *Magnolia grandiflora*, *Pinus glabra*, and other species rarely encountered outside this system in the region. All woody strata contain a mixture of evergreen and deciduous species. Canopies are diverse; in addition to the aforementioned taxa, other canopy taxa may include *Quercus alba*, *Quercus pagoda*, *Quercus michauxii*, *Quercus falcata*, *Quercus shumardii*, *Quercus velutina*, *Quercus laurifolia*, *Quercus nigra*, *Quercus hemisphaerica*, *Pinus echinata*, *Pinus taeda*, *Nyssa sylvatica*, *Fraxinus americana*, *Carya alba* (in the north), *Carya glabra*, *Ulmus alata*, *Ulmus americana*, *Ulmus rubra*, *Liriodendron tulipifera*, and *Liquidambar styraciflua* (NatureServe Ecology unpubl. data 2003). The presence of *Pinus taeda* is normal at lower frequencies, but higher ones may indicate past disturbance or removal of the hardwood canopy and subsequent invasion. Additional subcanopy taxa may include *Acer barbatum*, *Acer rubrum*, *Oxydendrum arboreum*, *Carpinus caroliniana ssp. caroliniana*, *Ostrya virginiana*, *Prunus caroliniana*, *Prunus serotina*, *Symplocos tinctoria*, *Magnolia macrophylla* (rare to the west), *Halesia diptera*, *Styrax grandifolius*, *Sassafras albidum*, *Ilex opaca*, *Hamamelis virginiana*,

Magnolia pyramidata, *Tilia americana* var. *caroliniana*, *Zanthoxylum clava-herculis*, *Crataegus marshallii*, *Morus rubra*, and *Cornus florida*. The shrub layer can be very diverse. Trees support lianas and epiphytes. Shrubs and woody vines include *Illicium floridanum*, *Hydrangea quercifolia*, *Arundinaria gigantea*, *Halesia diptera*, *Aesculus pavia*, *Calycanthus floridus* var. *floridus*, *Toxicodendron radicans*, *Parthenocissus quinquefolia*, *Viburnum rufidulum*, *Ilex vomitoria*, *Berchemia scandens*, *Vitis rotundifolia*, *Decumaria barbara*, *Callicarpa americana*, *Symplocos tinctoria*, *Ampelopsis arborea*, *Frangula caroliniana*, *Smilax tamnoides* (= *Smilax hispida*), *Gelsemium sempervirens*, *Sabal minor*, *Schisandra glabra*, *Lindera benzoin*, *Asimina parviflora*, *Cornus drummondii*, *Bignonia capreolata*, and *Euonymus americanus*. Except in gaps, herbs are scarce (Batista and Platt 1997). Herbs and herbaceous vines include *Thelypteris kunthii*, *Cystopteris protrusa*, *Viola walteri*, *Polystichum acrostichoides*, *Galium obtusum*, *Chasmanthium sessiliflorum*, *Aristolochia serpentaria*, *Trillium foetidissimum*, *Desmodium nudiflorum*, *Lithospermum tuberosum*, *Boehmeria cylindrica*, *Ageratina altissima* var. *altissima*, *Sanicula canadensis*, *Sanicula marilandica*, *Arisaema dracontium*, *Tillandsia usneoides*, *Cryptotaenia canadensis*, *Adiantum pedatum*, *Passiflora lutea*, *Cynoglossum virginianum*, *Botrychium virginianum*, *Ranunculus recurvatus*, *Mikania scandens*, and *Clematis crispa* (NatureServe Ecology unpubl. data 2003).

Dynamics: These are stable, fire-sheltered forests. There is presumably some natural disturbance from the effects of hurricanes, which are relatively frequent in the range of this system.

MEMBERSHIP

Associations:

- (*Fagus grandifolia*) - *Quercus pagoda* - *Magnolia grandiflora* / *Hydrangea quercifolia* / *Cystopteris protrusa* - *Thelypteris kunthii* Forest (CEGL007461, G3?)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Fraxinus americana* / *Acer barbatum* - *Cercis canadensis* - *Ostrya virginiana* Forest (CEGL007458, G1G2)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Pinus glabra* - (*Magnolia macrophylla*) / (*Illicium floridanum*) / *Hexastylis arifolia* Forest (CEGL007460, G3)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Quercus pagoda* - *Acer barbatum* - *Pinus taeda* Forest (CEGL004963, G1G2)
- *Fagus grandifolia* - *Magnolia grandiflora* / *Ilex opaca* - (*Persea borbonia*) / *Mitchella repens* Forest (CEGL007459, G2G3)
- *Fagus grandifolia* - *Magnolia grandiflora* / *Ostrya virginiana* / *Aesculus parviflora* Forest (CEGL008554, G2?)
- *Fagus grandifolia* - *Pinus glabra* - *Magnolia grandiflora* / *Serenoa repens* Forest (CEGL004977, G2G3)
- *Fagus grandifolia* - *Quercus alba* - *Liquidambar styraciflua* / *Magnolia grandiflora* / *Smilax pumila* - *Hexastylis arifolia* Forest (CEGL007210, G4)
- *Fagus grandifolia* - *Quercus alba* / *Symplocos tinctoria* East Gulf Coastal Plain Forest (CEGL003859, G3G4)
- *Pinus taeda* - *Quercus alba* / *Chasmanthium sessiliflorum* Forest (CEGL004763, G3G4)
- *Quercus* (*pagoda*, *shumardii*) - *Liquidambar styraciflua* / *Verbesina virginica* - *Solidago auriculata* Forest (CEGL008585, G3G4)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Quercus nigra* - *Carya pallida* - (*Quercus pagoda*) / *Magnolia* (*grandiflora*, *macrophylla*) Forest (CEGL004775, G3G4)
- *Quercus pagoda* - *Quercus* (*michauxii*, *shumardii*) - *Magnolia grandiflora* - (*Tilia americana* var. *caroliniana*) / *Sabal minor* Forest (CEGL007712, G2?)
- *Tilia americana* (var. *caroliniana*, var. *heterophylla*) - *Acer barbatum* - *Fraxinus americana* / *Arundinaria gigantea* / *Tillandsia usneoides* Forest (CEGL008557, G2G3)

Alliances:

- *Acer barbatum* - *Fraxinus americana* - (*Juglans nigra*) Forest Alliance (A.214)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Pinus taeda* - *Quercus* (*alba*, *falcata*, *stellata*) Forest Alliance (A.404)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

DISTRIBUTION

Range: This mesic upland system of the southern (Atlantic and Gulf) coastal plains is found in suitable conditions from Georgia south to northern Florida and west to (and including) the loessal plains of Mississippi and Louisiana. Its range is generally congruent with the natural range of *Pinus glabra* and *Magnolia grandiflora*.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS, SC

Map Zones: 46:C, 55:C, 56:?, 58:C, 99:C

USFS Ecomap Regions: 231B:CC, 231H:CC, 232B:CC, 232C:CC, 232D:CC, 232J:CC, 232K:CC, 232L:CC, 234A:CC

TNC Ecoregions: 43:C, 53:C, 55:P, 56:C

SOURCES

References: Batista and Platt 1997, Comer et al. 2003, Kossuth and Michael 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Outcalt 1990, Ware et al. 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723110#references

Description Author: A. Schotz and R. Evans, mod. M. Pyne

Version: 28 Sep 2006
Concept Author: A. Schotz and R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

SOUTHERN COASTAL PLAIN OAK DOME AND HAMMOCK (CES203.494)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; Broad-Leaved Evergreen Tree

National Mapping Codes: ESLF 4275

CONCEPT

Summary: This small-patch system occurs in the Southern Coastal Plain (Omernik ecoregion 75). Examples are known from inland portions of this region including parts of the East Gulf Coastal Plain (TNC ecoregion 53) and Florida peninsula (TNC ecoregion 55), and nearby portions of the South Atlantic Coastal Plain (TNC ecoregion 56). Thick stands of *Quercus virginiana* and/or *Quercus geminata* are diagnostic of this system. Examples often occupy locally distinct microhabitats that differ from the surrounding landscape, such as shallow depressions or slight topographic highs in a predominantly longleaf pine-dominated landscape. Although embedded in a matrix of vegetation with extremely frequent fire regimes, patches of this system are subject to only infrequent or rare fire events. Under more frequent fire regimes, these sites would likely be occupied by longleaf pine. It has been postulated that winter burning regimes have allowed this type to expand. A range of soil and moisture conditions may be present. More mesic examples have relatively thin soils (to 50 cm) above clay, while xeric examples occupy deep (>130 cm) well-drained sands. Dominant plant taxa of mesic examples are *Quercus virginiana* and *Quercus hemisphaerica*, along with *Diospyros virginiana*, *Campsis radicans* and *Smilax* spp. dominate the sparse ground cover. In xeric examples, dominants include *Quercus geminata*, *Pinus palustris*, *Quercus virginiana*, *Aristida stricta*, and *Stylisma humistrata*. This system is low in plant species diversity compared to most other habitats in the region.

Classification Comments: More diverse stands of upland hardwoods occurring in the same ecoregions should generally be treated under Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560). The core range of this system lies farther south than CES203.560. Closely related stands of vegetation may also occur in near-coastal environments where they are more obviously influenced by maritime disturbances; these are treated under different ecological systems. In Alabama examples of this system are of very limited extent, but occur inland as far as 60 miles or so from the coast; it is also known from bluffs along the Mobile-Tensas (A. Schotz pers. comm.).

Similar Ecological Systems:

- Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560)

Related Concepts:

- Mesic Hammock (FNAI 1990) Finer
- Xeric Hammock (FNAI 1990) Finer

DESCRIPTION

Environment: As currently defined this system includes examples across a moisture gradient from mesic to xeric, ranging across 3 different TNC ecoregions. In Georgia, more mesic examples of this system have relatively thin soils (to 50 cm) above clay, while xeric examples occupy deep (>130 cm) well-drained sands (Drew et al. 1998). There is also a tendency for examples found in central Florida to be somewhat more mesic than those found in north Florida (A. Johnson pers. comm.).

Vegetation: According to Drew et al. (1998) the dominant taxa of mesic examples are *Quercus virginiana*, *Quercus nigra*, and *Quercus hemisphaerica*, along with *Diospyros virginiana*, *Campsis radicans* and *Smilax* spp. dominate the sparse ground cover. In xeric examples dominants include *Quercus geminata*, *Pinus palustris*, *Quercus virginiana*, *Aristida stricta*, and *Stylisma humistrata*. Examples of this system are low in plant species diversity compared to other habitats in the region. Cabbage palms are a diagnostic component of examples of this system in central Florida (A. Johnson pers. comm.).

Dynamics: Myers (1990) postulated that winter-burning regimes have allowed the expansion of this type.

MEMBERSHIP

Associations:

- *Quercus geminata* / *Sabal etonia* Forest (CEGL008599, G2G3)
- *Quercus geminata* / *Vaccinium arboreum* Forest (CEGL003564, G3)
- *Quercus hemisphaerica* - *Carya glabra* - (*Quercus virginiana*) Forest (CEGL004506, G2G3?)
- *Quercus hemisphaerica* - *Quercus geminata* / *Persea borbonia* - *Osmanthus americanus* Forest (CEGL004787, G2G3)
- *Quercus nigra* - *Quercus geminata* / *Lyonia ferruginea* - *Serenoa repens* Forest (CEGL003665, G2?)
- *Quercus virginiana* - *Quercus (hemisphaerica, nigra)* / *Serenoa repens* Forest (CEGL004408, G3?)
- *Quercus virginiana* / *Vaccinium arboreum* - *Ilex vomitoria* Forest (CEGL007028, G2G3)

Alliances:

- *Quercus geminata* Forest Alliance (A.52)
- *Quercus hemisphaerica* - *Carya glabra* Forest Alliance (A.372)
- *Quercus hemisphaerica* Forest Alliance (A.53)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)

DISTRIBUTION

Range: This system occurs in Florida, adjacent Georgia and in very limited areas of Alabama (A. Schotz pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C, 56:C

SOURCES

References: Comer et al. 2003, Drew et al. 1998, Johnson pers. comm., Myers 1990, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723092#references

Description Author: R. Evans

Version: 06 Feb 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1305 SOUTHERN INTERIOR LOW PLATEAU DRY-MESIC OAK FOREST (CES202.898)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2305; ESLF 4111; ESP 1305

CONCEPT

Summary: This system of upland hardwood-dominated forests occurs in the Interior Low Plateau region of the southeastern United States along ridgetops and slopes of various aspects. The system includes essentially all upland hardwood stands of the region except for mesic hardwood forests (which are accommodated by South-Central Interior Mesophytic Forest (CES202.887)). The floristic expression of different stands included in this system varies considerably with aspect and soil type. Included here are a variety of associations ranging along a moisture gradient from submesic to drier ones. The submesic to dry-mesic expressions tend to be found on midslopes with northerly to easterly aspects, and the drier ones on southerly to westerly aspects and on broad ridges. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils in the drier expressions and moderately well-drained soils in the submesic to dry-mesic ones. The canopy closure of this system ranges from closed to somewhat open in the drier examples. Historically, these examples may have been more open under conditions of more frequent fire.

A number of different *Quercus* species may dominate stands of this system, with *Carya* species also prominent. In some drier examples on more acidic substrates, *Quercus prinus* is typical over most of the range, reflecting relations with other Appalachian systems to the east. In addition, *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea* will also share dominance or be prominent in many of the drier examples. *Quercus muehlenbergii* and/or *Quercus shumardii* may appear in drier examples with high base status. *Quercus alba* may also be present but not typically dominant. In the submesic to dry-mesic examples, *Quercus alba* will typically exhibit dominance, possibly with *Quercus velutina* or *Quercus falcata*. The understories are typically shrub- and small tree-dominated, with the typical species varying with aspect, soil, and moisture relations.

Classification Comments: The range of this system is consistent with the non-coastal plain portion of the "Western Mesophytic" Forest region of Braun (1950), Keever (1971), and Greller (1988). To the glaciated north, it is replaced by North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046) or North-Central Interior Dry Oak Forest and Woodland (CES202.047).

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--is found to the east and southeast in the Cumberlands.
- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)--is found to the southwest in the Coastal Plain.
- North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046)--is found to the (glaciated) north.

Related Concepts:

- Calcareous Xeric Forest (Evans 1991) Finer
- Xeric Acidic Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system encompasses a variety of associations ranging along a moisture gradient from submesic to drier ones. The submesic to dry-mesic expressions tend to be found on midslopes with northerly to easterly aspects, the drier ones on southerly to westerly aspects and on broad ridges. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils in the drier expressions and moderately well-drained soils in the submesic to dry-mesic ones.

Vegetation: A number of different *Quercus* species may dominate stands of this system, with *Carya* species also prominent. In the drier examples, *Quercus prinus* is typical over most of the range, reflecting relations with other Appalachian systems to the east. In addition, *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea* will also share dominance or be prominent in many of the drier examples. *Quercus muehlenbergii* and/or *Quercus shumardii* may appear in drier examples with high base status. *Quercus alba* may also be present but not typically dominant. In the submesic to dry-mesic examples, *Quercus alba* will typically exhibit dominance, possibly with *Quercus velutina* or *Quercus falcata*. The understories are typically shrub- and small tree-dominated, with the typical species varying with aspect, soil, and moisture relations. Some typical species include *Cornus florida*, *Cercis canadensis*, *Oxydendrum arboreum*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Vaccinium arboreum*, other highbush *Vaccinium* species, *Kalmia latifolia*, *Viburnum acerifolium*, *Styrax americanus*, and others. Some more open and drier stands may exhibit an understory of grassland species such as *Schizachyrium scoparium*, *Danthonia spicata*, and others. Forbs of the Fabaceae (e.g., *Desmodium*) and Asteraceae (e.g., *Helianthus*) will be prominent in many examples.

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Liquidambar styraciflua* - *Quercus* (*alba*, *falcata*) Forest (CEGL007217, GNA)
- *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221, GNA)

- *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Forest (CEGL007220, GNA)
- *Pinus echinata* - *Quercus prinus* Interior Low Plateau Forest (CEGL004054, G2G3)
- *Prunus serotina* - *Sassafras albidum* - (*Fraxinus americana*) / *Juniperus virginiana* Forest (CEGL004133, GNA)
- *Quercus alba* - *Carya alba* - (*Quercus velutina*) / *Desmodium nudiflorum* - (*Carex picta*) Forest (CEGL007795, G4)
- *Quercus alba* - *Quercus (falcata, stellata)* / *Chasmanthium laxum* Forest (CEGL007746, G3G4Q)
- *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acidic Forest (CEGL002067, G3)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070, G4G5)
- *Quercus alba* / *Cornus florida* Unglaciated Forest (CEGL002066, G4?)
- *Quercus falcata* - *Quercus (coccinea, stellata)* / *Schizachyrium scoparium* Woodland (CEGL004214, GNA)
- *Quercus falcata* - *Quercus (coccinea, stellata)* / *Vaccinium (pallidum, stamineum)* Forest (CEGL007247, G4)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus falcata* - *Quercus alba* - *Quercus stellata* - *Quercus velutina* Forest (CEGL005018, G3G5)
- *Quercus imbricaria* - *Quercus shumardii* - *Quercus muehlenbergii* / *Celtis occidentalis* / *Urtica chamaedryoides* Forest (CEGL003876, G2G3)
- *Quercus muehlenbergii* - *Quercus (falcata, shumardii, stellata)* / *Cercis canadensis* / *Viburnum rufidulum* Forest (CEGL007699, G3)
- *Quercus muehlenbergii* - *Quercus shumardii* - *Carya (carolinae-septentrionalis, ovata)* Forest (CEGL007808, G3)
- *Quercus pagoda* - (*Quercus falcata*) / *Ostrya virginiana* Forest (CEGL003871, G3?)
- *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268, G4?)
- *Quercus prinus* - *Quercus spp.* / *Vaccinium arboreum* - (*Kalmia latifolia*, *Styrax grandifolius*) Forest (CEGL007700, G4)
- *Quercus prinus* / *Smilax spp.* Forest (CEGL005022, G4)
- *Quercus rubra* - (*Acer saccharum*, *Quercus alba*) Forest (CEGL005017, GNRQ)
- *Quercus shumardii* - *Quercus muehlenbergii* - *Acer (barbatum, leucoderme, saccharum)* / *Ostrya virginiana* Forest (CEGL008442, G2G3)
- *Quercus stellata* - *Quercus marilandica* - *Carya (glabra, texana)* / *Vaccinium arboreum* Forest (CEGL002075, G4)
- *Quercus stellata* / *Viburnum rufidulum* / *Schizachyrium scoparium* - (*Sorghastrum nutans*, *Helianthus eggertii*) Woodland (CEGL004686, G2G3)
- *Quercus velutina* - *Carya (alba, glabra)* / *Vaccinium arboreum* Forest (CEGL004987, G2G3Q)
- *Quercus velutina* - *Quercus alba* - *Carya (glabra, ovata)* Forest (CEGL002076, G4?)
- *Robinia pseudoacacia* Forest (CEGL007279, GNA)

Alliances:

- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Pinus echinata* - *Quercus (alba, falcata, stellata, velutina)* Forest Alliance (A.394)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus spp.* Forest Alliance (A.237)
- *Quercus alba* - (*Quercus rubra*, *Carya spp.*) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)
- *Quercus stellata* - *Quercus marilandica* Forest Alliance (A.253)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)
- *Robinia pseudoacacia* Forest Alliance (A.256)

SPATIAL CHARACTERISTICS

Spatial Summary: This is the matrix forest in large parts of the Interior Low Plateau region.

Adjacent Ecological Systems:

- Nashville Basin Limestone Glade and Woodland (CES202.334)
- South-Central Interior Mesophytic Forest (CES202.887)

DISTRIBUTION

Range: This system occurs in the southeastern Interior Highlands of the Interior Low Plateau region, including southern Indiana and a small part of southeastern Ohio.

Divisions: 202:C

Nations: US

Subnations: AL, IL, IN, KY, OH, TN

Map Zones: 47:C, 48:C, 49:C, 53:C

USFS Ecomap Regions: 223B:CC, 223D:CC, 223E:CC, 223F:CC, 231C:CC

TNC Ecoregions: 44:C

SOURCES

References: Braun 1950, Comer et al. 2003, Greller 1988, Keever 1971

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722783#references

Description Author: M. Pyne

Version: 22 Jan 2008

Concept Author: M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1368 SOUTHERN PIEDMONT DRY OAK-(PINE) FOREST (CES202.339)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2368; ESLF 4311; ESP 1368

CONCEPT

Summary: This system encompasses the prevailing upland forests of the southern Piedmont. High-quality and historic examples are typically dominated by combinations of upland oaks, sometimes with pines as a significant component, especially in the southern portions of the region. These forests occur in a variety of habitats and, under natural conditions, were the matrix vegetation type covering most of the landscape. Much of this system is currently composed of successional forests that have arisen after repeated cutting, clearing, and cultivation of original oak-hickory forests. Stands of these forests are dominated by combinations of upland oaks, particularly *Quercus alba*, *Quercus rubra*, *Quercus velutina*, *Quercus stellata*, *Quercus coccinea*, and *Quercus falcata*, along with *Carya glabra*, *Carya alba*, and other *Carya* spp. Other common tree species include *Pinus taeda*, *Pinus echinata*, *Pinus virginiana*, *Acer rubrum*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*.

Classification Comments: Although these forests have often been called "oak-hickory" (Braun 1950) or "oak-pine-hickory" (Kuchler 1964, Greller 1989, Skeen et al. 1993), Monk et al. (1990) concluded there was insufficient abundance of hickory to justify including this genus in the name of such forests. There are fairly dramatic differences in the amount of pine present across the modern day Piedmont landscape, with it being especially prevalent in South Carolina, Georgia, and Alabama (USGS 1992). To some extent, the prevalence of pine in these southern portions of the region may represent natural conditions (Nelson 1957). It is possible that the more heavily mixed or pine-dominated forests of the southern Piedmont should be recognized as a different system, but distinguishing natural examples is difficult given a long history of land-use impacts and resulting vegetational changes in the region (Brender 1974). In addition, Skeen et al. (1993) assert that "the oak-hickory-pine designation may be reflective of past land use and disturbance history and that the steady-state typical forest of the southeastern Piedmont is in reality oak-hickory-yellow poplar."

There are fairly clear variations within this system between dry and dry-mesic forests and also between those on acidic or basic soils. These might warrant separate systems, but the similar canopy composition and similar dynamics tie them together, and those distinctions may best be made at the association level. Large areas once dominated by oak-hickory forests now have successional pine forest. This may be regarded as a distinct phase of this system for mapping purposes.

Similar Ecological Systems:

- Central Appalachian Dry Oak-Pine Forest (CES202.591)--occurs to the north and is more Appalachian in character.
- Southeastern Interior Longleaf Pine Woodland (CES202.319)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Piedmont Mesic Forest (CES202.342)

Related Concepts:

- Dry Oak-Hickory Forest (Schafale and Weakley 1990) Broader
- Dry-Mesic Oak-Hickory Forest (Schafale and Weakley 1990) Broader
- Loblolly Pine Savanna (VDNH unpubl. data) Undetermined

DESCRIPTION

Environment: Occurs on upland ridges and upper to mid slopes, occupying most of the uplands where soils are not rocky or otherwise extreme. Moisture conditions, determined by topography, are dry to dry-mesic. This system may occur on any kind of rock type, with rock chemistry being an important determinant of variation. Soils include almost the full range of upland soils, with only the shallowest rocky soils and those with extreme clay hardpans excluded.

Vegetation: Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba*, *Quercus rubra*, *Quercus velutina*, *Quercus stellata*, *Quercus coccinea*, and *Quercus falcata*, along with *Carya glabra*, *Carya alba*, and other *Carya* spp. Other common tree species include *Pinus taeda*, *Pinus echinata*, *Pinus virginiana*, *Acer rubrum*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*. In successional forests, recovering from clearcutting or cultivation, the pines dominate for a number of decades, with oaks and hickories gradually invading the understory. A well-developed understory and shrub layer is generally present, with species varying with soil chemistry. The herb layer is sparse to at most moderate in density. Before natural fires were suppressed, the forests presumably had less understory and shrub component and probably a grassy herb layer.

Dynamics: Fire was probably an important natural factor in this system, affecting vegetation structure and composition of the lower strata. It may have been important in favoring oaks and pines over other trees in the canopy. Fires were likely almost always low-intensity surface fires. These forests appear to occur naturally as predominantly old-growth, with canopy dynamics dominated by gap-phase regeneration. Small to medium-sized canopy gaps created by wind are the primary natural disturbance at present, and

probably were in the past as well. Fire likely created some small to medium-sized gaps in the past also, and likely caused all canopy gaps to persist longer. The dominant trees are capable of living for several centuries. Most of the canopy species are only moderately tolerant of shade. In recent years, more shade-tolerant species appear to be increasing in many of these forests, particularly *Acer rubrum*. This may be a result of loss of regular fire in the system.

MEMBERSHIP

Associations:

- *Carya glabra* - *Fraxinus americana* / *Acer leucoderme* / *Piptochaetium avenaceum* Woodland (CEGL008489, G2G3Q)
- *Pinus echinata* - (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* - *Salvia urticifolia* Woodland (CEGL008492, G2?)
- *Pinus echinata* - *Quercus (prinus, stellata)* Piedmont Forest [Provisional] (CEGL004148, G3?)
- *Pinus echinata* - *Quercus marilandica* / *Kalmia latifolia* - *Symplocos tinctoria* Woodland (CEGL004446, G2?)
- *Quercus alba* - *Carya glabra* - *Fraxinus americana* / *Acer leucoderme* / *Vitis rotundifolia* Forest (CEGL004541, G2?)
- *Quercus alba* - *Carya glabra* / *Schizachyrium scoparium* - *Helianthus divaricatus* - *Salvia urticifolia* - *Parthenium auriculatum* Woodland (CEGL003721, G1?)
- *Quercus alba* - *Quercus rubra* - *Carya (ovata, carolinae-septentrionalis)* / *Cercis canadensis* Forest (CEGL007232, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
- *Quercus alba* - *Quercus stellata* - *Carya carolinae-septentrionalis* / *Acer leucoderme* - *Cercis canadensis* Forest (CEGL007773, G2G3)
- *Quercus alba* - *Quercus velutina* - *Quercus stellata* / *Schizachyrium scoparium* - *Desmodium* spp. Woodland (CEGL003722, G1?)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus prinus* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431, G4G5)
- *Quercus prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261, G3G4)
- *Quercus prinus* - *Quercus alba* / *Oxydendrum arboreum* / *Kalmia latifolia* Forest (CEGL004415, G3)
- *Quercus prinus* - *Quercus alba* / *Oxydendrum arboreum* / *Vitis rotundifolia* Forest (CEGL006281, G3G4)
- *Quercus prinus* - *Quercus marilandica* Piedmont Woodland (CEGL003708, G2G3)
- *Quercus prinus* - *Quercus stellata* - *Carya glabra* / *Vaccinium arboreum* - *Viburnum rufidulum* Forest (CEGL004416, G2?)

Alliances:

- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Pinus echinata* - *Quercus (coccinea, prinus)* Forest Alliance (A.395)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus prinus* - *Quercus marilandica* Woodland Alliance (A.623)

SPATIAL CHARACTERISTICS

Spatial Summary: Naturally a matrix system, dominating most of the upland landscape in the Piedmont. Remnants are mostly large patch, but some large expanses remain.

Size: Once occurred as the matrix system, with contiguous patches covering many thousands of acres. Mature patches are now mostly reduced to large-patch remnants, some of hundreds of acres. A few areas have substantially forested landscapes in which oak-hickory forests in some condition cover thousands of acres in nearly contiguous patches.

Adjacent Ecological Systems:

- Piedmont Hardpan Woodland and Forest (CES202.268)
- Piedmont Seepage Wetland (CES202.298)
- Piedmont Upland Depression Swamp (CES202.336)
- Southeastern Interior Longleaf Pine Woodland (CES202.319)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Most commonly associated with Southern Piedmont Mesic Forest (CES202.342). Various rock outcrops, Piedmont Hardpan Woodland and Forest (CES202.268), Piedmont Upland Depression Swamp (CES202.336), and other small-patch systems may be embedded.

DISTRIBUTION

Range: This system ranges throughout the Piedmont from Alabama to Virginia. In Virginia, it is primarily central and southern, but extends into a narrow portion of northern Virginia in the Piedmont ecoregion.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 60:C, 61:C
USFS Ecomap Regions: 231A:CC, 231I:CC
TNC Ecoregions: 52:C

SOURCES

References: Braun 1950, Brender 1974, Comer et al. 2003, Greller 1989, Kuchler 1964, Monk et al. 1990, Nelson 1957, Skeen et al. 1993, USGS 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723166#references

Description Author: M. Schafale, R. Evans, M. Pyne, mod. S. Gawler

Version: 22 Sep 2008

Concept Author: M. Schafale, R. Evans, M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

1316 SOUTHERN PIEDMONT MESIC FOREST (CES202.342)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Long Disturbance Interval; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2316; ESLF 4122; ESP 1316

CONCEPT

Summary: This system encompasses mixed deciduous hardwood or occasionally hardwood-pine forests of mesic sites in the Piedmont (TNC Ecoregion 52) of the southeastern United States. Most examples occur on lower or north-facing slopes where topography creates mesic moisture conditions. A mix of a small number of mesophytic trees is usually dominant, with *Fagus grandifolia* most prominent. Both acidic and basic substrates are currently included in this concept, as are certain heath bluffs, where dense shrub layers of mesophytic ericaceous shrubs may occur beneath an open tree canopy. Fire is naturally infrequent in this system, due to the slopes and moist conditions. If fire does penetrate, it is likely to be low in intensity and may not have significant ecological effects. Vegetation consists of forests dominated by combinations of trees that include a significant component of mesophytic species. *Fagus grandifolia* is almost always abundant and is often strongly dominant. *Quercus rubra*, *Liriodendron tulipifera*, and *Acer rubrum* may be abundant. In basic soil examples, *Fraxinus americana* and *Acer barbatum* are also abundant. A well-developed understory is usually present. Herbs range from fairly dense in basic examples to sparse in acidic examples, and may be nearly absent in a few. The composition of all lower strata varies substantially with soil acidity.

Classification Comments: This system is distinguished from Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) by the significant component of mesophytic tree species, particularly *Fagus grandifolia*, as well as by occurrence on mesic topographic sites. Some oaks may also be present. It is distinguished from Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) and Southern Piedmont Large Floodplain Forest (CES202.324) by the absence of characteristic alluvial or bottomland species, along with upland position. This boundary can be somewhat difficult to place, as some alluvial species will occur upslope in basic soils, and some mesic forests will extend onto higher terraces in bottomlands. This system is closely related to Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242) and in the northern part of the range may be very similar except for the geologic substrate. Farther south, there is a greater floristic difference between the two. This system is related to the cove forest systems of the southern Appalachians but lacks a number of species characteristic of those regions. These species are present in increasing numbers as one goes west in the Piedmont. The westernmost Piedmont has some examples of well-developed Southern and Central Appalachian Cove Forest (CES202.373) in the more mountainous portions. Distinct subsets of this system, which could be recognized as different systems, are the basic/circumneutral and acidic examples, and also the shrubby heath bluffs.

Similar Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Related Concepts:

- Basic Mesic Forest (Fleming et al. 2005) Undetermined

DESCRIPTION

Environment: Examples occur on lower slopes or on north-facing slopes, where topography creates mesic moisture conditions. This system may occur on any kind of rock type, with rock chemistry being an important determinant of variation. Most soils are acidic, but those formed on mafic rocks often are circumneutral to basic. The moist conditions and slope limit natural fire intensity and frequency.

Vegetation: Vegetation consists of forests dominated by combinations of trees that include a significant component of mesophytic species. *Fagus grandifolia* is almost always abundant and is often strongly dominant. *Quercus rubra*, *Liriodendron tulipifera*, and *Acer rubrum* may be abundant. In basic soil examples, *Fraxinus americana* and *Acer barbatum* are also abundant. A well-developed understory is usually present. Shrubs are generally sparse to moderate in density, except in heath bluffs. Herbs range from fairly dense in basic examples to sparse in acidic examples, and may be nearly absent in a few. The composition of all lower strata varies substantially with soil acidity. Basic examples have a fairly diverse suite, especially of herbs, which may include a number of species shared with Southern and Central Appalachian Cove Forest (CES202.373). The more common acidic examples have fewer species, though generally they have a higher species richness than the drier systems.

Dynamics: Fire is naturally infrequent in this system, due to the slopes and moist conditions. If fire does penetrate, it is likely to be low in intensity and may not have significant ecological effects. These forests generally exist naturally as old-growth forests, with canopy dynamics dominated by gap phase regeneration. Small to occasional medium sized canopy gaps created by wind are likely the

primary form of natural disturbance, though occasional fires might create gaps. Most of the prevailing species are shade tolerant. Most are not very fire-tolerant.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - (*Liquidambar styraciflua*) / *Oxydendrum arboreum* / *Kalmia latifolia* Forest (CEGL004636, G3?)
- *Fagus grandifolia* - *Liriodendron tulipifera* / *Euonymus americanus* / *Athyrium filix-femina* ssp. *asplenioides* Forest (CEGL007201, G4)
- *Fagus grandifolia* - *Quercus alba* / *Kalmia latifolia* - (*Symplocos tinctoria*, *Rhododendron catawbiense*) / *Galax urceolata* Forest (CEGL004539, G2G3)
- *Fagus grandifolia* - *Quercus rubra* / *Acer barbatum* - *Aesculus sylvatica* / *Actaea racemosa* - *Adiantum pedatum* Forest (CEGL008466, G3G4)
- *Fagus grandifolia* - *Quercus rubra* / *Cornus florida* / *Polystichum acrostichoides* - *Hexastylis virginica* Forest (CEGL008465, G3G4)
- *Quercus alba* - *Carya alba* / *Euonymus americanus* / *Hexastylis arifolia* Forest (CEGL006227, G4G5)
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* - *Tilia americana* var. *caroliniana* / *Ostrya virginiana* Forest (CEGL004542, G2G3Q)
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* / *Collinsonia canadensis* - *Podophyllum peltatum* - *Amphicarpaea bracteata* Forest (CEGL007692, G3)
- *Quercus rubra* - *Quercus alba* - *Carya glabra* / *Geranium maculatum* Forest (CEGL007237, G4Q)
- *Quercus rubra* / *Magnolia tripetala* - *Cercis canadensis* / *Actaea racemosa* - *Tiarella cordifolia* Forest (CEGL003949, G3?)
- *Tilia americana* var. *heterophylla* - *Fraxinus americana* - (*Ulmus rubra*) / *Sanguinaria canadensis* - (*Aquilegia canadensis*, *Asplenium rhizophyllum*) Forest (CEGL007711, G2G3)

Alliances:

- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)

SPATIAL CHARACTERISTICS

Spatial Summary: Large- to small-patch system occurring as a regular part of the landscape mosaic in most of the Piedmont.

Size: Generally occurs as large to small patches, often in convoluted bodies following slopes in the dissected lands along streams and rivers. Contiguous convoluted patches or closely associated sets of patches may once have covered thousands of acres and perhaps could have been connected along miles of river bluffs. However, the effect of past fire on the extent of this system is uncertain, and it may have been confined to a more limited range of topography and to smaller, discontinuous patches than it now appears. Most remnants at present are several tens to hundreds of acres.

Adjacent Ecological Systems:

- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Adjacent Ecological System Comments: Most commonly associated with Southern Piedmont Dry Oak-(Pine) Forest (CES202.339), Southern Piedmont Small Floodplain and Riparian Forest (CES202.323), and Southern Piedmont Large Floodplain Forest (CES202.324). May contain embedded Southern Piedmont Cliff (CES202.386) or Southern Piedmont Glade and Barrens (CES202.328).

DISTRIBUTION

Range: Ranges throughout the southern Piedmont, from Virginia to Alabama.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 231A:CC

TNC Ecoregions: 52:C

SOURCES

References: Anderson 1999a, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723165#references

Description Author: M. Schafale and R. Evans

Version: 22 Sep 2008

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1376 SOUTHERN RIDGE AND VALLEY / CUMBERLAND DRY CALCAREOUS FOREST (CES202.457)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Circumneutral Soil; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2376; ESLF 4319; ESP 1376

CONCEPT

Summary: This system includes dry to dry-mesic calcareous forests of the Southern Ridge and Valley region of Alabama and Georgia, extending north into Tennessee, Kentucky, Virginia and adjacent West Virginia. It includes calcareous forests on lower escarpments of the Cumberland Plateau and other related areas. Examples occur on a variety of different landscape positions and occur on generally deeper soils than glade systems of the same regions. This system is distinguished from those farther north in the Ridge and Valley because of its southerly location in the region, an area which is transitional to the "Oak-Pine-Hickory" region. High-quality and historic examples are typically dominated by combinations of *Quercus* species and *Carya* species, sometimes with *Pinus* species and/or *Juniperus virginiana* as a significant component in certain landscape positions and with particular successional histories. These forests occur in a variety of habitats and are the matrix vegetation type that covers most of the landscape under natural conditions. Examples can occur on a variety of topographic and landscape positions including ridgetops and upper and midslopes. Fire frequency and intensity are factors determining the relative mixture of deciduous hardwood versus evergreen trees in this system. Much of this system is currently composed of successional forests that have arisen after repeated cutting, clearing, and cultivation of the original forests. The range of this system is primarily composed of circumneutral substrates, which exert an expected influence on the composition of the vegetation.

Classification Comments: This system is defined as distinct because of its location in the portion of the Ridge and Valley region which is transitional to the "Oak-Pine-Hickory" region (Greller 1988). Most of the zone of occurrence is attributed to the "Southern Limestone/Dolomite Valleys and Low Rolling Hills" (67f) and the "Southern Shale Valleys" (67g) of Griffith et al. (2001), as well as calcareous parts of 68b and 68c (where it is more limited in extent). In addition, the system could be found in drier, more exposed portions of 66f, "Limestone Valleys and Coves" (Griffith et al. 2001), but most of this terrain is probably more mesic and concave. This ecoregion and "Southern Sedimentary Ridges" (66e) are part of the "Blue Ridge" but are clearly transitional to the Ridge and Valley region. Ecoregion 66e is more likely too acidic to support this system. It is also likely in the "Carter Hills" (EPA Ecoregion 70h of Woods et al. (2002)) of Kentucky and in limited portions of related parts of Ecoregion 70 (Western Allegheny Plateau) in Kentucky.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--is found in some similar landscapes but on more acidic and nutrient-poor substrates, which usually correspond to different landform positions.
- Central Appalachian Alkaline Glade and Woodland (CES202.602)--of central Appalachians, mainly Virginia and north; need to clarify ranges; generally more open stands, not closed canopy.
- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is related and overlapping in range, with more open physiognomy.
- Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)--is more open, with an overlapping range.

Related Concepts:

- Xeric Calcareous Forest (Evans 1991) Intersecting

DESCRIPTION

Environment: Examples can occur on a variety of topographic and landscape positions including ridgetops and upper and mid slopes, where soils are influenced by calcareous/circumneutral geology. Fire frequency and intensity is a factor determining the relative mixture of deciduous hardwood versus evergreen trees in this system.

Vegetation: Natural vegetation consists of forests (or woodlands) dominated most typically by *Quercus alba*, *Quercus muehlenbergii*, *Quercus stellata*, and *Quercus shumardii*, with varying amounts of *Carya* spp., *Acer saccharum*, *Acer barbatum*, *Acer leucoderme*, *Acer rubrum*, and other species. This system concept also includes successional communities that have been impacted by logging or agriculture, including upland forest types dominated by *Liriodendron tulipifera*, *Pinus* spp., *Juniperus virginiana*, and *Robinia pseudoacacia*.

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240, G4)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070, G4G5)
- *Quercus alba* - *Quercus stellata* / *Ostrya virginiana* - *Acer barbatum* / *Chasmanthium sessiliflorum* Forest (CEGL008443, G3G4)

- *Quercus muehlenbergii* - *Quercus shumardii* - *Carya (carolinae-septentrionalis, ovata)* Forest (CEGL007808, G3)
- *Quercus shumardii* - *Quercus muehlenbergii* - *Acer (barbatum, leucoderme, saccharum)* / *Ostrya virginiana* Forest (CEGL008442, G2G3)
- *Quercus stellata* - *Juniperus virginiana var. virginiana* / *Ulmus alata* - (*Cotinus obovatus*) Woodland (CEGL004583, G3)
- *Robinia pseudoacacia* - *Celtis occidentalis* - (*Fraxinus americana, Liriodendron tulipifera*) Forest (CEGL007281, GNA)

Alliances:

- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Quercus alba* - (*Quercus rubra, Carya spp.*) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Robinia pseudoacacia* Forest Alliance (A.256)

SPATIAL CHARACTERISTICS

Spatial Summary: This system can be large patch in some areas and matrix in others, depending on the arrangement of geological strata and relative degree of erosion of the landscape. If erosion has exposed extensive areas of calcareous materials, the extent is likely to be matrix rather than large patch.

DISTRIBUTION

Range: This systems is endemic to the Southern Ridge and Valley and the Cumberland Plateau escarpment in Alabama, Georgia, Tennessee, Kentucky, Virginia and adjacent West Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, TN, VA, WV

Map Zones: 48:C, 53:C, 57:C, 61:C

USFS Ecomap Regions: 221Jb:CCC, 222J:CC, 231Cc:CCC, 231D:CC

TNC Ecoregions: 50:C, 59:C

SOURCES

References: Comer et al. 2003, Greller 1988, Griffith et al. 2001, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723128#references

Description Author: R. Evans and M. Pyne

Version: 29 Sep 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

1051 SOUTHERN ROCKY MOUNTAIN DRY-MESIC MONTANE MIXED CONIFER FOREST AND WOODLAND (CES306.823)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: RM Montane Mesic Mixed Conifer; Moderate (100-500 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Forest and Woodland (Treed); Aridic; Intermediate Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Needle-Leaved Tree

Non-Diagnostic Classifiers: Ridge/Summit/Upper Slope; Sideslope; Temperate [Temperate Continental]; Mesotrophic Soil; Shallow Soil; Mineral: W/ A-Horizon <10 cm

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2051; ESLF 4238; ESP 1051

CONCEPT

Summary: This is a highly variable ecological system of the montane zone of the Rocky Mountains. It occurs throughout the southern Rockies, north and west into Utah, Nevada, Wyoming and Idaho. These are mixed-conifer forests occurring on all aspects at elevations ranging from 1200 to 3300 m. Rainfall averages less than 75 cm per year (40-60 cm), with summer "monsoons" during the growing season contributing substantial moisture. The composition and structure of the overstory are dependent upon the temperature and moisture relationships of the site and the successional status of the occurrence. *Pseudotsuga menziesii* and *Abies concolor* are most frequent, but *Pinus ponderosa* may be present to codominant. *Pinus flexilis* is common in Nevada. *Pseudotsuga menziesii* forests occupy drier sites, and *Pinus ponderosa* is a common codominant. *Abies concolor*-dominated forests occupy cooler sites, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and north- and east-facing slopes which burn somewhat infrequently. *Picea pungens* is most often found in cool, moist locations, often occurring as smaller patches within a matrix of other associations. As many as seven conifers can be found growing in the same occurrence, and there are a number of cold-deciduous shrub and graminoid species common, including *Arctostaphylos uva-ursi*, *Mahonia repens*, *Paxistima myrsinites*, *Symphoricarpos oreophilus*, *Jamesia americana*, *Quercus gambelii*, and *Festuca arizonica*. This system was undoubtedly characterized by a mixed-severity fire regime in its "natural condition," characterized by a high degree of variability in lethality and return interval.

Classification Comments: The transition between this system and Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959) in Wyoming needs to be further clarified, both in terms of floristics and distribution details. For now, it is assumed that this system does not occur in the Bighorn Range or in the Yellowstone region, but its occurrence in isolated ranges of central and western Wyoming is possible.

Similar Ecological Systems:

- Madrean Upper Montane Conifer-Oak Forest and Woodland (CES305.798)
- Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)

Related Concepts:

- Blue Spruce: 216 (Eyre 1980) Finer
- Interior Douglas-fir: 210 (Eyre 1980) Intersecting
- White Fir: 211 (Eyre 1980) Intersecting

DESCRIPTION

Vegetation: This highly variable ecological system is comprised of mixed-conifer forests at montane elevations throughout the Intermountain West region. The four main alliances in this system are found on slightly different, but intermingled, biophysical environments: *Abies concolor* dominates at higher, colder locations; *Picea pungens* represents mesic conditions; and *Pseudotsuga menziesii* dominates intermediate zones. As many as seven conifers can be found growing in the same occurrence, with the successful reproduction of the diagnostic species determining the association type. Common conifers include *Pinus ponderosa*, *Pinus flexilis*, *Abies lasiocarpa* var. *lasiocarpa*, *Abies lasiocarpa* var. *arizonica*, *Juniperus scopulorum*, and *Picea engelmannii*. *Populus tremuloides* is often present as intermingled individuals in remnant aspen clones or in adjacent patches. The composition and structure of the overstory are dependent upon the temperature and moisture relationships of the site and the successional status of the occurrence (DeVelice et al. 1986, Muldavin et al. 1996).

A number of cold-deciduous shrub and graminoid species are found in many occurrences (e.g., *Arctostaphylos uva-ursi*, *Mahonia repens*, *Paxistima myrsinites*, *Symphoricarpos oreophilus*, *Jamesia americana*, *Quercus gambelii*, and *Festuca arizonica*). Other important species include *Acer glabrum*, *Acer grandidentatum*, *Amelanchier alnifolia*, *Arctostaphylos patula*, *Holodiscus dumosus*, *Jamesia americana*, *Juniperus communis*, *Physocarpus monogynus*, *Quercus arizonica*, *Quercus rugosa*, *Quercus X pauciloba*, *Quercus hypoleucoides*, *Robinia neomexicana*, *Rubus parviflorus*, and *Vaccinium myrtilloides*. Where soil moisture is favorable, the herbaceous layer may be quite diverse, including graminoids *Bromus ciliatus* (= *Bromus canadensis*), *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Carex siccata* (= *Carex foenea*), *Festuca occidentalis*, *Koeleria macrantha*, *Muhlenbergia montana*, *Muhlenbergia virescens*, *Poa fendleriana*, *Pseudoroegneria spicata*, and forbs *Achillea millefolium*, *Arnica cordifolia*, *Erigeron*

eximius, *Fragaria virginiana*, *Linnaea borealis*, *Luzula parviflora*, *Osmorhiza berteroi*, *Packera cardamine* (= *Senecio cardamine*), *Thalictrum occidentale*, *Thalictrum fendleri*, *Thermopsis rhombifolia*, *Viola adunca*, and species of many other genera, including *Lathyrus*, *Penstemon*, *Lupinus*, *Vicia*, *Arenaria*, *Galium*, and others.

Dynamics: Forests in this ecological system represent the gamut of fire tolerance. Formerly, *Abies concolor* in the Utah High Plateaus were restricted to rather moist or less fire-prone areas by frequent ground fires. These areas experienced mixed fire severities, with patches of crowning in which all trees are killed, intermingled with patches of underburn in which larger *Abies concolor* survived (www.fs.fed.us/database/feis/). With fire suppression, *Abies concolor* has vigorously colonized many sites formerly occupied by open *Pinus ponderosa* woodlands. These invasions have dramatically changed the fuel load and potential behavior of fire in these forests. In particular, the potential for high-intensity crown fires on drier sites now codominated by *Pinus ponderosa* and *Abies concolor* has increased. Increased landscape connectivity, in terms of fuel loadings and crown closure, has also increased the potential size of crown fires.

Pseudotsuga menziesii forests are the only true 'fire-tolerant' occurrences in this ecological system. *Pseudotsuga menziesii* forests were probably subject to a moderate-severity fire regime in presettlement times, with fire-return intervals of 30-100 years. Many of the important tree species in these forests are fire-adapted (*Populus tremuloides*, *Pinus ponderosa*, *Pinus contorta*) (Pfister et al. 1977), and fire-induced reproduction of *Pinus ponderosa* can result in its continued codominance in *Pseudotsuga menziesii* forests (Steele et al. 1981). Seeds of the shrub *Ceanothus velutinus* can remain dormant in forest occurrences for 200 years (Steele et al. 1981) and germinate abundantly after fire, competitively suppressing conifer seedlings. Successional relationships in this system are complex. *Pseudotsuga menziesii* is less shade-tolerant than many northern or montane trees such as *Tsuga heterophylla*, *Abies concolor*, *Picea engelmannii*, and seedlings compete poorly in deep shade. At drier locales, seedlings may be favored by moderate shading, such as by a canopy of *Pinus ponderosa*, which helps to minimize drought stress. In some locations, much of these forests have been logged or burned during European settlement, and present-day occurrences are second-growth forests dating from fire, logging, or other occurrence-replacing disturbances (Mauk and Henderson 1984, Chappell et al. 1997).

Picea pungens is a slow-growing, long-lived tree which regenerates from seed (Burns and Honkala 1990a). Seedlings are shallow-rooted and require perennially moist soils for establishment and optimal growth. *Picea pungens* is intermediate in shade tolerance, being somewhat more tolerant than *Pinus ponderosa* or *Pseudotsuga menziesii*, and less tolerant than *Abies lasiocarpa* or *Picea engelmannii*. It forms late-seral occurrences in the subhumid regions of the Utah High Plateaus. It is common for these forests to be heavily disturbed by grazing or fire.

In general, fire suppression has led to the encroachment of more shade-tolerant, less fire-tolerant species (e.g., climax) into occurrences and an attendant increase in landscape homogeneity and connectivity (from a fuels perspective). This has increased the lethality and potential size of fires.

MEMBERSHIP

Associations:

- *Abies concolor* - (*Pseudotsuga menziesii*) / *Jamesia americana* - *Holodiscus dumosus* Scree Woodland (CEGL000890, GNR)
- *Abies concolor* - (*Pseudotsuga menziesii*) / *Quercus gambelii* / *Carex rossii* Forest (CEGL005351, GNR)
- *Abies concolor* - (*Pseudotsuga menziesii*) / *Thalictrum fendleri* Forest (CEGL005353, GNR)
- *Abies concolor* - *Pinus ponderosa* / *Carex inops* ssp. *inops* Forest (CEGL000257, G3)
- *Abies concolor* - *Pinus ponderosa* / *Cercocarpus ledifolius* Forest (CEGL002732, G4?)
- *Abies concolor* - *Pinus ponderosa* / *Symphoricarpos* spp. Forest (CEGL000018, G3)
- *Abies concolor* - *Pseudotsuga menziesii* / *Acer glabrum* Forest (CEGL000240, G4)
- *Abies concolor* - *Pseudotsuga menziesii* / *Carex rossii* Forest (CEGL000431, G2?)
- *Abies concolor* - *Pseudotsuga menziesii* / *Erigeron eximius* Forest (CEGL000247, G5)
- *Abies concolor* - *Pseudotsuga menziesii* / *Festuca thurberi* - *Danthonia parryi* Woodland (CEGL005350, GNR)
- *Abies concolor* - *Pseudotsuga menziesii* / *Lathyrus lanszwertii* var. *leucanthus* Forest (CEGL000250, G3)
- *Abies concolor* - *Pseudotsuga menziesii* / *Vaccinium myrtillus* Forest (CEGL000265, G5)
- *Abies concolor* / *Arctostaphylos patula* Forest (CEGL000242, G5)
- *Abies concolor* / *Arctostaphylos uva-ursi* Forest (CEGL000243, G5)
- *Abies concolor* / *Carex siccata* Forest (CEGL000244, G2)
- *Abies concolor* / *Cercocarpus ledifolius* Woodland (CEGL000885, G4)
- *Abies concolor* / *Festuca arizonica* Woodland (CEGL000887, G4)
- *Abies concolor* / *Galium triflorum* Woodland (CEGL000888, GU)
- *Abies concolor* / *Juniperus communis* Forest (CEGL000249, G4?)
- *Abies concolor* / *Leymus triticoides* Woodland (CEGL000886, G3)
- *Abies concolor* / *Mahonia repens* Forest (CEGL000251, G5)
- *Abies concolor* / Mixed Grasses Forest (CEGL005357, GNR)
- *Abies concolor* / *Muhlenbergia virescens* Forest (CEGL000252, G5)
- *Abies concolor* / *Osmorhiza berteroi* Forest (CEGL000253, G4G5)
- *Abies concolor* / *Physocarpus malvaceus* Forest (CEGL000254, G4G5)
- *Abies concolor* / *Quercus gambelii* Forest (CEGL000261, G5)
- *Abies concolor* / *Robinia neomexicana* Woodland (CEGL000891, G4Q)
- *Abies concolor* / *Symphoricarpos oreophilus* Forest (CEGL000263, G5)
- *Ceanothus velutinus* Shrubland (CEGL002167, GNR)

- *Picea pungens* / *Arctostaphylos uva-ursi* Forest (CEGL000385, G4)
- *Picea pungens* / *Festuca arizonica* Woodland (CEGL000895, G5)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Arctostaphylos nevadensis* Woodland (CEGL000208, G2)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Arctostaphylos patula* Woodland (CEGL000209, G3)
- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Purshia tridentata* Woodland (CEGL000214, G3)
- *Pseudotsuga menziesii* / *Amelanchier alnifolia* Forest (CEGL000420, G2Q)
- *Pseudotsuga menziesii* / *Arctostaphylos patula* Woodland (CEGL000423, G4)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest (CEGL000424, G4)
- *Pseudotsuga menziesii* / *Arnica cordifolia* Forest (CEGL000427, G4)
- *Pseudotsuga menziesii* / *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) Woodland [Provisional] (CEGL002808, GNR)
- *Pseudotsuga menziesii* / *Bromus ciliatus* Forest (CEGL000428, G4)
- *Pseudotsuga menziesii* / *Carex geyeri* Forest (CEGL000430, G4?)
- *Pseudotsuga menziesii* / *Cercocarpus ledifolius* Woodland (CEGL000897, G3G4)
- *Pseudotsuga menziesii* / *Cercocarpus montanus* Woodland (CEGL000898, G4?)
- *Pseudotsuga menziesii* / *Festuca arizonica* Forest (CEGL000433, G5)
- *Pseudotsuga menziesii* / *Festuca idahoensis* Woodland (CEGL000900, G4)
- *Pseudotsuga menziesii* / *Holodiscus dumosus* Scree Woodland (CEGL000902, G3G4)
- *Pseudotsuga menziesii* / *Jamesia americana* Forest (CEGL000438, G3G4)
- *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000439, G4)
- *Pseudotsuga menziesii* / *Leucopoa kingii* Woodland (CEGL000904, G3G4)
- *Pseudotsuga menziesii* / *Mahonia repens* Forest (CEGL000442, G5)
- *Pseudotsuga menziesii* / *Muhlenbergia montana* Forest (CEGL000443, G4)
- *Pseudotsuga menziesii* / *Muhlenbergia virescens* Forest (CEGL000444, G4)
- *Pseudotsuga menziesii* / *Paxistima myrsinites* Forest (CEGL000446, G2G3)
- *Pseudotsuga menziesii* / *Physocarpus monogynus* Forest (CEGL000449, G4)
- *Pseudotsuga menziesii* / *Poa fendleriana* Woodland (CEGL002809, GNR)
- *Pseudotsuga menziesii* / *Pseudoroegneria spicata* Woodland (CEGL000908, G4)
- *Pseudotsuga menziesii* / *Quercus arizonica* Forest (CEGL000451, G3?)
- *Pseudotsuga menziesii* / *Quercus gambelii* Forest (CEGL000452, G5)
- *Pseudotsuga menziesii* / *Quercus hypoleucoides* Forest (CEGL000453, G3)
- *Pseudotsuga menziesii* / *Quercus rugosa* Forest (CEGL000454, G2)
- *Pseudotsuga menziesii* / *Quercus X pauciloba* Forest (CEGL000455, GU)
- *Pseudotsuga menziesii* / *Symphoricarpos occidentalis* Forest (CEGL000461, G3?)
- *Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Forest (CEGL000462, G5)
- *Pseudotsuga menziesii* Scree Woodland (CEGL000911, G5)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies concolor* Woodland Alliance (A.553)
- *Ceanothus velutinus* Shrubland Alliance (A.787)
- *Picea pungens* Forest Alliance (A.165)
- *Picea pungens* Woodland Alliance (A.557)
- *Pinus ponderosa* - *Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

DISTRIBUTION

Range: This system occurs throughout the southern Rockies, north and west into Utah, Nevada, eastern Wyoming (very southern in the Laramie Range and possibly on Sheep Mountain) and Idaho. Although not common, it does occur in southeastern Oregon but does not extend farther west into the Cascades.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, ID, NM, NV, OR, UT, WY

Map Zones: 6:P, 9:?, 12:C, 13:C, 15:C, 16:C, 17:C, 18:C, 21:?, 22:C, 23:C, 24:P, 25:C, 27:C, 28:C, 29:C, 33:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CP, 315A:C?, 315H:CC, 321A:??, 322A:CC, 331B:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331N:CP, 341A:CC, 341B:CC, 341C:CP, 341D:CC, 341E:CC, 341F:CC, 341G:CP, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M313A:CC, M313B:CC, M331A:CP, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:C?, M332E:CP, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 6:?, 7:?, 8:?, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C

SOURCES

References: Alexander et al. 1984b, Alexander et al. 1987, Boyce 1977, Bunin 1975c, Burns and Honkala 1990a, Chappell et al. 1997, Comer et al. 2002, Comer et al. 2003, DeVelice et al. 1986, Fitzhugh et al. 1987, Giese 1975, Heinze et al. 1962, Hess 1981,

Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Komarkova et al. 1988b, Mauk and Henderson 1984, Muldavin et al. 1996, Nachlinger et al. 2001, Neely et al. 2001, Steele et al. 1983, Tuhy et al. 2002, Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722850#references

Description Author: M.S. Reid

Version: 25 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1052 SOUTHERN ROCKY MOUNTAIN MESIC MONTANE MIXED CONIFER FOREST AND WOODLAND (CES306.825)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: RM Montane Dry-Mesic Mixed Conifer; Forest and Woodland (Treed); Ravine; Stream terrace (undifferentiated); Toeslope; Mesotrophic Soil; Ustic; Long Disturbance Interval; F-Patch/Low Intensity; F-Landscape/Low Intensity; Needle-Leaved Tree

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Temperate [Temperate Continental]; Shallow Soil; Mineral: W/ A-Horizon <10 cm

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2052; ESLF 4239; ESP 1052

CONCEPT

Summary: These are mixed conifer forests of the Rocky Mountains west into the ranges of the Great Basin, occurring predominantly in cool ravines and on north-facing slopes. Elevations range from 1200 to 3300 m. Occurrences of this system are found on cooler and more mesic sites than Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823). Such sites include lower and middle slopes of ravines, along stream terraces, moist, concave topographic positions and north- and east-facing slopes which burn somewhat infrequently. *Pseudotsuga menziesii* and *Abies concolor* are most common canopy dominants, but *Picea engelmannii*, *Picea pungens*, or *Pinus ponderosa* may be present. This system includes mixed conifer/*Populus tremuloides* stands. A number of cold-deciduous shrub species can occur, including *Acer glabrum*, *Acer grandidentatum*, *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Jamesia americana*, *Physocarpus malvaceus*, *Robinia neomexicana*, *Vaccinium membranaceum*, and *Vaccinium myrtillus*. Herbaceous species include *Bromus ciliatus*, *Carex geyeri*, *Carex rossii*, *Carex siccata*, *Muhlenbergia virescens*, *Pseudoroegneria spicata*, *Erigeron eximius*, *Fragaria virginiana*, *Luzula parviflora*, *Osmorhiza berteroi*, *Packera cardamine*, *Thalictrum occidentale*, and *Thalictrum fendleri*. Naturally occurring fires are of variable return intervals and mostly light, erratic, and infrequent due to the cool, moist conditions.

Classification Comments: This system will need to be modeled to separate from similar dry-mesic system.

Similar Ecological Systems:

- Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

Related Concepts:

- Blue Spruce: 216 (Eyre 1980) Finer
- Interior Douglas-fir: 210 (Eyre 1980) Intersecting
- White Fir: 211 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Abies concolor* - (*Pseudotsuga menziesii*) / *Jamesia americana* - *Holodiscus dumosus* Scree Woodland (CEGL000890, GNR)
- *Abies concolor* - (*Pseudotsuga menziesii*) / *Quercus gambelii* / *Thalictrum fendleri* Forest (CEGL005352, GNR)
- *Abies concolor* - (*Pseudotsuga menziesii*) / *Thalictrum fendleri* Forest (CEGL005353, GNR)
- *Abies concolor* - *Picea pungens* - *Populus angustifolia* / *Acer glabrum* Forest (CEGL000255, G2)
- *Abies concolor* - *Pinus ponderosa* / *Cercocarpus ledifolius* Forest (CEGL002732, G4?)
- *Abies concolor* - *Pseudotsuga menziesii* / *Acer glabrum* Forest (CEGL000240, G4)
- *Abies concolor* - *Pseudotsuga menziesii* / *Acer negundo* Forest (CEGL005367, GNR)
- *Abies concolor* - *Pseudotsuga menziesii* / *Erigeron eximius* Forest (CEGL000247, G5)
- *Abies concolor* - *Pseudotsuga menziesii* / *Lathyrus lanszwertii* var. *leucanthus* Forest (CEGL000250, G3)
- *Abies concolor* - *Pseudotsuga menziesii* / *Vaccinium myrtillus* Forest (CEGL000265, G5)
- *Abies concolor* / *Acer grandidentatum* Forest (CEGL000241, G4)
- *Abies concolor* / *Arctostaphylos patula* Forest (CEGL000242, G5)
- *Abies concolor* / *Arctostaphylos uva-ursi* Forest (CEGL000243, G5)
- *Abies concolor* / *Carex siccata* Forest (CEGL000244, G2)
- *Abies concolor* / *Festuca arizonica* Woodland (CEGL000887, G4)
- *Abies concolor* / *Galium triflorum* Woodland (CEGL000888, GU)
- *Abies concolor* / *Juglans major* Forest (CEGL000248, G2G3)
- *Abies concolor* / *Leymus triticoides* Woodland (CEGL000886, G3)
- *Abies concolor* / *Mahonia repens* Forest (CEGL000251, G5)
- *Abies concolor* / *Muhlenbergia virescens* Forest (CEGL000252, G5)
- *Abies concolor* / *Osmorhiza berteroi* Forest (CEGL000253, G4G5)
- *Abies concolor* / *Physocarpus malvaceus* Forest (CEGL000254, G4G5)

- *Abies concolor* / *Quercus gambelii* Forest (CEGL000261, G5)
- *Abies concolor* / *Robinia neomexicana* Woodland (CEGL000891, G4Q)
- *Abies concolor* / *Symphoricarpos oreophilus* Forest (CEGL000263, G5)
- *Picea pungens* / *Alnus incana* Woodland (CEGL000894, G3)
- *Picea pungens* / *Arctostaphylos uva-ursi* Forest (CEGL000385, G4)
- *Picea pungens* / *Arnica cordifolia* Forest (CEGL000386, G3?)
- *Picea pungens* / *Betula occidentalis* Woodland (CEGL002637, G2)
- *Picea pungens* / *Carex siccata* Forest (CEGL000387, G4)
- *Picea pungens* / *Cornus sericea* Woodland (CEGL000388, G4)
- *Picea pungens* / *Dasiphora fruticosa* ssp. *floribunda* Woodland (CEGL000396, G2G3)
- *Picea pungens* / *Equisetum arvense* Woodland (CEGL000389, G3?)
- *Picea pungens* / *Erigeron eximius* Forest (CEGL000390, G5)
- *Picea pungens* / *Festuca arizonica* Woodland (CEGL000895, G5)
- *Picea pungens* / *Fragaria virginiana* ssp. *virginiana* Forest (CEGL000391, G3G4)
- *Picea pungens* / *Juniperus communis* Forest (CEGL000392, G4G5)
- *Picea pungens* / *Linnaea borealis* Forest (CEGL000393, G4)
- *Picea pungens* / *Lonicera involucrata* Forest (CEGL000394, G2)
- *Picea pungens* / *Mahonia repens* Forest (CEGL000395, G5)
- *Picea pungens* / *Packera cardamine* Forest (CEGL000399, GU)
- *Picea pungens* / *Pseudoroegneria spicata* Forest (CEGL000397, G4?)
- *Pseudotsuga menziesii* / *Acer glabrum* Forest (CEGL000418, G4?)
- *Pseudotsuga menziesii* / *Acer grandidentatum* Forest (CEGL000419, GNR)
- *Pseudotsuga menziesii* / *Acer negundo* Woodland (CEGL002754, GNR)
- *Pseudotsuga menziesii* / *Betula occidentalis* Woodland (CEGL002639, G3?)
- *Pseudotsuga menziesii* / *Bromus ciliatus* Forest (CEGL000428, G4)
- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (CEGL000899, G4)
- *Pseudotsuga menziesii* / *Quercus gambelii* Forest (CEGL000452, G5)
- *Pseudotsuga menziesii* / *Viola adunca* var. *adunca* Forest (CEGL000467, G3)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies concolor* Woodland Alliance (A.553)
- *Picea pungens* Forest Alliance (A.165)
- *Picea pungens* Temporarily Flooded Woodland Alliance (A.567)
- *Picea pungens* Woodland Alliance (A.557)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Temporarily Flooded Woodland Alliance (A.568)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

DISTRIBUTION

Range: This system is found in the southern Rocky Mountains of Arizona and New Mexico north and west into the ranges of the Great Basin, Wyoming and southeastern Idaho, occurring predominantly in cool ravines and on north-facing slopes.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, ID, NM, NV, OR?, UT, WY

Map Zones: 6:?, 9:?, 12:P, 13:C, 15:C, 16:C, 17:P, 18:C, 21:?, 22:P, 23:C, 24:P, 25:C, 27:C, 28:C, 29:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CP, 315A:C?, 315H:CC, 321A:??, 322A:CC, 331B:CC, 331G:C?, 331H:CP, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CP, 341D:CC, 341F:CC, 342A:CP, 342B:CP, 342D:CP, 342E:CC, 342F:CP, 342G:CP, 342H:CC, 342I:C?, 342J:CP, M313A:CC, M313B:CC, M331A:CP, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C

SOURCES

References: Agree 1982, Alexander et al. 1984a, Alexander et al. 1984b, Alexander et al. 1987, Anderson 1999a, Boyce 1977, Bunin 1975c, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, DeVelice and Ludwig 1983c, DeVelice et al. 1986, Dieterich 1979, Fitzhugh et al. 1987, Fowells 1965, Giese 1975, Heinze et al. 1962, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Hopkins 1982, Komarkova et al. 1988b, Mauk and Henderson 1984, Moir and Ludwig 1979, Nachlinger et al. 2001, Neely et al. 2001, Parson and DeBenedetti 1979, Pfister 1972, Tuhy et al. 2002, Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722848#references

Description Author: NatureServe Western Ecology Team

Version: 01 Sep 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

1059 SOUTHERN ROCKY MOUNTAIN PINYON-JUNIPER WOODLAND (CES306.835)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Shallow Soil; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Long Disturbance Interval; Needle-Leaved Tree; *Pinus edulis*, *Juniperus monosperma*

Non-Diagnostic Classifiers: Escarpment; Foothill(s); Lowland [Foothill]; Midslope; Ridge; Temperate [Temperate Continental]; Unglaciated; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Butte

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2059; ESLF 4246; ESP 1059

CONCEPT

Summary: This southern Rocky Mountain ecological system occurs on dry mountains and foothills in southern Colorado east of the Continental Divide, in mountains and plateaus of north-central New Mexico, and extends out onto limestone breaks in the southeastern Great Plains. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus monosperma* dominate the tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus monosperma* at higher elevations. Stands with *Juniperus osteosperma* are representative of the Colorado Plateau and are not included in this system. In southern transitional areas between Madiran Pinyon-Juniper Woodland (CES305.797) and Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835) in central New Mexico, *Juniperus deppeana* becomes common. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species are more typical of southern Rocky Mountains than the Colorado Plateau and include *Artemisia bigelovii*, *Cercocarpus montanus*, *Quercus gambelii*, *Achnatherum scribneri*, *Bouteloua gracilis*, *Festuca arizonica*, or *Pleuraphis jamesii*.

Related Concepts:

- Juniper - Pinyon Pine Woodland (504) (Shiflet 1994) Broader
- Pinyon - Juniper: 239 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Juniperus monosperma* - *Rhus trilobata* / *Schizachyrium scoparium* Woodland (CEGL002121, GNR)
- *Juniperus monosperma* / *Agave lechuguilla* Woodland (CEGL000703, G4)
- *Juniperus monosperma* / *Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma* / *Artemisia bigelovii* Woodland (CEGL000705, G3?)
- *Juniperus monosperma* / *Artemisia tridentata* Woodland (CEGL000706, G5)
- *Juniperus monosperma* / *Atriplex confertifolia* / *Achnatherum hymenoides* Woodland (CEGL000707, G3G4)
- *Juniperus monosperma* / *Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma* / *Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma* / *Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma* / *Bouteloua hirsuta* Woodland (CEGL000711, GNR)
- *Juniperus monosperma* / *Cercocarpus montanus* - *Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma* / *Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma* / *Ericameria nauseosa* - *Fallugia paradoxa* Woodland (CEGL000715, G4)
- *Juniperus monosperma* / *Fallugia paradoxa* / *Xanthoparmelia neoconspersa* Woodland (CEGL000716, G4)
- *Juniperus monosperma* / *Forestiera pubescens* Woodland (CEGL005371, GNR)
- *Juniperus monosperma* / *Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Juniperus monosperma* / *Krascheninnikovia lanata* Woodland (CEGL000712, G3G4)
- *Juniperus monosperma* / *Nolina microcarpa* - *Agave lechuguilla* Woodland (CEGL000718, G4)
- *Juniperus monosperma* / *Quercus turbinella* Woodland (CEGL000720, GNR)
- *Juniperus monosperma* / *Quercus X pauciloba* Woodland (CEGL000721, G5)
- *Juniperus monosperma* / Rockland Woodland (CEGL005369, GNR)
- *Juniperus monosperma* / Sparse Understory Woodland (CEGL005368, GNR)
- *Pinus edulis* - (*Juniperus monosperma*) / *Bouteloua gracilis* Woodland (CEGL002151, G5?)
- *Pinus edulis* - (*Juniperus monosperma*, *Juniperus osteosperma*) / *Hesperostipa comata* Woodland (CEGL000797, G2?)
- *Pinus edulis* - *Juniperus osteosperma* / *Bromus tectorum* Semi-natural Woodland (CEGL002367, GNA)
- *Pinus edulis* - *Juniperus osteosperma* / *Cercocarpus ledifolius* Woodland (CEGL002940, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Ephedra viridis* Woodland (CEGL002370, G3)

- *Pinus edulis* - *Juniperus osteosperma* / *Hesperostipa neomexicana* Woodland (CEGL002371, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Pseudoroegneria spicata* - Cushion Plant Woodland (CEGL002819, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Purshia tridentata* Woodland (CEGL000789, G5)
- *Pinus edulis* - *Juniperus scopulorum* Woodland [Provisional] (CEGL002907, GU)
- *Pinus edulis* - *Juniperus* spp. / *Artemisia tridentata* (*ssp. wyomingensis*, *ssp. vaseyana*) Woodland (CEGL000776, G5)
- *Pinus edulis* - *Juniperus* spp. / *Cercocarpus montanus* - Mixed Shrubs Woodland (CEGL000780, G5)
- *Pinus edulis* - *Juniperus* spp. / *Poa fendleriana* Woodland (CEGL000787, G5)
- *Pinus edulis* - *Juniperus* spp. / *Pseudoroegneria spicata* Woodland (CEGL000788, G4)
- *Pinus edulis* - *Juniperus* spp. / *Quercus gambelii* Woodland (CEGL000791, G5)
- *Pinus edulis* - *Quercus arizonica* / *Rhus trilobata* Woodland (CEGL000790, G5?)
- *Pinus edulis* / *Achnatherum nelsonii ssp. dorei* Woodland (CEGL000796, G4)
- *Pinus edulis* / *Achnatherum scribneri* Woodland (CEGL000798, G3)
- *Pinus edulis* / *Andropogon hallii* Woodland (CEGL000774, G2)
- *Pinus edulis* / *Arctostaphylos pungens* Woodland (CEGL000775, G3)
- *Pinus edulis* / *Bouteloua curtipendula* Woodland (CEGL000777, GNR)
- *Pinus edulis* / *Festuca arizonica* Woodland (CEGL000783, G3)
- *Pinus edulis* / *Leymus ambiguus* Woodland (CEGL002908, GU)
- *Pinus edulis* / *Muhlenbergia dubia* Woodland (CEGL000784, G2)
- *Pinus edulis* / *Muhlenbergia pauciflora* Woodland (CEGL000785, G4)
- *Pinus edulis* / *Nolina microcarpa* Woodland (CEGL000786, GNR)
- *Pinus edulis* / *Quercus X pauciloba* Woodland (CEGL000793, G5)
- *Pinus edulis* / Rockland Woodland (CEGL000794, G5)
- *Pinus edulis* / Sparse Understory Forest (CEGL000795, G5)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus edulis* Forest Alliance (A.135)

DISTRIBUTION

Range: This system occurs on dry mountains and foothills in southern Colorado, in mountains and plateaus of northern New Mexico and Arizona, and extends out onto breaks in the Great Plains. It extends south to the Sacramento Mountains, especially the eastern side. The western side has Madrean elements (*Quercus grisea*) and may be classified as Madrean woodland.

Divisions: 303:C; 304:C; 306:C

Nations: US

Subnations: CO, NM

Map Zones: 14:?, 15:P, 24:?, 25:C, 27:C, 28:C, 34:P

USFS Ecomap Regions: 313B:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322B:CC, 331B:CC, 331H:CP, 331I:CC, 331J:CC, M313B:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC

TNC Ecoregions: 20:C, 21:C, 22:P, 27:C, 28:C

SOURCES

References: Alexander 1981, Bradley et al. 1992, Comer et al. 2003, Commons et al. 1999, Dwyer and Pieper 1967, Eager 1999, Hess and Wasser 1982, Ladyman and Muldavin 1996, Lindauer et al. 1982, Mehl 1992, Muldavin et al. 1992, Muldavin et al. 1996, Neely et al. 2001, Powell 1988b, West 1999a, West 1999b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723255#references

Description Author: NatureServe Western Ecology Team

Version: 22 Dec 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1054 SOUTHERN ROCKY MOUNTAIN PONDEROSA PINE WOODLAND (CES306.648)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; F-Patch/Medium Intensity; Needle-Leaved Tree; *Pinus ponderosa* with shrubby understory

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2054; ESLF 4241; ESP 1054

CONCEPT

Summary: This very widespread ecological system is most common throughout the cordillera of the Rocky Mountains, from the Greater Yellowstone region south. It is also found in the Colorado Plateau region, west into scattered locations of the Great Basin. Its easternmost extent in Wyoming is in the Bighorn Mountains. These woodlands occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 1900 m in northern Wyoming to 2800 m in the New Mexico mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on soils derived from igneous, metamorphic, and sedimentary material, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030) in the eastern Cascades, Okanogan, and northern Rockies regions receives winter and spring rains, and thus has a greater spring "green-up" than the drier woodlands in the central Rockies. *Pinus ponderosa* (primarily var. *scopulorum* and var. *brachyptera*) is the predominant conifer; *Pseudotsuga menziesii*, *Pinus edulis*, *Pinus contorta*, *Populus tremuloides*, and *Juniperus* spp. may be present in the tree canopy. The understory is usually shrubby, with *Artemisia nova*, *Artemisia tridentata*, *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Cercocarpus montanus*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus gambelii*, *Symphoricarpos* spp., *Prunus virginiana*, *Amelanchier alnifolia* (less so in Montana), and *Rosa* spp. common species. *Pseudoroegneria spicata*, *Pascopyrum smithii*, and species of *Hesperostipa*, *Achnatherum*, *Festuca*, *Muhlenbergia*, and *Bouteloua* are some of the common grasses. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density.

Classification Comments: This system intergrades with Southern Rocky Mountain Ponderosa Pine Savanna (CES306.649). They are distinguished by the high-frequency, surface-fire regime, less steep or rocky environmental setting, and more open grassy understory structure of the savanna system. Ponderosa pine woodlands, savannas, and "escarpments" of central and eastern Montana, eastern Wyoming, the Black Hills region, western Dakotas, and Nebraska are now included in Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650).

Because this ecological system has undergone some important changes in its concept, the original system (CES306.032) was archived, and this new system was created to account for the new concept of ponderosa pine woodlands in the southern Rocky Mountains.

Similar Ecological Systems:

- North Pacific Interior Dry-Mesic Mixed Conifer Forest [Provisional] (CES207.152)
- Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)
- Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650)
- Southern Rocky Mountain Ponderosa Pine Savanna (CES306.649)

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Broader

DESCRIPTION

Environment: This ecological system within the region occurs at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites at elevations ranging from 1980-2800 m (6500-9200 feet). It can occur on all slopes and aspects, however, it commonly occurs on moderately steep to very steep slopes or ridgetops. This ecological system generally occurs on soils derived from igneous, metamorphic, and sedimentary material, including basalt, basaltic, andesitic flows, intrusive granitoids and porphyrites, and tuffs (Youngblood and Mauk 1985). Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile, and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Surface textures are highly variable in this ecological system ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations. *Pinus ponderosa* / *Arctostaphylos patula* represents the extreme with typically a high percentage of rock and bare soil present.

Precipitation generally contributes 25-60 cm annually to this system, mostly through winter storms and some monsoonal summer rains. Typically a seasonal drought period occurs throughout this system as well. Fire plays an important role in maintaining the characteristics of these open-canopy woodlands. However, soil infertility and drought may contribute significantly in some areas as

well.

Dynamics: *Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States. Historically, ground fires and drought were influential in maintaining open-canopy conditions in these woodlands. With settlement and subsequent fire suppression, occurrences have become denser. Presently, many occurrences contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. These altered structures have affected fuel loads and alter fire regimes. Presettlement fire regimes were primarily frequent (5- to 15-year return intervals), low-intensity ground fires triggered by lightning strikes or deliberately set fires by Native Americans. With fire suppression and increased fuel loads, fire regimes are now less frequent and often become intense crown fires, which can kill mature *Pinus ponderosa* (Reid et al. 1999).

Establishment is erratic and believed to be linked to periods of adequate soil moisture and good seed crops, as well as fire frequencies, which allow seedlings to reach sapling size. Longer fire-return intervals have resulted in many occurrences having dense subcanopies of overstocked and unhealthy young *Pinus ponderosa* (Reid et al. 1999). Mehl (1992) states the following: "Where fire has been present, occurrences will be climax and contain groups of large, old trees with little understory vegetation or down woody material and few occurring dead trees. The age difference of the groups of trees would be large. Where fire is less frequent, there will also be smaller size trees in the understory giving the occurrence some structure with various canopy layers. Dead, down material will be present in varying amounts along with some occurring dead trees. In both cases the large old trees will have irregular open, large branched crowns. The bark will be lighter in color, almost yellow, thick and some will like have basal fire scars."

Grace's warbler, pygmy nuthatch, and flammulated owl are indicators of a healthy ponderosa pine woodland. All of these birds prefer mature trees in an open woodland setting (Winn 1998, Jones 1998, Levad 1998 as cited in Rondeau 2001).

MEMBERSHIP

Associations:

- *Pinus ponderosa* - *Pinus strobiformis* Forest (CEGL007091, G2?)
- *Pinus ponderosa* / *Arctostaphylos patula* Woodland (CEGL000842, G5)
- *Pinus ponderosa* / *Arctostaphylos pungens* Woodland (CEGL000843, G3)
- *Pinus ponderosa* / *Arctostaphylos uva-ursi* Woodland (CEGL000844, G4)
- *Pinus ponderosa* / *Artemisia arbuscula* Woodland (CEGL000845, G2G3Q)
- *Pinus ponderosa* / *Artemisia nova* Woodland (CEGL000846, G5)
- *Pinus ponderosa* / *Artemisia tridentata* - *Purshia tridentata* Woodland (CEGL000178, G3)
- *Pinus ponderosa* / *Artemisia tridentata* ssp. *vaseyana* Woodland (CEGL002794, GNR)
- *Pinus ponderosa* / *Bouteloua gracilis* Woodland (CEGL000848, G4)
- *Pinus ponderosa* / *Bromus inermis* Semi-natural Woodland (CEGL002943, GNA)
- *Pinus ponderosa* / *Carex geyeri* Woodland (CEGL000182, G3G4)
- *Pinus ponderosa* / *Carex inops* ssp. *heliophila* Woodland (CEGL000849, G3G4)
- *Pinus ponderosa* / *Carex rossii* Forest (CEGL000183, G4G5)
- *Pinus ponderosa* / *Cercocarpus ledifolius* Woodland (CEGL000850, G4)
- *Pinus ponderosa* / *Cercocarpus montanus* Woodland (CEGL000851, G4)
- *Pinus ponderosa* / *Fallugia paradoxa* Woodland (CEGL002999, GNR)
- *Pinus ponderosa* / *Festuca arizonica* Woodland (CEGL000856, G4)
- *Pinus ponderosa* / *Festuca thurberi* Woodland (CEGL005373, GNR)
- *Pinus ponderosa* / *Hesperostipa comata* Woodland (CEGL000879, G1)
- *Pinus ponderosa* / *Juniperus communis* Woodland (CEGL000859, G4?)
- *Pinus ponderosa* / *Juniperus scopulorum* Woodland (CEGL000861, G4)
- *Pinus ponderosa* / *Leucopoa kingii* Woodland (CEGL000186, G3)
- *Pinus ponderosa* / *Muhlenbergia montana* Woodland (CEGL000862, G4G5)
- *Pinus ponderosa* / *Muhlenbergia virescens* - *Festuca arizonica* Woodland (CEGL000864, G5?)
- *Pinus ponderosa* / *Muhlenbergia virescens* Woodland (CEGL000863, G5)
- *Pinus ponderosa* / *Physocarpus monogynus* Forest (CEGL000190, G3)
- *Pinus ponderosa* / *Pteridium aquilinum* Woodland [Provisional] (CEGL002944, GNR)
- *Pinus ponderosa* / *Purshia stansburiana* Woodland (CEGL000854, G3)
- *Pinus ponderosa* / *Purshia tridentata* Woodland (CEGL000867, G3G5)
- *Pinus ponderosa* / *Quercus gambelii* / *Carex inops* ssp. *heliophila* Woodland (CEGL005372, GNR)
- *Pinus ponderosa* / *Quercus gambelii* Woodland (CEGL000870, G5)
- *Pinus ponderosa* / *Quercus X pauciloba* Woodland (CEGL000874, G5)
- *Pinus ponderosa* / *Ribes cereum* Forest (CEGL000199, GNR)
- *Pinus ponderosa* / *Ribes inerme* Scree Woodland (CEGL000876, G4)
- *Pinus ponderosa* / *Robinia neomexicana* Woodland (CEGL005374, GNR)
- *Pinus ponderosa* / Rockland Woodland (CEGL000877, G5?)
- *Pinus ponderosa* / *Schizachyrium scoparium* Woodland (CEGL000201, G3G4)
- *Pinus ponderosa* / *Symphoricarpos oreophilus* Forest (CEGL000205, G3)
- *Pinus ponderosa* Scree Woodland (CEGL000878, G4)

Alliances:

- *Pinus ponderosa* Forest Alliance (A.124)
- *Pinus ponderosa* Woodland Alliance (A.530)

DISTRIBUTION

Range: This system is found throughout much of the Rocky Mountains cordillera, from northwestern Wyoming, south through the Rocky Mountains of Colorado and into New Mexico. In Arizona, it occurs on the Mogollon Rim north into the Colorado Plateau region and west into scattered locations of the Great Basin.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, ID?, NM, NV, UT, WY

Map Zones: 12:?, 14:?, 15:C, 16:C, 17:?, 22:C, 23:C, 24:C, 25:C, 26:?, 27:C, 28:C, 29:C, 33:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 331B:CC, 331F:CP, 331G:CP, 331H:CC, 331I:CC, 331J:CC, 341A:CP, 341B:CC, 341F:CC, 342F:CC, 342G:CC, M313A:CC, M313B:CC, M331B:CC, M331D:CP, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M341A:CP, M341B:CC, M341C:CC, M341D:C?

TNC Ecoregions: 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 33:?

SOURCES

References: Comer et al. 2002, Comer et al. 2003, DeVelice et al. 1986, Hess and Alexander 1986, Hoffman and Alexander 1976, Johansen and Latta 2003, Komarkova et al. 1988b, Marriott and Faber-Langendoen 2000, Mauk and Henderson 1984, Mehl 1992, Muldavin et al. 1987, Muldavin et al. 1996, Nachlinger et al. 2001, Neely et al. 2001, Reid et al. 1999, Rondeau 2001, Tuhy et al. 2002, Western Ecology Working Group n.d., Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.797980#references

Description Author: M.S. Reid

Version: 01 Oct 2007

Concept Author: M.S. Reid

Stakeholders: Canada, Midwest, West

ClassifResp: West

1336 SOUTHWEST FLORIDA COASTAL STRAND AND MARITIME HAMMOCK (CES411.368)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2336; ESLF 4142; ESP 1336

CONCEPT

Summary: This ecological system occurs as a narrow band of hardwood forest lying just inland of the coastal dune system in southwestern Florida. It is found on stabilized, old, coastal dunes, often with substantial shell components. The vegetation is characterized by hardwood species with tropical affinities. As such, the northern extent of this type is limited by periodic freezes and cold tolerance of tropical constituent species, such as *Piscidia piscipula* and *Eugenia axillaris* (Johnson and Muller 1993a). This system is closely related to both inland tropical hammocks and southeast Florida maritime hammocks, and may share some species overlap with each.

Classification Comments: This system may be distinguished from southeast Florida maritime hammocks by geographic location, presence/absence of certain indicator species, and relatively less harsh coastal exposure. It is distinguished from maritime hammocks further north which contain temperate species including *Persea borbonia*, *Quercus virginiana*, *Magnolia grandiflora*, and *Juniperus virginiana* var. *silicicola* (Johnson and Muller 1993a).

Similar Ecological Systems:

- Southeast Florida Coastal Strand and Maritime Hammock (CES411.369)

Related Concepts:

- Coastal Berm (FNAI 1990) Undetermined
- Coastal Strand (FNAI 1990) Intersecting
- Maritime Hammock (FNAI 1990) Intersecting
- Shell Mound (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Ernodea littoralis* - *Forestiera segregata* var. *segregata* - *Coccoloba uvifera* - *Jacquinia keyensis* Shrubland (CEGL003785, G1)
- *Ficus aurea* - *Sideroxylon foetidissimum* - *Bursera simaruba* / *Eugenia foetida* - *Piscidia piscipula* / *Hymenocallis latifolia* Forest (CEGL007002, G1)
- *Quercus virginiana* - *Sabal palmetto* / *Eugenia axillaris* - *Myrsine floridana* - *Coccoloba uvifera* Forest (CEGL007035, G1)
- *Sabal palmetto* - *Coccoloba uvifera* - *Piscidia piscipula* / *Myrsine floridana* / *Hymenocallis latifolia* Forest (CEGL007011, G1)
- *Scaevola plumieri* - *Coccoloba uvifera* / *Uniola paniculata* Shrubland (CEGL003781, G1?)
- *Sophora tomentosa* var. *truncata* - *Forestiera segregata* var. *segregata* - *Ernodea littoralis* - *Agave decipiens* Shrubland (CEGL003793, G1)
- *Swietenia mahagoni* - *Piscidia piscipula* - *Colubrina arborescens* Forest (CEGL004710, G1Q)

Alliances:

- *Bursera simaruba* - *Coccoloba diversifolia* - *Nectandra coriacea* - *Eugenia axillaris* Forest Alliance (A.33)
- *Coccoloba uvifera* Shrubland Alliance (A.715)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Sabal palmetto* - *Coccoloba uvifera* Forest Alliance (A.43)
- *Sophora tomentosa* - *Forestiera segregata* Shrubland Alliance (A.725)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 232D:CC, 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723148#references

Description Author: R. Evans, after Johnson and Muller
Version: 16 Dec 2002
Concept Author: R. Evans, after Johnson and Muller (1993a)

Stakeholders: Southeast
ClassifResp: Southeast

**1339 WEST GULF COASTAL PLAIN CHENIER AND UPPER TEXAS COASTAL FRINGE FOREST AND WOODLAND
(CES203.466)**

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2339; ESLF 4145; ESP 1339

CONCEPT

Summary: This system includes a range of woody vegetation present along the northern Gulf of Mexico, from Louisiana to the upper Texas coast, including shell ridges along the coast and bay margins, coastal salt domes, stranded ancient barrier ridges (Ingleside barrier strandplain), and chenier ridges of the Chenier Plain. It is heterogeneous in physiognomy, including forests, woodlands and shrublands. The Chenier Plain is characterized by a prograding coastline replenished by sediments carried to the Gulf of Mexico initially by the Mississippi and subsequently the Atchafalaya and other rivers. It is void of barrier islands and shoreline, and sediments are reworked by waves into beach ridges, sometimes with a substantial shell component. This process has been continuing since the last glacial retreat, and as the coastline progrades, older beach ridges are left as interior ridges surrounded by marsh. These interior beach ridges are referred to as cheniers (French for oak) because they were historically dominated by *Quercus virginiana*. Ridges parallel the coast and are usually 3 meters above mean sea level. Today, very few remain vegetated by a live oak-dominated forest because many have been cleared for agriculture. Though not confined to coastal areas, salt domes are a distinctive feature along the Gulf Coast of upper Texas and Louisiana where they often form a drastic contrast to the low-lying Coastal Plain sediments surrounding them. Formed by the rise of salt masses which push up overlying strata, salt domes may rise 30 meters above the surrounding landscape. The natural vegetation of cheniers and salt domes are oak-dominated woodlands and forests. The Ingleside barrier strandplain is a Pleistocene barrier ridge that outcrops discontinuously along the Texas coast. One of these areas is located northeast of Galveston Bay and supports vegetation classes within this ecological system. Shell ridges located along coast and bay margins are typically dominated by halophytic shrubs. Similar vegetation may also be found on coastal dredge spoil. Vegetation structure and composition of occurrences of this system may be influenced by salt spray (on those shell ridges, salt domes and cheniers closest to the gulf), tropical storms and hurricanes, and the distinctive climate of the immediate coast. This system includes the Northern Gulf Coast Chenier Plain which extends from Vermillion Bay in Louisiana through Jefferson County, Texas; it also includes the upper Texas coast from the Chenier Plain south to Matagorda Bay.

MEMBERSHIP

Associations:

- *Acacia farnesiana* - *Opuntia stricta* var. *dillenii* - *Lycium carolinianum* var. *quadrifidum* / *Spartina patens* Shrubland (CEGL003932, G3?)
- *Celtis laevigata* - (*Zanthoxylum clava-herculis*, *Acacia farnesiana*) / *Vitis mustangensis* Forest (CEGL007198, G3?)
- *Quercus virginiana* - (*Celtis laevigata*) / *Prunus caroliniana* Forest (CEGL002156, G2G3)
- *Quercus virginiana* - *Celtis laevigata* / *Sabal minor* Forest (CEGL007466, G2)
- *Quercus virginiana* - *Magnolia grandiflora* - *Quercus pagoda* - *Celtis laevigata* / *Sabal minor* Forest (CEGL007467, G1)

Alliances:

- *Acacia farnesiana* Shrubland Alliance (A.1029)
- *Celtis laevigata* Forest Alliance (A.226)
- *Quercus virginiana* - *Celtis laevigata* Forest Alliance (A.374)

DISTRIBUTION

Range: Northern Gulf of Mexico, from Louisiana to the upper Texas coast.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 37:C, 98:C

USFS Ecomap Regions: 232E:CC, 255D:CC

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723120#references

Description Author: J. Teague and R. Evans

Version: 31 Jan 2005

Stakeholders: Southeast

1323 WEST GULF COASTAL PLAIN MESIC HARDWOOD FOREST (CES203.280)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Long Disturbance Interval; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2323; ESLF 4129; ESP 1323

CONCEPT

Summary: This ecological system is found in limited upland areas (especially ravines and sideslopes) of the Gulf Coastal Plain west of the Mississippi River. These areas are topographically isolated from historically fire-prone, pine-dominated uplands in eastern Texas, western Louisiana, and southern Arkansas. Sites are often found along slopes above perennial streams in the region. These sites have moderate to high fertility and moisture retention. Soils can be quite variable, ranging from coarse to loamy in surface texture. Most are acidic in surface reactions and less commonly circumneutral. Vegetation indicators are mesic hardwoods such as *Fagus grandifolia*, *Quercus alba*, and *Ilex opaca*, although scattered, large-diameter pines (most often *Pinus taeda*) are also often present. Spring-blooming herbaceous species are typical in the understory of most examples.

Classification Comments: Some stands from Macon Ridge in Louisiana (a terrace ecoregion in the Mississippi River Alluvial Plain) are also included here. Some hardwood stands could occur on narrow ridgetops which are isolated from fire, but which would not be "mesic" in their composition or environment. These may be treated as a hardwood-dominated example of the widespread and variable West Gulf Coastal Plain Pine-Hardwood Forest (CES203.378). More information is needed.

Related Concepts:

- Beech-Magnolia-Loblolly Slopes (Ajilusgi 1979) Equivalent
- Floodplain Hardwood Pine Forest (Marks and Harcombe 1981) Broader
- Lower Slope Hardwood Pine Forest (Marks and Harcombe 1981) Finer

DESCRIPTION

Environment: Sites are often found along slopes above perennial streams in the region. These sites have moderate to high fertility and moisture retention. Soils can be quite variable, ranging from coarse to loamy in surface texture. Most are acidic in surface reactions and less commonly circumneutral.

Vegetation: Examples of this forested system can be diverse. Canopy trees can include *Fagus grandifolia*, *Magnolia grandiflora*, *Liquidambar styraciflua*, *Quercus alba*, *Quercus shumardii*, *Quercus pagoda*, *Quercus falcata*, *Quercus michauxii* (in wetter examples), *Quercus hemisphaerica* (in drier examples), *Quercus stellata* (in drier examples), *Quercus nigra*, *Fraxinus americana*, *Carya alba*, *Celtis laevigata*, *Nyssa sylvatica*, *Ulmus americana*, and *Pinus taeda*. *Quercus rubra* is rare and of limited extent in the range of this ecological system but is attributed to an association which occurs in Hempstead, Howard, Little River, and Sevier counties, Arkansas. Understory trees can include *Carpinus caroliniana*, *Prunus caroliniana*, *Ostrya virginiana*, *Ilex opaca* var. *opaca*, *Cornus florida*, *Acer barbatum*, and *Acer leucoderme*. *Arundinaria gigantea* may be present in some examples. Other shrubs may include *Persea borbonia*, *Viburnum acerifolium*, and *Sabal minor*. Herbs can include *Solidago auriculata*, *Athyrium filix-femina* ssp. *Asplenoides*, *Chasmanthium sessiliflorum*, *Cynoglossum virginianum*, and *Trillium ludovicianum*.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Magnolia grandiflora* - *Quercus alba* / *Carpinus caroliniana* - *Ostrya virginiana* - *Ilex opaca* var. *opaca* Forest (CEGL007872, G2)
- *Fagus grandifolia* - *Quercus alba* / *Acer (barbatum, leucoderme)* / *Solidago auriculata* Forest (CEGL007207, G2G3)
- *Fagus grandifolia* - *Quercus alba* / *Ilex opaca* var. *opaca* / *Athyrium filix-femina* ssp. *asplenoides* Forest (CEGL007208, G3)
- *Fraxinus americana* - *Celtis laevigata* - *Nyssa sylvatica* - *Quercus shumardii* - *Ulmus americana* Forest (CEGL007897, G2G3)
- *Liquidambar styraciflua* - *Quercus michauxii* / *Acer rubrum* var. *drummondii* / *Saururus cernuus* - *Packera glabella* - *Carex tribuloides* Saturated Ravine Forest [Provisional] (CEGL008444, G3?)
- *Magnolia grandiflora* / *Prunus caroliniana* - *Carpinus caroliniana* / *Arundinaria gigantea* Forest (CEGL008577, G1?)
- *Quercus alba* - *Carya alba* / *Chasmanthium sessiliflorum* West Gulf Coastal Plain Forest (CEGL008413, G3G4)
- *Quercus alba* - *Quercus hemisphaerica* / *Prunus caroliniana* - *Persea borbonia* - *Viburnum acerifolium* Forest (CEGL007959, G2)
- *Quercus alba* - *Quercus nigra* / *Ostrya virginiana* / *Sabal minor* Forest (CEGL008581, G2G3)
- *Quercus alba* - *Quercus rubra* / *Ostrya virginiana* / *Arundinaria gigantea* / *Cynoglossum virginianum* Forest (CEGL007971, G2)
- *Quercus alba* / *Acer leucoderme* - *Ostrya virginiana* / *Solidago auriculata* Forest (CEGL008575, G2?)
- *Quercus falcata* - *Quercus stellata* - (*Pinus taeda*) West Gulf Coastal Plain Forest (CEGL008415, G3?)
- *Quercus shumardii* - *Quercus pagoda* - *Fraxinus americana* / *Ostrya virginiana* - *Cornus florida* / *Trillium ludovicianum* Forest (CEGL007272, G1)

Alliances:

- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

DISTRIBUTION

Range: This system is limited to particular upland areas (especially ravines and sideslopes) of the Gulf Coastal Plain west of the Mississippi River, with some occurrences on Macon Ridge (a terrace ecoregion in the Mississippi River Alluvial Plain) in Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 37:C, 44:P, 99:C

USFS Ecomap Regions: 231E:CC, 232F:CC

TNC Ecoregions: 40:C, 41:C, 42:C

SOURCES

References: Comer et al. 2003, Marks and Harcombe 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723207#references

Description Author: R. Evans, mod. M. Pyne and E. Lunsford

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1371 WEST GULF COASTAL PLAIN PINE-HARDWOOD FOREST (CES203.378)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Short Disturbance Interval; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2371; ESLF 4314; ESP 1371

CONCEPT

Summary: This West Gulf Coastal Plain ecological system consists of forests and woodlands dominated by *Pinus taeda* and/or *Pinus echinata* in combination with a host of dry to dry-mesic site hardwood species. This type was the historical matrix (dominant vegetation type) for large portions of the Upper West Gulf Coastal Plain (TNC ecoregion 40) where it replaced *Pinus palustris*-dominated vegetation. In this region of southern Arkansas, northwestern Louisiana, and parts of eastern Texas, this type was historically present on nearly all uplands in the region except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). Such sites are underlain by loamy to fine-textured soils of variable depths. These are upland sites on ridgetops and adjacent sideslopes, with moderate fertility and moisture retention. This type was also present in more limited areas of the West Gulf Coastal Plain (TNC ecoregion 41), where it was confined more typically to sideslopes and other locations not dominated by *Pinus palustris*. There are no known "fidel" herbaceous species or any local endemic or globally rare plant species, and overall this system may have supported relatively low levels of vascular plant species diversity. This system has undergone major transformations since European settlement of the region.

Similar Ecological Systems:

- West Gulf Coastal Plain Stream Terrace Sandyland Longleaf Pine Woodland (CES203.891)

Related Concepts:

- Calcareous Forest (Smith 1996a) Undetermined
- Mid Slope Oak Pine Forest (Marks and Harcombe 1981) Undetermined
- Shortleaf Pine/Oak-Hickory Forest (Smith 1996a) Intersecting

DESCRIPTION

Environment: In southern Arkansas, northwestern Louisiana, and parts of eastern Texas, this type was historically present on nearly all uplands in the region except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). Such sites are underlain by loamy to fine-textured soils of variable depths. These are upland sites on ridgetops and adjacent sideslopes, with moderate fertility and moisture retention.

Vegetation: Examples of this system are forests and woodlands dominated by *Pinus taeda* and/or *Pinus echinata* in combination with a host of dry to dry-mesic site hardwood species, such as *Quercus alba*, *Quercus falcata*, and *Quercus stellata*. Stands on narrow ridgetops, which can be isolated from the effects of fire, may exhibit greater dominance by hardwoods. Other species that may occur include *Quercus margarettiae*, *Quercus velutina*, *Carya alba*, *Carya texana*, *Crataegus* spp., *Ostrya virginiana*, *Symplocos tinctoria*, *Morella cerifera*, *Vaccinium arboreum*, *Vaccinium elliotii*, *Viburnum acerifolium*, *Viburnum dentatum*, *Chasmanthium sessiliflorum*, *Dichanthelium sphaerocarpon*, and *Schizachyrium scoparium*. The importance of *Acer barbatum*, *Acer leucoderme*, and *Liquidambar styraciflua* may increase with the absence of fire.

MEMBERSHIP

Associations:

- *Pinus (echinata, taeda) / Symplocos tinctoria - Morella cerifera - Vaccinium elliotii* Forest (CEGL008410, G3?)
- *Pinus echinata - (Pinus taeda) - Quercus falcata / Dichanthelium sphaerocarpon* Forest (CEGL007947, G2G3)
- *Pinus echinata - Pinus taeda - Quercus (alba, falcata, stellata)* Forest (CEGL004713, G2G3)
- *Pinus echinata - Pinus taeda - Quercus stellata - Carya texana / Vaccinium arboreum* Woodland (CEGL007499, G3?)
- *Pinus echinata - Quercus alba / Viburnum (dentatum, acerifolium)* Forest (CEGL003855, G2G3)
- *Pinus echinata - Quercus stellata - Quercus falcata - Carya texana* Woodland (CEGL007800, G1)
- *Pinus taeda - (Pinus echinata) - Quercus alba - Carya alba / Acer barbatum - (Acer leucoderme)* Forest (CEGL007524, G2G3)
- *Pinus taeda - (Pinus echinata) - Quercus falcata - Carya texana / Vaccinium arboreum* Forest (CEGL007528, G4)
- *Pinus taeda - (Pinus echinata) / Quercus michauxii / Thaspium barbinode* Forest (CEGL008582, G1)
- *Pinus taeda - (Quercus spp.) / Ostrya virginiana - Sabal minor* Forest (CEGL007955, G2G3)
- *Pinus taeda - Quercus alba - (Fagus grandifolia) / Ilex opaca / Smilax pumila - Mitchella repens* Forest (CEGL007525, G3G4)
- *Pinus taeda - Quercus stellata / Crataegus* spp. Woodland (CEGL002112, G2G3?)
- *Quercus stellata - Quercus marilandica - Pinus taeda* Jackson Acidic Clay Woodland (CEGL007900, G2?Q)

Alliances:

- *Pinus (echinata, taeda) - Quercus (stellata, marilandica, falcata)* Woodland Alliance (A.2011)

- *Pinus echinata* - *Quercus (alba, falcata, stellata, velutina)* Forest Alliance (A.394)
- *Pinus taeda* - *Pinus echinata* Forest Alliance (A.129)
- *Pinus taeda* - *Quercus (alba, falcata, stellata)* Forest Alliance (A.404)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293)

DISTRIBUTION

Range: West Gulf Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 37:C, 44:C

USFS Ecomap Regions: 231E:CC, 232F:CC, 234E:PP

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Comer et al. 2003, Griffith et al. 2004, Marks and Harcombe 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723138#references

Description Author: R. Evans and T. Foti, mod. M. Pyne

Version: 31 May 2007

Concept Author: R. Evans and T. Foti

Stakeholders: Southeast

ClassifResp: Southeast

1378 WEST GULF COASTAL PLAIN SANDHILL OAK AND SHORTLEAF PINE FOREST AND WOODLAND (CES203.056)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: Short Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2378; ESLF 4321; ESP 1378

CONCEPT

Summary: This ecological system occurs west of the Mississippi River primarily outside the natural range of longleaf pine and less commonly within. Like other sandhill systems of the Gulf and Atlantic coastal plains, this type is found on uplands underlain with deep, coarse sandy soils. These sites are typified by low fertility and moisture retention, which contribute to open tree canopies with usually <60% canopy closure. Sparse understory vegetation and abundant patches of bare soil are indicative of this system. Vegetation indicators are species tolerant of droughty sites, especially *Quercus incana* and *Quercus arkansana*, but also *Quercus marilandica* and *Quercus stellata*. *Pinus palustris* is absent (or perhaps at low frequency within its range); *Pinus echinata* is usually present. This system supports a large concentration of vascular plant endemics, near endemics, and a number of plant species with high fidelity to sandhills in the region. Elsewhere in the Atlantic and Gulf coastal plains, including most of the adjacent ecoregion (41), these site conditions are closely associated with longleaf pine.

Classification Comments: In Arkansas (at least), this system is most closely affiliated with the "Briley-Alaga-Bibb" Soil Association (MUID=AR039 in STATSGO).

Related Concepts:

- Arenic Dry Mixed Pine-Hardwood Uplands (Turner et al. 1999) Broader. in part; the non-longleaf pine part.
- Grossarenic Dry Uplands (Turner et al. 1999) Broader. in part; the non-longleaf pine part.
- Oak-Farkleberry Sandylands (Ajilusi 1979) Undetermined
- Sandhill Pine Forest (Marks and Harcombe 1981) Finer

DESCRIPTION

Environment: This system type is found on droughty uplands underlain with deep, coarse sandy soils. These sites are typified by low fertility and moisture retention.

Vegetation: All described community types in this system tend to support relatively open wooded canopies (<60% closure), and one type is described as essentially treeless. A degraded expression of this type has been described [see CEGLO07507], but this is treated under the semi-natural ecological system. Other types are floristically differentiated, with special importance placed on the occurrence of *Quercus arkansana*. Some characteristic trees include *Quercus arkansana*, *Quercus incana*, *Quercus margarettiae*, *Quercus falcata*, *Quercus stellata*, *Quercus marilandica*, *Pinus echinata*, *Carya texana*, and less commonly *Pinus taeda*. In the southern part of the range, *Pinus palustris* may be a component. *Cornus drummondii* and/or *Juniperus virginiana* var. *virginiana* may be in the subcanopy of some examples. Typical herbs include *Schizachyrium scoparium*, *Bouteloua hirsuta*, *Dalea villosa* var. *grisea*, *Cnidioscolus texanus*, and *Tetragonotheca ludoviciana*, as well as the fern ally *Selaginella arenicola* ssp. *riddellii*.

Dynamics: Fire is believed to have been a critical natural disturbance process which affected the vegetation structure and likely the species composition of communities in this system. There are several indirect pieces of evidence which suggest this: (1) *Pinus echinata* is intolerant of competition, and young stems are generally slower growing and slower to dominate sites than either *Pinus taeda* or many hardwood species (Lawson 1990); (2) *Pinus echinata* regeneration decreases dramatically with time since fire (Ferguson 1958); and (3) *Pinus echinata* has the ability to resprout. Watson (1986) postulates that most seedlings of *Pinus echinata* are killed during the periodic fires, and the mature trees are spared. This prevents the formation of thickets. This paper implies that low fuel levels accompany the sparse vegetation of these sandy areas, leading to a somewhat longer fire-return interval, which suits *Pinus echinata*. A variety of fire-return intervals have been estimated for *Pinus echinata* vegetation. Garren (1943) proposed an 8- to 10-year return interval, Landers (1989) inferred a regime of 10 per century, and Martin and Smith (1993) estimated a 5- to 15-year interval, however, none of these estimates were specific to *Pinus echinata* on sandhills. Many such sites in the region lack well-developed and continuous fine fuels necessary to ignite and spread fires, possibly due to site infertility and droughtiness (R. Evans pers. obs., L. Smith pers. comm.).

MEMBERSHIP

Associations:

- (*Pinus palustris*) - *Quercus stellata* - *Quercus incana* / *Tetragonotheca ludoviciana* Woodland (CEGL008566, G2)
- (*Quercus incana*) / *Schizachyrium scoparium* - *Bouteloua hirsuta* - *Dalea villosa* var. *grisea* - *Selaginella arenicola* ssp. *riddellii* Xeric Sand Barrens Woodland (CEGL007973, GNR)
- *Pinus echinata* - (*Pinus taeda*) - *Quercus (margarettiae, stellata, falcata)* - *Carya texana* Woodland (CEGL007946, G2)
- *Pinus echinata* - *Pinus taeda* - *Quercus stellata* / *Juniperus virginiana* var. *virginiana* / *Cornus drummondii* Woodland

(CEGL007798, G1G2Q)

- *Pinus echinata* - *Quercus (incana, stellata, margarettiae)* / *Cnidoscolus texanus* Woodland (CEGL007507, G2)
- *Pinus echinata* / *Quercus incana* / *Selaginella arenicola ssp. riddellii* Woodland (CEGL003559, G2Q)
- *Pinus palustris* - *Pinus (echinata, taeda)* - *Quercus falcata* - *Carya texana* Woodland (CEGL008571, G2G3)
- *Quercus (incana, margarettiae, arkansana)* - (*Pinus echinata*) / *Schizachyrium scoparium* Woodland (CEGL007972, G2)
- *Quercus arkansana* - *Quercus incana* / *Selaginella arenicola ssp. riddellii* Woodland (CEGL003693, G2)

Alliances:

- *Pinus (echinata, taeda)* - *Quercus (incana, margarettiae, arkansana)* Woodland Alliance (A.386)
- *Pinus (echinata, taeda)* - *Quercus (stellata, marilandica, falcata)* Woodland Alliance (A.2011)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

DISTRIBUTION

Range: This system occurs west of the Mississippi River primarily outside the natural range of longleaf pine.

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 37:C

USFS Ecomap Regions: 231E:CC, 232F:CC

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Comer et al. 2003, Ferguson 1958, Garren 1943, Landers 1989, Lawson 1990, Marks and Harcombe 1981, Martin and Smith 1993, R. Evans pers. comm., Smith pers. comm., Turner et al. 1999, Watson 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723254#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1521 WEST GULF COASTAL PLAIN STREAM TERRACE SANDYLAND LONGLEAF PINE WOODLAND (CES203.891)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); West Gulf Coastal Plain; Very Short Disturbance Interval; Needle-Leaved Tree

National Mapping Codes: EVT 2521; ESLF 4283; ESP 1521

CONCEPT

Summary: These *Pinus palustris* sandhills are dry woodlands or savannas found on excessively drained, xeric soils of alluvial origin in the West Gulf Coastal Plain (South Central Plains of EPA) of Texas and formerly Louisiana. They occur on areas of deep sand (ranging in texture from coarse to fine) which are present in quaternary alluvial deposits. The general habitat is on low terraces adjacent to stream floodplains, and adjacent communities may include baygalls and ponds. Precipitation rapidly dissipates via percolation due to the character of the soil. Soils include fine sands, such as fluvial terraces of Bienville-Alaga soils developed in the Deweyville Formation, and the Tonkawa fine sand, as well as other coarse sands. *Pinus palustris* historically dominated the vegetation of this region across nearly all uplands regardless of soil type or moisture, and longleaf pine forests were among the most valuable economic resources in the region at the turn of the century (Bray 1906). The importance of frequent fire has been well-documented for the perpetuation of this and related systems throughout the coastal plains. Stands are dominated by *Pinus palustris*, which often occurs in mixed stands with *Quercus incana*, *Pinus echinata*, and *Carya texana*. Some small isolated terraces (inclusions) may be dominated by oaks and hickories, with little or no *Pinus palustris*. The oaks generally become denser with fire exclusion, particularly on the small isolated areas. Mesophytic oak species are absent or extremely rare. This type, and other longleaf communities and systems of the West Gulf Coastal Plain, lie outside the range of *Aristida beyrichiana* (wiregrass). Other grasses (*Andropogon* spp., other *Aristida* spp., and *Schizachyrium* spp.) dominate understories which are rich in species diversity. Overall losses of longleaf pine in Texas have exceeded those of all other southern states (Outcalt 1997); less than 16,200 hectares of mostly second-growth stands remain (McWilliams and Lord 1988). Land-use practices continue to degrade remaining examples of longleaf pine communities (Bridges and Orzell 1989a).

Classification Comments: This system was formerly part of West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293) but has been separated out due to its distinctive environment. The herbaceous cover of subtypes 2 and 3 of Bridges and Orzell (1989a) is usually sparse, with considerable exposed sand and foliose lichen cover, and is characterized by numerous West Gulf Coastal Plain endemics (Bridges and Orzell 1989a). Two taxa (*Phlox nivalis* ssp. *texensis* and *Gaillardia aestivalis* var. *winkleri*) are nearly endemic to subtype 3 and occur primarily along Village Creek in Hardin County, Texas. *Carex tenax* and *Galium hispidulum* are nearly restricted to subtype 3 and are long-distance disjuncts from the East Gulf Coastal Plain (Bridges and Orzell 1989a).

Similar Ecological Systems:

- West Gulf Coastal Plain Pine-Hardwood Forest (CES203.378)--is found on the inner (landward) side, generally north and west of the range of this type.
- West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293)--represents the longleaf pine system of regular uplands of varying soil textures.
- West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191)--is found on the outer (seaward) side, generally south and east of the range of this type, and is an upland/wetland mosaic.

Related Concepts:

- Arenic Dry Mixed Pine-Hardwood Uplands (Turner et al. 1999) Broader
- Grossarenic Dry Uplands (Turner et al. 1999) Broader
- Longleaf-Bluestem Uplands (Ajilusgi 1979) Undetermined
- Sandhill Pine Forest (Marks and Harcombe 1981) Equivalent
- Upland Pine Forest (Marks and Harcombe 1981) Undetermined
- Xeric stream terrace sand ridge subtype (of Upland Longleaf Pine Savanna) (Bridges and Orzell 1989a) Equivalent

DESCRIPTION

Environment: This system usually occurs in deep, well-drained sandy soils on stream terraces, occurring above medium-sized perennial creeks that are typically clear and have sandy bottoms. These sites have very fine sands on ridgetops or slightly higher rises in the sandhill terraces. The flat areas with broad sandhills are slightly coarser and hold a little more water. A site for this system can have both fine and coarse sands. The landscape profile starts out with some bottomland hardwoods type with braided bald-cypress - tupelo, then a slight slope with a wide baygall edge against the sandhill. Sometimes there is a small ribbon of American beech slope forest just above the baygall, then going into the upland sandhill; sometimes it is just a baygall to sandhill transition (J. Singhurst pers. comm.). It represents a distinctive subset of longleaf pine-dominated vegetation in the inner (landward) portions of the West Gulf Coastal Plain in eastern Texas (and Louisiana).

Vegetation: Stands are dominated by *Pinus palustris*, which often occurs in mixed stands with *Quercus incana*, *Quercus*

margarettae, *Pinus echinata*, and *Carya texana*. Some small isolated terraces (inclusions) may be dominated by oaks and hickories, with little or no *Pinus palustris*. The oaks generally become denser with fire exclusion, particularly on the small isolated areas. Other mesophytic oak species are absent or extremely rare. This type, and other longleaf communities and systems of the West Gulf Coastal Plain, lies outside the range of *Aristida beyrichiana*. Other grasses (*Andropogon* spp., other non-wiregrass *Aristida* spp., and *Schizachyrium* spp.) dominate understories rich in species diversity. Some additional small trees may include *Quercus marilandica*, *Quercus hemisphaerica*, and *Liquidambar styraciflua*. A sparse understory shrub component includes *Vaccinium arboreum* and *Ilex vomitoria*; however, fire suppression allows the shrubs to become more dominant in the midstory. Some other common shrubs may include *Asimina parviflora*, *Callicarpa americana*, *Crataegus* spp., *Prunus angustifolia*, *Prunus gracilis*, *Rhus aromatica*, *Ptelea trifoliata* var. *mollis*, *Sassafras albidum*, and *Sideroxylon lanuginosum*. Ground cover plant species are tolerant of periodic drought during the growing season, and they also exhibit adaptations to a frequent fire regime. Some characteristic herbs (which vary across environments) include *Schizachyrium scoparium*, *Aristida desmantha*, *Berlandiera pumila*, *Bulbostylis ciliatifolia*, *Cnidocolus texanus*, *Croton argyranthemus*, *Dichantheium acuminatum*, *Eriogonum longifolium*, *Lespedeza hirta*, *Liatris elegans* var. *elegans*, *Liatris pycnostachya*, *Opuntia humifusa* var. *humifusa*, *Paronychia drummondii*, *Rudbeckia grandiflora* var. *alismiifolia*, *Ruellia humilis*, *Silphium laciniatum*, *Stillingia sylvatica*, *Stylisma pickeringii* var. *pattersonii*, *Tradescantia reverchonii*, *Tragia urens*, and *Yucca louisianensis*. Some other taxa that may be present include *Ambrosia trifida*, *Baptisia* sp., *Bulbostylis capillaris*, *Bulbostylis ciliatifolia*, *Carex tenax*, *Cenchrus* sp., *Chamaecrista* sp., *Commelina erecta*, *Croptilon divaricatum*, *Cyperus grayoides*, *Dalea* sp., *Delphinium carolinianum*, *Echinacea* sp., *Eragrostis secundiflora*, *Eriogonum multiflorum*, *Euphorbia corollata*, *Gaillardia aestivalis* var. *winkleri*, *Heterotheca subaxillaris*, *Hypericum drummondii*, *Hypericum hypericoides*, *Hymenopappus artemisiifolius*, *Lechea tenuifolia*, *Lechea mucronata*, *Nuttallanthus canadensis* (= *Linaria canadensis*), *Loeflingia squarrosa*, *Matelea cynanchoides*, *Mirabilis albida*, *Monarda punctata*, *Oenothera heterophylla*, *Paronychia drummondii*, *Polanisia erosa* ssp. *erosa*, *Polypremum procumbens*, *Pteridium aquilinum*, *Rhynchosia* sp., *Scutellaria* sp., *Solidago* spp., *Streptanthus hyacinthoides*, *Tephrosia* sp., *Tetragonotheca ludoviciana*, *Thelesperma filifolium*, *Toxicodendron radicans*, *Trichostema dichotomum*, and *Vernonia* sp. (J. Singhurst, pers. comm.).

In Bridges and Orzell (1989a; table 3 - herbs), the following herbs are "differentials" (present in subtype 3 [or at much greater abundance] than in subtype 2): *Aristida desmantha*, *Carex tenax*, *Eriogonum longifolium* [which is in subtypes 1 and 3, but not 2], *Eriogonum multiflorum*, and *Polanisia erosa*. Many "indicators" are present at roughly the same frequency in subtypes 2 and 3.

Dynamics: The importance of frequent fire has been well-documented for the perpetuation of this system, but fires may actually be less frequent, more patchy and discontinuous than in other related longleaf pine-dominated systems. The oaks generally become denser with fire exclusion, particularly in small, isolated examples. Lichens (e.g., *Cladonia* spp.) and *Selaginella arenicola* ssp. *riddellii* also occur along with patches of bare sand. Canopy trees are patchy in distribution, with regeneration in canopy gaps of a quarter acre or less in size, midsuccessional clumps in similar sized patches, and the oldest trees occurring as isolated individuals. The reference condition classes are aggregates of numerous patches well-dispersed over the landscape. Canopy gaps are created by fire mortality, pest outbreaks, lightning, and windthrow at the scale of individual trees or several trees. Because of the irregular seed production of longleaf pine, canopy gaps may lack regeneration for several years. Uncharacteristic vegetation types include even-aged canopy stands in which age structure has been homogenized by logging or clearing. Examples include where *Pinus taeda* or *Pinus elliotii* have replaced some or all of the longleaf pine, where midstory oaks and/or low shrubs have become dense due to fire suppression, and where the grass-dominated ground cover has been lost due to soil disturbance or canopy closure.

MEMBERSHIP

Associations:

- *Pinus palustris* - *Pinus* (*echinata*, *taeda*) - *Quercus* (*incana*, *margarettae*) / *Schizachyrium scoparium* Woodland (CEGL007513, G1G2)
- *Pinus palustris* / *Quercus incana* - *Quercus margarettae* / *Vaccinium arboreum* / *Cnidocolus texanus* - *Stylisma pickeringii* var. *pattersonii* Woodland (CEGL003602, G2G3)
- *Pinus palustris* / *Quercus incana* / *Schizachyrium scoparium* - *Croton argyranthemus* Woodland (CEGL008572, G2G3)
- *Pinus palustris* / *Quercus incana* / *Schizachyrium scoparium* - *Liatris elegans* - *Opuntia humifusa* var. *humifusa* Woodland (CEGL003580, G1?Q)
- *Pinus palustris* / *Quercus marilandica* / *Ilex vomitoria* / *Schizachyrium scoparium* Woodland (CEGL003579, G2)
- *Pinus palustris* / *Quercus marilandica* / *Panicum virgatum* Woodland (CEGL008580, G2)
- *Pinus palustris* / *Quercus marilandica* / *Schizachyrium scoparium* - *Silphium laciniatum* - *Ruellia humilis* Woodland (CEGL003596, G1)
- *Pinus palustris* / *Schizachyrium scoparium* - *Liatris pycnostachya* Woodland (CEGL003571, G2G3)
- *Pinus palustris* / *Schizachyrium scoparium* - *Rudbeckia grandiflora* var. *alismiifolia* Woodland (CEGL003572, G2G3)

Alliances:

- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Woodland Alliance (A.520)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Adjacent communities may include baygalls and ponds.

DISTRIBUTION

Range: This upland ecological system occurs mainly in the Southern Loam Hills Subsection (232Fa) of Texas and formerly Louisiana, apparently ranging south into the Southwest Flatwoods Subsection (232Fb) (Hardin County, Texas). West Gulf Coastal

Plain longleaf sandhills are distinctive from those in the East Gulf Coastal Plain because they occur beyond the ranges where wiregrass and sand post oak are dominant.

Divisions: 203:C

Nations: US

Subnations: LA?, TX

Map Zones: 37:C

USFS Ecomap Regions: 232F:CC

TNC Ecoregions: 41:C

SOURCES

References: Ajilusgi 1979, Bray 1906, Bridges and Orzell 1989a, Collier 1964, Cruikshank and Eldredge 1939, Foster et al. 1917, Harcombe et al. 1993, Marks and Harcombe 1981, McWilliams and Lord 1988, Outcalt 1997, Singhurst 1996, Singhurst pers. comm., Snead and McCulloh 1984, Southeastern Ecology Working Group n.d., TNC 2001, TNC 2003b, Turner 1979, Turner et al. 1999, Williams 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.802841#references

Description Author: M. Pyne

Version: 31 Jan 2008

Concept Author: M. Pyne (after I. McWhorter, W. Ledbetter et al.)

Stakeholders: Southeast

ClassifResp: Southeast

1348 WEST GULF COASTAL PLAIN UPLAND LONGLEAF PINE FOREST AND WOODLAND (CES203.293)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); West Gulf Coastal Plain; Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2348; ESLF 4251; ESP 1348

CONCEPT

Summary: The common and unifying feature of this system is vegetation naturally dominated by *Pinus palustris*. This was formerly the most extensive system within its natural range in western Louisiana and eastern Texas. In most of the region, longleaf pine is (presently) a distinctive, but rarely dominant, element of existing vegetation (Harcombe et al. 1993). However, this tree historically dominated the vegetation across nearly all uplands regardless of soil type or moisture (excluding wetlands), and longleaf pine forests were among the most valuable economic resources in the region at the turn of the century (Bray 1906). Typical sites included sandhills on well-drained to excessively drained soils, but also more loamy and clayey upland soils. The importance of frequent fire has been well documented for the perpetuation of this system. Unlike comparable systems east of the Mississippi River, this type lies outside the range of *Aristida* spp. (wiregrasses), but most stands supported open grass-dominated understories rich in species diversity.

Classification Comments: This system was part of what was once considered "the lumber region par excellence of Texas" (Bray 1906). Intensive logging began around 1880 as forests in the northern states were cut out and railroads and logging technologies were moved into the region (Collier 1964, Williams 1989). By 1917, the majority of Texas longleaf had been cut (Foster et al. 1917), and by 1934-35, loblolly had become the single most prevalent species in 17 southeastern Texas counties (Cruikshank and Eldredge 1939). Overall losses of longleaf pine in Texas have exceeded those of all other southern states (Outcalt 1997); less than 16,200 hectares of mostly second-growth stands remain (McWilliams and Lord 1988). Land-use practices continue to degrade remaining examples of longleaf pine communities (Bridges and Orzell 1989a).

Similar Ecological Systems:

- West Gulf Coastal Plain Stream Terrace Sandyland Longleaf Pine Woodland (CES203.891)
- West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191)

Related Concepts:

- Arenic Dry Mixed Pine-Hardwood Uplands (Turner et al. 1999) Broader. in part; the longleaf pine part.
- Grossarenic Dry Uplands (Turner et al. 1999) Broader. in part; the longleaf pine part.
- Longleaf-Bluestem Uplands (Ajilusgi 1979) Undetermined
- Upland Pine Forest (Marks and Harcombe 1981) Undetermined

DESCRIPTION

Environment: This system represents the presumed matrix vegetation type of the inner (landward) portions of the West Gulf Coastal Plain in Louisiana and eastern Texas within the range of longleaf pine. In Louisiana, these are mapped as the Upper Terrace and some smaller landward units (Snead and McCulloh 1984). The system is bounded on the outer (seaward) side by West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191) and on the inner (landward) side primarily by West Gulf Coastal Plain Pine-Hardwood Forest (CES203.378) and other hardwood or hardwood-pine systems.

Vegetation: Stands are dominated by *Pinus palustris* (longleaf pine). Unlike comparable systems east of the Mississippi River, this type lies outside the range of *Aristida* spp. (wiregrasses), but most stands supported open grass-dominated understories rich in species diversity. Some additional small trees may include *Quercus marilandica*, *Quercus incana*, *Quercus margarettiae*, *Liquidambar styraciflua*, and *Carya texana*. Some common shrubs may include *Ilex vomitoria* and *Vaccinium arboreum*. Some characteristic herbs (which vary across environments) include *Schizachyrium scoparium*, *Panicum virgatum*, *Croton argyranthemus*, *Liatris pycnostachya*, *Tragia urens*, *Liatris elegans*, *Opuntia humifusa* var. *humifusa*, *Cnidoscolus texanus*, *Stylisma pickeringii* var. *pattersonii*, *Rudbeckia grandiflora* var. *alismifolia*, *Silphium laciniatum*, and *Ruellia humilis*.

Dynamics: The importance of frequent fire has been well documented for the perpetuation of this system.

MEMBERSHIP

Associations:

- (*Pinus palustris*) - *Quercus stellata* - *Quercus marilandica* - *Carya texana* / *Tragia urens* Woodland (CEGL007907, G2)
- *Pinus palustris* - *Pinus (echinata, taeda)* - *Quercus (incana, margarettiae)* / *Schizachyrium scoparium* Woodland (CEGL007513, G1G2)
- *Pinus palustris* - *Pinus (echinata, taeda)* Upper West Gulf Coastal Plain Woodland (CEGL008482, G1?)
- *Pinus palustris* - *Quercus marilandica* West Gulf Woodland (CEGL008579, G2G3)
- *Pinus palustris* / *Quercus incana* - *Quercus margarettiae* / *Vaccinium arboreum* / *Cnidoscolus texanus* - *Stylisma pickeringii* var. *pattersonii* Woodland (CEGL003602, G2G3)

- *Pinus palustris* / *Quercus incana* / *Schizachyrium scoparium* - *Croton argyranthemus* Woodland (CEGL008572, G2G3)
- *Pinus palustris* / *Quercus incana* / *Schizachyrium scoparium* - *Liatris elegans* - *Opuntia humifusa* var. *humifusa* Woodland (CEGL003580, G1?Q)
- *Pinus palustris* / *Quercus marilandica* / *Ilex vomitoria* / *Schizachyrium scoparium* Woodland (CEGL003579, G2)
- *Pinus palustris* / *Quercus marilandica* / *Panicum virgatum* Woodland (CEGL008580, G2)
- *Pinus palustris* / *Quercus marilandica* / *Schizachyrium scoparium* - *Silphium laciniatum* - *Ruellia humilis* Woodland (CEGL003596, G1)
- *Pinus palustris* / *Schizachyrium scoparium* - *Liatris pycnostachya* Woodland (CEGL003571, G2G3)
- *Pinus palustris* / *Schizachyrium scoparium* - *Rudbeckia grandiflora* var. *alismifolia* Woodland (CEGL003572, G2G3)

Alliances:

- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Woodland Alliance (A.520)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- West Gulf Coastal Plain Pine-Hardwood Forest (CES203.378)
- West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191)

DISTRIBUTION

Range: The boundary of this system follows TNC Ecoregion 41 (West Gulf Coastal Plain) closely in western Louisiana, but extends slightly into Ecoregion 40 (Upper West Gulf Coastal Plain) in eastern Texas.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 37:C

USFS Ecomap Regions: 231E:CC, 232F:CC

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Bray 1906, Bridges and Orzell 1989a, Collier 1964, Comer et al. 2003, Cruikshank and Eldredge 1939, Foster et al. 1917, Harcombe et al. 1993, Marks and Harcombe 1981, McWilliams and Lord 1988, Outcalt 1997, Snead and McCulloh 1984, Williams 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723196#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1013 WESTERN GREAT PLAINS DRY BUR OAK FOREST AND WOODLAND (CES303.667)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lowland [Lowland]; Forest and Woodland (Treed); F-Landscape/Medium Intensity; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2013; ESLF 4106; ESP 1013

CONCEPT

Summary: This system is dominated by *Quercus macrocarpa* and is found in upland areas in the northern part of the Western Great Plains. It often occurs as small to large patches on buttes, escarpments, and in foothill zones, usually on northerly-facing slopes. Other species, such as *Tilia americana* (not in the Dakotas), *Populus tremuloides*, *Juniperus virginiana*, and *Fraxinus* spp., may be present. The herbaceous layer can vary from sparsely to moderately vegetated and is composed of prairie grasses or woodland *Carex* spp. Shrub associates can include *Prunus virginiana*, *Corylus cornuta*, *Amelanchier alnifolia*, or *Symphoricarpos* spp. Historically, higher cover of grass species occurred as these stands were more open due to more frequent fires. Few good examples of this system likely remain because of past timber harvesting and heavy grazing. Where it occurs at elevations above 915 m (3000 feet), *Pinus ponderosa* woodlands are probably adjacent.

Classification Comments: Stands of bur oak can also be included within Central Mixedgrass Prairie (CES303.659); however, that system would only include small patches or single trees protected by fire. Any stands of bur oak or more substantial woodlands should be included within this system.

Similar Ecological Systems:

- Central Mixedgrass Prairie (CES303.659)

Related Concepts:

- Bur Oak: 236 (Eyre 1980) Broader

DESCRIPTION

Environment: This system is found in upland areas throughout the northern part of the Western Great Plains. Soils are predominately dry to mesic.

Vegetation: This system is typified by the predominance of *Quercus macrocarpa* constituting at least 10% of the vegetation cover in any given example of this system. Other species, such as *Tilia americana*, *Juniperus virginiana*, and *Fraxinus* spp., may be also present. Understory vegetation can range from sparsely vegetated to more dense and usually exemplifies the surrounding prairie grassland vegetation.

Dynamics: This system is primarily driven by fire. Fire suppression within this system can lead to more closed canopies and a decrease in the cover of grass species in the understory. Grazing, conversion to agriculture, and past timber harvesting can impact this system. Overgrazing can also lead to a decrease in understory species, and timber harvesting can completely eliminate examples of this system.

MEMBERSHIP

Associations:

- *Populus tremuloides* - *Quercus macrocarpa* / *Aralia nudicaulis* Forest (CEGL002065, GNRQ)
- *Quercus macrocarpa* - *Populus tremuloides* / *Corylus* spp. Woodland (CEGL002139, G4?)
- *Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (CEGL002072, G4)
- *Quercus macrocarpa* / *Corylus americana* - *Amelanchier alnifolia* Woodland (CEGL000556, G3)
- *Quercus macrocarpa* / *Corylus cornuta* Woodland (CEGL002137, G2G3)
- *Tilia americana* - (*Quercus macrocarpa*) / *Ostrya virginiana* Forest (CEGL002012, G3)

Alliances:

- *Acer saccharum* - *Tilia americana* - (*Quercus rubra*) Forest Alliance (A.220)
- *Populus tremuloides* Forest Alliance (A.274)
- *Quercus macrocarpa* Forest Alliance (A.245)
- *Quercus macrocarpa* Woodland Alliance (A.620)

DISTRIBUTION

Range: This system is found throughout the northern part of the Western Great Plains Division. In Wyoming, it occurs in the Bear Lodge Mountains and around Devils Tower National Monument. In North Dakota, it is found in the Killdeer Mountains, and it may occur in the Pine Ridge region of Nebraska.

Divisions: 303:C

Nations: US

Subnations: MT, ND, NE?, SD, WY

Map Zones: 29:C, 30:C, 31:C, 33:C, 38:?, 39:C, 40:C

USFS Ecomap Regions: 251B:CC, 251G:CC, 251H:C?, 331C:CC, 331E:CC, 331F:CC, 331M:CP, 332B:CC, 332C:CC, 332D:CC, 332E:CC, M334A:CC

TNC Ecoregions: 25:P, 26:C, 27:C, 33:C, 34:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Girard et al. 1989, Tolstead 1947

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722991#references

Description Author: S. Menard and K. Kindscher, mod. K.A. Schulz

Version: 01 Oct 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, West

ClassifResp: Midwest

UPLAND SHRUBLAND

1386 ACADIAN-APPALACHIAN ALPINE TUNDRA (CES201.567)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino; Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Ridge/Summit/Upper Slope

Non-Diagnostic Classifiers: Long (>500 yrs) Persistence; Glaciated; Oligotrophic Soil; Acidic Soil; Very Shallow Soil; Aquic; Udic; Consolidated; Landslide; W-Landscape/High Intensity; Dwarf-Shrub; Graminoid; Lichen

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Mixed evergreen-deciduous dwarf-shrubland

National Mapping Codes: EVT 2386; ESLF 5210; ESP 1386

CONCEPT

Summary: Restricted to the Northern Appalachians and the Gaspé Peninsula, this system encompasses vegetation above treeline on northeastern mountains. Wind, snow, and cloud-cover fog are prominent environmental factors. Most of the cover is dwarf-shrubland, lichen, or sparse vegetation; islands of taller shrubs may occur in protected spots. The dominant plants are ericads (*Vaccinium uliginosum* is diagnostic and often dominant, with several other alpine-restricted ericads such as *Phyllodoce caerulea* and *Loiseleuria procumbens*) and cushion-plants such as *Diapensia lapponica*. *Carex bigelowii* is a characteristic and, in some places, locally dominant sedge. This system includes wetland depressions, small alpine bogs, within the surrounding upland matrix.

MEMBERSHIP

Associations:

- *Arctoparmelia centrifuga* - *Rhizocarpon geographicum* Nonvascular Vegetation (CEGL006420, G3G4?)
- *Carex bigelowii* Herbaceous Vegetation (CEGL006081, G2)
- *Diapensia lapponica* Dwarf-shrubland (CEGL006322, G2G3)
- *Empetrum nigrum* - *Vaccinium uliginosum* - *Vaccinium oxycoccos* / *Rubus chamaemorus* Dwarf-shrubland (CEGL006140, GNR)
- *Kalmia angustifolia* - *Chamaedaphne calyculata* / *Rubus chamaemorus* / *Cladina* spp. Dwarf-shrubland (CEGL006425, GNR)
- *Trichophorum caespitosum* - *Calamagrostis pickeringii* Herbaceous Vegetation (CEGL006423, GNR)
- *Trichophorum caespitosum* - *Carex scirpoidea* - *Carex bigelowii* Herbaceous Vegetation (CEGL006424, GNR)
- *Trichophorum caespitosum* - *Saxifraga (foliolosa, paniculata, rivularis)* Herbaceous Vegetation (CEGL006428, GNR)
- *Vaccinium uliginosum* - *Harrimanella hypnoides* - *Loiseleuria procumbens* Dwarf-shrubland (CEGL006155, G2G3)
- *Vaccinium uliginosum* - *Rhododendron lapponicum* / *Juncus trifidus* Dwarf-shrubland (CEGL006298, G2G3)
- *Vaccinium uliginosum* / *Sibbaldiopsis tridentata* Sparse Vegetation (CEGL006533, GNR)

Alliances:

- *Carex bigelowii* - *Juncus trifidus* Herbaceous Alliance (A.1295)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Diapensia lapponica* Dwarf-shrubland Alliance (A.1120)
- *Empetrum nigrum* Saturated Dwarf-shrubland Alliance (A.1095)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Trichophorum caespitosum* Saturated Herbaceous Alliance (A.1915)
- *Umbilicaria hyperborea* - *Rhizocarpon geographicum* Nonvascular Alliance (A.3032)
- *Vaccinium uliginosum* Dwarf-shrubland Alliance (A.1116)

DISTRIBUTION

Range: This system is found at higher summits of the northern Appalachian Mountains, from northern New England and the Adirondacks into the Canadian Gaspé.

Divisions: 201:C

Nations: CA, US

Subnations: ME, NH, NY, QC, VT

Map Zones: 64:C, 66:C

USFS Ecomap Regions: M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 63:C

SOURCES

References: Bliss 1963, Comer et al. 2003, Kimball and Weihrauch 2000, Sperduto and Cogbill 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722036#references

Description Author: S.C. Gawler

Version: 09 Jan 2003
Concept Author: S.C. Gawler

Stakeholders: Canada, East
ClassifResp: East

1389 ACADIAN-APPALACHIAN SUBALPINE WOODLAND AND HEATH-KRUMMHOLZ (CES201.568)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Alpine/AltiAndino; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*

Non-Diagnostic Classifiers: Long (>500 yrs) Persistence; Montane; Forest and Woodland (Treed); Moss/Lichen (Nonvascular); Glaciated; Mesotrophic Soil; Oligotrophic Soil; Acidic Soil; Very Shallow Soil; Shallow Soil; Mineral: W/ A-Horizon >10 cm; Mineral: W/ A-Horizon <10 cm; Udic; Consolidated; Intermediate Disturbance Interval; Long Disturbance Interval; F-Patch/Medium Intensity; W-Landscape/High Intensity; Needle-Leaved Tree; Broad-Leaved Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2389; ESLF 5320; ESP 1389

CONCEPT

Summary: This system encompasses vegetation of varying physiognomy at upper elevations, near and slightly above treeline, in the northeastern U.S. and adjacent Canada. It may be a zone between montane spruce-fir forest and alpine systems or may cover the ridgelines and summits of lower mountains. In the Appalachians it occurs mostly above 915 m (3000 feet) elevation but can be at much lower elevations near the Atlantic Coast. Trees become progressively stunted as exposure increases, with *Picea rubens* being replaced by *Picea mariana* in a stunted form. Vegetation structure ranges from woodland to shrubland to sparsely vegetated dwarf-shrubs and herbs. Woodlands may be locally extensive, and patches of open rock support areas of shrub, dwarf-shrub or sparse vegetation. In the subalpine zone, shrublands may be extensive on the upper slopes, forming krummholz or, in somewhat more protected spots, deciduous shrub thickets. Ericads, including *Kalmia angustifolia*, *Ledum groenlandicum*, and *Vaccinium uliginosum*, are the most characteristic shrubs; *Empetrum nigrum* and *Empetrum eamesii* ssp. *atropurpureum* (= *Empetrum atropurpureum*) are indicative of the subalpine zone. *Vaccinium boreale* occurs rarely but is diagnostic where it is present. Subalpine fens are included here: these are heath-dominated and graminoid-dominated fens, often occurring in a mosaic surrounded by other subalpine vegetation. They are on gentle slopes (usually about 10%), usually at 732 to 915 m (2400-3000 feet) elevation. *Calamagrostis pickeringii* is dominant and characteristic in the graminoid fens, with northern sedges such as *Carex michauxiana*, *Carex wiegandii*, *Carex exilis*, etc. The montane heath fens contain *Alnus viridis* ssp. *crispa* (= *Alnus crispa*), *Nemopanthus mucronatus*, and ericads. Peat accumulation is in the range of 10-50 cm. Occurrences are usually about 5 acres in size but range up to about 20 acres.

Classification Comments: This system is distinguished from Acadian-Appalachian Montane Spruce-Fir Forest (CES201.566) by the shift to woodland and patchy barrens from the forested character of the montane forest, including the decreased importance of *Picea rubens*. They are often contiguous on the ground. It is related to Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571) but occurs at higher elevations, lacks *Pinus* spp. (except for occasional stunted individuals) and *Quercus rubra*, and features *Vaccinium uliginosum*, *Empetrum* and other subalpine plant species that are lacking from the lower-elevation analog. Patches of *Picea rubens* / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* Woodland (CEGL006053) might occur in this system, but only incidentally; that association is more central to the concept of Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571). Subalpine fens are considered a distinct system by New Hampshire Natural Heritage Program (the only state where they are currently known to occur), but because (1) there is little information currently available on them and (2) they tend to occur below treeline, they are included within this system. This could be reconsidered as more information on their landscape distribution, extent and pattern becomes available.

Similar Ecological Systems:

- Acadian-Appalachian Montane Spruce-Fir Forest (CES201.566)
- Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571)

MEMBERSHIP

Associations:

- *Alnus viridis* ssp. *crispa* - *Spiraea alba* / *Solidago macrophylla* Shrubland (CEGL006064, GNR)
- *Empetrum nigrum* - *Vaccinium uliginosum* - *Vaccinium oxycoccos* / *Rubus chamaemorus* Dwarf-shrubland (CEGL006140, GNR)
- *Kalmia angustifolia* - *Chamaedaphne calyculata* / *Rubus chamaemorus* / *Cladina* spp. Dwarf-shrubland (CEGL006425, GNR)
- *Picea mariana* - *Abies balsamea* / *Sibbaldiopsis tridentata* Shrubland (CEGL006038, GNR)
- *Picea mariana* / *Kalmia angustifolia* Dwarf-shrubland (CEGL006031, GNR)
- *Picea mariana* / *Ledum groenlandicum* - *Empetrum nigrum* / *Cladina* spp. Dwarf-shrubland (CEGL006268, G3G5)
- *Picea rubens* / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* Woodland (CEGL006053, G3G5)
- *Vaccinium uliginosum* / *Sibbaldiopsis tridentata* Sparse Vegetation (CEGL006533, GNR)

Alliances:

- *Alnus viridis* ssp. *crispa* Shrubland Alliance (A.929)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)

- *Empetrum nigrum* Saturated Dwarf-shrubland Alliance (A.1095)
- *Kalmia angustifolia* - *Ledum groenlandicum* Dwarf-shrubland Alliance (A.1086)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Picea mariana* - *Abies balsamea* Shrubland Alliance (A.812)
- *Picea rubens* Woodland Alliance (A.546)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Acadian-Appalachian Montane Spruce-Fir Forest (CES201.566)

DISTRIBUTION

Range: This system is found on the higher summits of the northern Appalachian mountains, from northern New England and the Adirondacks into the Canadian Gaspé, extending south in scattered locations into southern New England.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: ME, NB, NH, NY, QC, VT

Map Zones: 64:C, 65:C, 66:C

USFS Ecomap Regions: 211B:CC, 211C:CC, 211I:CP, M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 61:C, 63:C

SOURCES

References: Comer et al. 2003, Sperduto and Cogbill 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723037#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: Canada, East

ClassifResp: East

1095 APACHERIAN-CHIHUAHUAN MESQUITE UPLAND SCRUB (CES302.733)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Thorn Shrub; Prosopis spp.-dominated

Non-Diagnostic Classifiers: Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic; Intermediate Disturbance Interval; F-Patch/High Intensity [Seasonality/Winter Fire]

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2095; ESLF 5301; ESP 1095

CONCEPT

Summary: This ecological system often occurs as invasive upland shrublands that are concentrated in the extensive desert grassland in foothills and piedmonts of the Chihuahuan Desert, extending into the Sky Island region to the west. Substrates are typically derived from alluvium, often gravelly without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. *Prosopis* spp. and other deep-rooted shrubs exploit this deep-soil moisture that is unavailable to grasses and cacti. Vegetation is typically dominated by *Prosopis glandulosa* or *Prosopis velutina* and succulents. Other desert scrub species that may codominate include *Acacia neovernicosa*, *Acacia constricta*, *Juniperus monosperma*, or *Juniperus coahuilensis*. *Larrea tridentata* is typically absent or has low cover. Grass cover is typically low and composed of desert grasses such as *Dasyochloa pulchella* (= *Erioneuron pulchellum*), *Muhlenbergia porteri*, *Muhlenbergia setifolia*, and *Pleuraphis mutica*. During the last century, the area occupied by this system has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency. It is similar to Chihuahuan Mixed Desert and Thorn Scrub (CES302.734) but is generally found at higher elevations where *Larrea tridentata* and other desert scrub are not codominant. It is also similar to Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub (CES302.737) but does not occur on eolian-deposited substrates (sandsheets), although some stands may have evidence of wind erosion and deposition.

Classification Comments: This system is similar to Chihuahuan Mixed Desert and Thorn Scrub (CES302.734) but is generally found at higher elevations where *Larrea tridentata* and other desert scrub are not codominant. It is also similar to Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub (CES302.737) but does not occur on eolian-deposited substrates. This system includes mesquite-dominated types resulting from conversion of desert grasslands to shrublands. Landfire mapzone 25 modeling workshops limited BpS to naturally occurring mesquite shrublands found on rocky outcrop and foothills. During the last century, the area occupied by the uncharacteristic portion of this system has increased through conversion of desert grasslands as a result of drought, overgrazing and seed dispersion by livestock, and/or decreases in fire frequency. The boundary between Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733) and Tamaulipan Mesquite Upland Scrub (CES301.984) needs to be defined.

Similar Ecological Systems:

- Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735)
- Chihuahuan Mixed Desert and Thorn Scrub (CES302.734)
- Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub (CES302.737)
- Tamaulipan Mesquite Upland Scrub (CES301.984)

Related Concepts:

- Grama -Muhly - Threewain (713) (Shiflet 1994) Intersecting
- Mesquite (729) (Shiflet 1994) Broader
- Mesquite: 242 (Eyre 1980) Broader

DESCRIPTION

Environment: This desert scrub occurs on substrates that are typically derived from alluvium, often gravelly without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. *Prosopis* spp. and other deep-rooted shrubs exploit this deep-soil moisture that is unavailable to grasses and cacti (Burgess 1995).

Vegetation: Vegetation is typically dominated by *Prosopis glandulosa* or *Prosopis velutina* and succulents. Other desert scrub species that may codominate include *Acacia neovernicosa*, *Acacia constricta*, *Juniperus monosperma*, or *Juniperus coahuilensis*. Grass cover is variable and ranges from sparse to moderately dense. Common species may include *Aristida purpurea*, *Bothriochloa barbinodis*, *Bouteloua curtipendula*, *Dasyochloa pulchella* (= *Erioneuron pulchellum*), *Muhlenbergia porteri*, *Muhlenbergia setifolia*, *Pleuraphis mutica*, and *Setaria leucopila*. The deeper soils help support good grass cover beneath the shrub canopy. Areas of higher annual rainfall and deeper soils allow for a more diverse plant community.

Dynamics: During the last century, the area occupied by this system has increased through conversion of desert grasslands as a result of drought, overgrazing and *Prosopis glandulosa* seed dispersion by livestock, and/or decreases in fire frequency (Buffington and Herbel 1965, Brown and Archer 1987). It is believed that this system formerly occurred in relatively minor amounts and was largely confined to drainages until cattle distributed seed upland from the bosques into desert grasslands (Brown and Archer 1987, 1989).

Shrublands dominated by *Prosopis* spp. have replaced large areas of desert grasslands, especially those formerly dominated by *Bouteloua eriopoda*, in Trans Pecos Texas, southern New Mexico and southeastern Arizona (York and Dick-Peddie 1969, Hennessy et al. 1983). Studies on the Jornada Experimental Range suggest that combinations of drought, overgrazing by livestock, wind and water erosion, seed dispersal by livestock, fire suppression, shifting dunes, and changes in the seasonal distribution of precipitation have caused this recent, dramatic shift in vegetation physiognomy (Buffington and Herbel 1965, Herbel et al. 1972, Humphrey 1974, McLaughlin and Bowers 1982, Gibbens et al. 1983, Hennessy et al. 1983, Schlesinger et al. 1990, McPherson 1995).

Historical natural-ignition fires were relatively small, probably 10-15 acres in size. Repeated fire is thought to help maintain a general mosaic pattern between open grassland and shrub-dominated areas (Johnston 1963). Wright et al. (1976) found that *Prosopis glandulosa* is very fire-tolerant when only 3 years old. Most plants resprout after being top-killed by fire. Thus, prior to livestock grazing reducing fire frequency, repeated grassland fires probably maintained lower stature of shrubs and prevented new establishment by killing seedlings.

Drought is a relatively common occurrence in this desert scrub, generally occurring every 10-15 years and lasting 2-3 years with occasional long-term drought periods (10-15 years duration). *Prosopis* spp. and other shrubs have extensive root systems that allow them to exploit deep-soil water that is unavailable to shallower rooted grasses and cacti (Burgess 1995). This strategy works well, especially during drought. However, on sites that have well-developed argillic or calcic soil horizons that limit infiltration and storage of winter moisture in the deeper soil layers, *Prosopis* spp. invasion can be limited to a few, small individuals (McAuliffe 1995). This has implications in plant geography and desert grassland restoration work in the southwestern United States.

MEMBERSHIP

Associations:

- *Fouquieria splendens* - *Calliandra eriophylla* Shrubland [Provisional] (CEGL005334, GNR)
- *Fouquieria splendens* - *Prosopis velutina* Shrubland [Provisional] (CEGL005335, GNR)
- *Fouquieria splendens* Shrubland (CEGL004452, GNR)
- *Prosopis glandulosa* / *Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa* / *Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa* / *Sporobolus airoides* Shrubland (CEGL001385, G5)
- *Prosopis glandulosa* var. *torreyana* Shrubland (CEGL001381, G3)
- *Prosopis velutina* - *Acacia greggii* Shrubland (CEGL001388, GUQ)
- *Prosopis velutina* / *Atriplex canescens* / Mixed Grasses Shrubland [Provisional] (CEGL005344, GNR)
- *Prosopis velutina* / *Calliandra eriophylla* Shrubland [Provisional] (CEGL005345, GNR)
- *Prosopis velutina* / *Celtis laevigata* var. *reticulata* Shrubland (CEGL001390, GNR)
- *Prosopis velutina* / *Eragrostis lehmanniana* Semi-natural Shrubland [Provisional] (CEGL005343, GNA)
- *Prosopis velutina* / Mixed Grasses Shrubland [Provisional] (CEGL005348, GNR)
- *Prosopis velutina* / *Muhlenbergia porteri* Shrubland (CEGL001391, G3Q)
- *Prosopis velutina* Foothill Shrubland [Provisional] (CEGL005347, GNR)

Alliances:

- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis velutina* Shrubland Alliance (A.1043)

DISTRIBUTION

Range: This system is found on foothills and piedmont in the Chihuahuan Desert, extending into the Sky Island region and into the lower Mogollon Rim to the west.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), MXSO(MX), NM, TX

Map Zones: 13:P, 14:C, 15:C, 24:C, 25:C, 26:C, 27:C, 35:?, 36:?

USFS Ecomap Regions: 313C:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CP, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 24:C, 29:?, 30:P

SOURCES

References: Brown and Archer 1987, Brown and Archer 1989, Buffington and Herbel 1965, Burgess 1995, Comer et al. 2003, Gibbens et al. 1983, Gibbens et al. 2005, Hennessy et al. 1983, Herbel et al. 1972, Humphrey 1974, Johnston 1963, MacMahon 1988, McAuliffe 1995, McLaughlin and Bowers 1982, McPherson 1995, Muldavin et al. 2002, Schlesinger et al. 1990, Shiflet 1994, Wright et al. 1976, York and Dick-Peddie 1969

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722939#references

Description Author: K.A. Schulz

Version: 25 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1073 BAJA SEMI-DESERT COASTAL SUCCULENT SCRUB (CES206.934)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Mediterranean [Mediterranean Desertic-Oceanic]; Xeric

Non-Diagnostic Classifiers: Headland; Shrubland (Shrub-dominated); Sideslope; Salt Spray; Bluff; Coast

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2073; ESLF 5250; ESP 1073

CONCEPT

Summary: This ecological system includes succulent-rich shrublands along maritime coastal bluffs and terraces that are restricted to isolated locations from Baja Norte, Mexico, north to Orange County and Catalina Island, California. This system is very localized and patchy from San Diego County south into Baja California and on the Channel Islands. These areas are frost-free and receive the least annual precipitation of the California coastal shrublands, a significant proportion of which falls in summer from rare summer thunderstorms or is augmented by summer fog drip. Characteristic plant species include *Lycium californicum*, *Rhus integrifolia*, *Opuntia californica* var. *parkeri* (= *Opuntia parryi*), *Opuntia prolifera*, *Opuntia littoralis*, *Yucca schidigera*, *Ferocactus viridescens*, *Agave shawii*, *Euphorbia misera*, *Bergerocactus emoryi*, and *Simmondsia chinensis*.

MEMBERSHIP

Associations:

- *Opuntia littoralis* Shrubland (CEGL003066, G3G4)

Alliances:

- *Opuntia littoralis* Shrubland Alliance (A.879)

DISTRIBUTION

Range: This system occurs from Baja Norte, Mexico, north to Orange County and Catalina Island, California. This system is very localized and patchy from San Diego County south into Baja California and on the Channel Islands.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C

TNC Ecoregions: NT1301:P, 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722747#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

1096 CALIFORNIA MARITIME CHAPARRAL (CES206.929)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Mediterranean [Mediterranean Xeric-Oceanic]; Udic; Evergreen Sclerophyllous Shrub

Non-Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Sideslope; Sand Soil Texture

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2096; ESLF 5302; ESP 1096

CONCEPT

Summary: This ecological system includes chaparral in patches restricted by edaphic conditions (sands, sandstones, other marine sediments, and stabilized sand dunes) within the fog belt throughout the central and northern California coast. This system is characterized by a combination of locally endemic species of *Arctostaphylos* and *Ceanothus*, species that primarily reproduce by seed rather than resprouting. Shrubs vary in height (up to 3 m tall) and occur in variable densities. More open patches support herbaceous vegetation, while occurrences of high shrub density have no understory. Characteristic species include *Arctostaphylos tomentosa*, *Arctostaphylos nummularia* (= *Arctostaphylos sensitiva*), *Arctostaphylos tomentosa* ssp. *crustacea* (= *Arctostaphylos crustacea*), *Arctostaphylos hookeri*, *Arctostaphylos pajaroensis*, *Arctostaphylos montaraensis* (and others), *Ceanothus masonii*, *Ceanothus griseus*, and *Ceanothus verrucosus*. In occurrences in southern Oregon, *Arctostaphylos hispidula* is the predominant chaparral shrub. Southernmost stands (San Diego County) can include *Cneoridium* spp. and *Comarostaphylis diversifolia*. Other common widespread woody taxa can include *Adenostoma fasciculatum*, *Eriogonum fasciculatum*, *Salvia mellifera*, *Frangula californica* (= *Rhamnus californica*), *Rhamnus crocea*, and *Quercus agrifolia*. Controlled burns have resulted in poor survivorship of the *Arctostaphylos* spp., and current theories are that they need long fire-free intervals to develop a viable seedbank that can reproduce following fire (Keeley and Davis 2005). This system often co-occurs with California Coastal Closed-Cone Conifer Forest and Woodland (CES206.922).

Related Concepts:

- Ceanothus Mixed Chaparral (208) (Shiflet 1994) Intersecting
- Chamise Chaparral (206) (Shiflet 1994) Intersecting

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- California Coastal Closed-Cone Conifer Forest and Woodland (CES206.922)

Adjacent Ecological System Comments: This system often co-occurs with California Coastal Closed-Cone Conifer Forest and Woodland (CES206.922).

DISTRIBUTION

Range: This system occurs within the fog belt from southern California to the Mendocino coast of northern California. It extends north into coastal Oregon in very small patches.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C, 13:?

USFS Ecomap Regions: 261B:CC, 263A:CC, M242A:PP, M261A:PP, M261B:PP

TNC Ecoregions: 14:C, 15:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Keeley and Davis 2005, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722752#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1097 CALIFORNIA MESIC CHAPARRAL (CES206.926)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Mediterranean [Mediterranean Xeric-Oceanic]; Udic; *Quercus berberidifolia*

Non-Diagnostic Classifiers: Sideslope; Ustic; Intermediate Disturbance Interval; F-Landscape/High Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2097; ESLF 5303; ESP 1097

CONCEPT

Summary: This ecological system occurs in mesic site conditions, such as north-facing slopes, concavities, or toeslopes, with well-drained soils throughout Mediterranean California away from the coastal fog belt. It occurs most commonly on north-facing slopes up to 1500 m (4550 feet) in elevation and up to 1830 m (6000 feet) in southern California. This system tends to be dominated by a variety of mixed or single-species, evergreen, sclerophyllous shrubs that resprout from lignotubers following fire. Common species include *Quercus berberidifolia*, *Quercus wislizeni* var. *frutescens*, *Cercocarpus montanus* var. *glaber* (= *Cercocarpus betuloides*), *Fraxinus dipetala*, *Garrya flavescens*, *Garrya elliptica*, *Heteromeles arbutifolia*, *Lonicera* spp., *Prunus ilicifolia*, *Rhamnus crocea*, *Rhamnus ilicifolia*, *Toxicodendron diversilobum*, *Ribes* spp., and *Sambucus* spp. Weakly re-sprouting or obligate seeders that also commonly occur in this system include arborescent *Ceanothus* spp., such as *Ceanothus spinosus*, *Ceanothus oliganthus*, *Ceanothus tomentosus*, and *Ceanothus leucodermis*. *Umbellularia californica* and *Aesculus californica* can also occur as shrubs and, lacking disturbance, can grow to tree size, as do some of the other chaparral shrubs (some old-growth stands can reach 10.6 m [35 feet] in height!). Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. This is not a system that requires frequent fire for perpetuation.

Related Concepts:

- Montane Shrubland (209) (Shiflet 1994) Broader. Some portions of SRM type 209 are included in the Mesic Chaparral system.
- Scrub Oak Mixed Chaparral (207) (Shiflet 1994) Equivalent. These are basically equivalent.

MEMBERSHIP

Associations:

- *Cercocarpus montanus* var. *glaber* Sierran Chaparral Shrubland (CEGL008638, G4?)
- *Prunus ilicifolia* / *Sanicula crassicaulis* Shrubland (CEGL003342, G2)

Alliances:

- *Cercocarpus montanus* var. *glaber* Shrubland Alliance (A.587)
- *Prunus ilicifolia* Shrubland Alliance (A.2608)

DISTRIBUTION

Range: This system occurs throughout Mediterranean California away from the coastal fog belt. It may occur as very small patches in southwestern Oregon, but it isn't clearly documented from there.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 3:C, 4:C, 5:C, 6:C

USFS Ecomap Regions: 261B:CC, 262A:??, 263A:CC, M261A:C?, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC

TNC Ecoregions: 5:C, 12:C, 13:C, 14:C, 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722755#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1098 CALIFORNIA MONTANE WOODLAND AND CHAPARRAL (CES206.925)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Short (50-100 yrs) Persistence; Shrubland (Shrub-dominated); Mediterranean [Mediterranean Xeric-Oceanic]; Shallow Soil

Non-Diagnostic Classifiers: Montane [Montane]; Sideslope; Xeric; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2098; ESLF 5304; ESP 1098

CONCEPT

Summary: This ecological system includes chaparral or open shrubby woodlands found among montane forests above 1500 m (4550 feet) elevation from the southern Cascades of Oregon to the Peninsular Ranges of California into Baja California, Mexico, where much annual precipitation occurs as snow. These are often locations with steep, exposed slopes with rocky and/or shallow soils, often glaciated. Stands are not found in the foothills but rather occur commonly above 1524 m (5000 feet) in elevation. These are mosaics of woodlands with chaparral understories, shrub-dominated chaparral, or short-lived chaparral with conifer species invading, if good seed source is available. Shrubs will often have higher densities than the trees, which are more limited due to the rocky/thin soils. These can also be short-duration chaparrals in previously forested areas that have experienced crownfires. Trees tend to have a scattered open canopy or can be clustered, over a usually continuous dense shrub layer. Trees can include *Pinus jeffreyi*, *Abies concolor*, *Abies magnifica*, *Pinus monticola*, *Pinus lambertiana*, *Pinus coulteri*, *Pinus attenuata*, *Cupressus forbesii*, *Cupressus arizonica ssp. stephensonii*, and *Cupressus arizonica ssp. nevadensis* (= *Cupressus nevadensis*). Typical sclerophyllous chaparral shrubs include *Arctostaphylos nevadensis*, *Arctostaphylos patula*, *Arctostaphylos glandulosa*, *Ceanothus cordulatus*, *Ceanothus diversifolius*, *Ceanothus pinetorum*, *Ceanothus velutinus*, and *Chrysolepis sempervirens* (= *Castanopsis sempervirens*). Some stands can be dominated by winter deciduous shrubs, such as *Prunus emarginata*, *Prunus subcordata* and *Ceanothus sanguineus* (in Oregon), *Prunus virginiana*, *Ceanothus integerrimus*, *Holodiscus discolor* (= *Holodiscus microphyllus*), and *Quercus garryana var. breweri*. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Occurrences of this system likely shift across montane forested landscapes with catastrophic fire events.

Classification Comments: Two phases are recognized: first, early-seral and post-fire shrub fields with conifers, and second, edaphically controlled sites, with soils that are too dry or shallow-soiled for trees, hence sites where shrubs stay dominant (such as *Quercus vacciniifolia*, *Arctostaphylos patula*, *Chrysolepis sempervirens*). This treatment combines "interior closed-cone conifer" woodlands (obligate fire-reproducing species) with montane chaparral and may need to be revisited.

Related Concepts:

- Bittercherry (419) (Shiflet 1994) Intersecting. Sierran chaparral on east-side includes *Prunus emarginata* shrublands.
- Montane Shrubland (209) (Shiflet 1994) Broader. This ecological system includes early-seral and post-fire shrub fields with conifers, and secondly edaphically-controlled sites, with soils that are too dry or shallow-soiled for trees, hence sites where shrubs stay dominant. Nearly equivalent to 209.
- Sierra Nevada Mixed Conifer: 243 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Arctostaphylos patula* Sierran Chaparral Shrubland (CEGL005820, G5?)
- *Arctostaphylos viscida* Sierran Chaparral Shrubland (CEGL005817, G5?)
- *Ceanothus cordulatus* / Sparse Understory Sierran Shrubland (CEGL005821, G4?)
- *Ceanothus cordulatus* Shrubland [Provisional] (CEGL003023, G3?)
- *Chrysolepis sempervirens* / Sparse Understory Sierran Shrubland (CEGL008695, G3)
- *Chrysolepis sempervirens* Shrubland [Provisional] (CEGL003039, G4?)
- *Holodiscus discolor* - *Sambucus racemosa* Shrubland (CEGL003130, GNR)
- *Holodiscus discolor* / *Sedum obtusatum ssp. boreale* - *Cryptogramma acrostichoides* Shrubland (CEGL003129, GNR)
- *Prunus emarginata* Sierran Chaparral Shrubland (CEGL005822, G3?)
- *Quercus garryana var. breweri* Shrubland [Placeholder] (CEGL003091, G3?)

Alliances:

- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Arctostaphylos viscida* Shrubland Alliance (A.790)
- *Ceanothus cordulatus* Shrubland Alliance (A.763)
- *Chrysolepis sempervirens* Shrubland Alliance (A.762)
- *Holodiscus discolor* Shrubland Alliance (A.901)
- *Prunus emarginata* Shrubland Alliance (A.2602)

- *Quercus garryana* Shrubland Alliance (A.905)

DISTRIBUTION

Range: This system occurs above 1500 m (4550 feet) elevation from the southern Cascades of Oregon to the Klamath Mountains and Peninsular Ranges of California into Baja California, Mexico.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), OR

Map Zones: 2:C, 3:C, 4:C, 6:C, 7:C, 12:P, 13:?

USFS Ecomap Regions: 261B:CC, 263A:CC, 322A:??, 341D:CC, 342B:CC, M242B:??, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 5:C, 12:C, 14:C, 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722756#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 16 Jan 2009

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

1099 CALIFORNIA XERIC SERPENTINE CHAPARRAL (CES206.927)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Mediterranean [Mediterranean Xeric-Oceanic]; Ultramafic with low Ca:Mg ratio; Very Shallow Soil; Xeric; Broad-Leaved Evergreen Shrub; *Cupressus macnabiana*

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Serpentine; Consolidated

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2099; ESLF 5305; ESP 1099

CONCEPT

Summary: This ecological system occurs throughout Mediterranean California (excluding far southern California) on thin, rocky, ultramafic (gabbro, peridotite, serpentinite) soils and in areas below winter snow accumulations that typically experience hot and dry summers. Not all ultramafic outcrops support distinct vegetation; only those with very low Ca:Mg ratios impact biotic composition. This system is highly variable and spotty in distribution. Characteristic plant species include *Cupressus macnabiana*, *Quercus durata*, *Arctostaphylos viscida*, *Arctostaphylos pungens*, and *Arctostaphylos glauca*. Common associates include *Adenostoma fasciculatum*, *Ceanothus cuneatus*, *Fremontodendron californicum*, *Quercus sadleriana*, *Quercus vacciniifolia*, *Garrya* spp., *Umbellularia californica*, *Ceanothus pumilus*, *Frangula californica* (= *Rhamnus californica*), and *Arctostaphylos nevadensis*. California endemics such as *Ceanothus jepsonii* also occur. *Pinus sabiniana* can occur at varying cover from trace to more abundant. Many locally endemic and often rare forbs can occur, such as *Streptanthus* spp., *Hesperolinon* spp., *Eriogonum* spp., *Madia* spp., *Mimulus* spp., *Allium* spp., and *Asclepias solanoana*. This chaparral type tends to have fewer trees than mesic chaparral.

Classification Comments: Xeric serpentine chaparral shrublands occurring in the Klamath-Siskiyou region of northwestern California are placed into the similar Klamath-Siskiyou Xeromorphic Serpentine Savanna and Chaparral (CES206.150). However, the distribution of these two systems, as currently described, overlaps somewhat. Further review and clarification of their differences and differing distributions are desirable.

Related Concepts:

- Chamise Chaparral (206) (Shiflet 1994) Intersecting. Includes serpentine chaparral

DISTRIBUTION

Range: This system occurs throughout Mediterranean California (excluding far southern California) into Oregon, on thin, rocky, ultramafic soils.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C, 5:C, 6:C, 7:?

USFS Ecomap Regions: 261B:PP, 262A:PP, 263A:PP, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:C?

TNC Ecoregions: 5:P, 13:P, 14:C, 15:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722754#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1074 CHIHUAHUAN CREOSOTEBUSH DESERT SCRUB (CES302.731)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Xeromorphic Shrub

Non-Diagnostic Classifiers: Lowland [Lowland]; Toeslope/Valley Bottom; Alkaline Soil; Aridic

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2074; ESLF 5251; ESP 1074

CONCEPT

Summary: This ecological system is the common lower elevation desert scrub that occurs throughout much of the Chihuahuan Desert and has recently expanded into former desert grasslands in the northern portion of its range. Stands typically occur in flat to gently sloping desert basins and on alluvial plains, extending up into lower to mid positions of piedmont slopes (bajada). Substrates range from coarse-textured loams on gravelly plains to finer-textured silty and clayey soils in basins. Soils are alluvial, typically loamy and non-saline, and frequently calcareous as they are often derived from limestone, and to a lesser degree igneous rocks. The vegetation is characterized by a moderate to sparse shrub layer (<10% cover on extremely xeric sites) that is typically strongly dominated by *Larrea tridentata* with *Flourensia cernua* often present to codominant. A few scattered shrubs or succulents may also be present, such as *Agave lechuguilla*, *Parthenium incanum*, *Jatropha dioica*, *Koeberlinia spinosa*, *Lycium* spp., and *Yucca* spp. Additionally, *Flourensia cernua* will often strongly dominate in silty basins that are included in this ecological system. In general, shrub diversity is low as this ecological system lacks codominant thornscrub and other mixed desert scrub species that are common on the gravelly mid to upper piedmont slopes. However, shrub diversity and cover may increase locally where soils are deeper and along minor drainages with occasional *Atriplex canescens*, *Gutierrezia sarothrae*, or *Prosopis glandulosa*. Herbaceous cover is usually low and composed of grasses. Common species may include *Bouteloua eriopoda*, *Dasyochloa pulchella* (= *Erioneuron pulchellum*), *Muhlenbergia porteri*, *Pleuraphis mutica*, *Scleropogon brevifolius*, and *Sporobolus airoides*. Included in this ecological system are *Larrea tridentata*-dominated shrublands with a sparse understory that occur on gravelly to silty, upper basin floors and alluvial plains. A pebbly desert pavement may be present on the soil surface.

Classification Comments: NRCS Ecological Site Description MLRA 42 SD-2 Loamy Ecological Site descriptions describe this system on the Jornada Experimental Range with State-and-Transition Model showing shifts in species composition with land use. Historic stands are thought to have been *Pleuraphis mutica*- and *Bouteloua eriopoda*-dominated desert grassland with few scrubs present. During Landfire mapzone 25 BpS modeling workshops, experts considered this type to be non-reference condition, shrub-invaded Chihuahuan Tobosa Flats and Loamy Plains Desert Grassland (BpS) at the Jornada.

Related Concepts:

- Chihuahuan Desert Scrub (*Larrea* Scrub Phase) (Henrickson and Johnston 1986) Equivalent
- MLRA 42 - Southern Desertic Basin (SD-1) Loamy (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Gravelly Loam (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Loamy (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-3) Loamy (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-4) Loamy (NRCS 2006) Broader

DESCRIPTION

Environment: This ecological system is the common lower elevation desert scrub that occurs throughout much of the Chihuahuan Desert and has recently expanded into former desert grasslands in the northern portion of its range. Stands typically occur in flat to gently sloping, desert basins and on alluvial plains, extending up into the lower to mid positions of piedmont slopes (bajada). Substrates range from coarse-textured loams on gravelly plains to finer-textured silty and clayey soils in basins. Soils are alluvial, typically loamy and non-saline, and frequently calcareous as they are often derived from limestone, and to a lesser degree igneous rocks (Brown 1982, MacMahon and Wagner 1985, Henrickson and Johnston 1986, MacMahon 1988, Dick-Peddie 1993).

Vegetation: This alluvial plains desert scrub is characterized by a moderate to sparse shrub layer (<10% cover on extremely xeric sites) that is typically strongly dominated by *Larrea tridentata* with *Flourensia cernua* often present to codominant (Brown 1982, MacMahon and Wagner 1985, Henrickson and Johnston 1986, MacMahon 1988, Dick-Peddie 1993). A few scattered shrubs or succulents may also be present such as *Agave lechuguilla*, *Parthenium incanum*, *Jatropha dioica*, *Koeberlinia spinosa*, *Lycium* spp., and *Yucca torreyi*. Additionally, *Flourensia cernua* will often strongly dominate in silty basins that are included in this ecological system. In general, shrub diversity is low as this ecological system lacks codominant thornscrub and other mixed desert scrub species that are common on the gravelly mid to upper piedmont slopes. However, shrub diversity and cover may increase locally where soils are deeper and along minor drainages with occasional *Atriplex canescens*, *Gutierrezia sarothrae*, or *Prosopis glandulosa*. In the southern Chihuahuan Desert, stands are dominated by *Larrea tridentata* with *Agave parryi* (= *Agave scabra*), *Opuntia kleiniae*, *Opuntia imbricata*, and *Yucca filifera* (Huerta-Martinez et al. 2004). Herbaceous cover is usually low and composed of grasses.

Common species may include *Bouteloua eriopoda*, *Dasyochloa pulchella*, *Muhlenbergia porteri*, *Pleuraphis mutica*, *Scleropogon brevifolius*, and *Sporobolus airoides*. Included in this ecological system are *Larrea tridentata*-dominated shrublands with a sparse understory that occur on gravelly to silty, upper basin floors and alluvial plains. A pebbly desert pavement may be present on the soil surface.

Dynamics: In the U.S., much of this scrubland is thought to be a result of recent expansion of *Larrea tridentata* into former desert grasslands in the last 150 years as a result of drought, overgrazing by livestock, and/or decreases in fire over the last 70-250 years (Buffington and Herbel 1965, Ahlstrand 1979, Donart 1984, Dick-Peddie 1993, Gibbens et al. 2005). This system includes vast areas of loamy plains that have been converted from *Pleuraphis mutica* and *Bouteloua eriopoda* desert grasslands to *Larrea tridentata* scrub. This system also includes invasive *Flourensia cernua* shrublands that occur in former (degraded) tobosa (*Pleuraphis mutica*) flats and loamy plains. Presence of *Scleropogon brevifolius* is common in these invasive stands. Dick-Peddie (1993) suggested that absence of *Flourensia cernua* as codominant and presence of *Dasyochloa pulchella*, *Acourtia nana* (= *Perezia nana*), and *Yucca elata* may be indicators of recent conversion of desert grasslands into desert scrub, but more research is needed. Conversely, shrublands with a sparse understory of *Larrea tridentata* on remnant early Holocene erosional surfaces often with desert pavement may indicate historic distributions of *Larrea tridentata* desert scrub in the Chihuahuan Desert (Muldavin et al. 2000b).

MEMBERSHIP

Associations:

- *Larrea tridentata* - *Parthenium incanum* Shrubland (CEGL001274, G5)
- *Larrea tridentata* / *Bouteloua eriopoda* Shrubland (CEGL001265, G4)
- *Larrea tridentata* / *Dasyochloa pulchella* Shrubland (CEGL001269, G5)
- *Larrea tridentata* / *Muhlenbergia porteri* Shrubland (CEGL001272, GNR)
- *Larrea tridentata* / Sparse Understory Shrubland (CEGL001276, GNR)
- *Larrea tridentata* / *Sporobolus airoides* Shrubland (CEGL001277, GNR)

Alliances:

- *Larrea tridentata* Shrubland Alliance (A.851)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Chihuahuan Mixed Desert and Thorn Scrub (CES302.734)
- North American Warm Desert Playa (CES302.751)

Adjacent Ecological System Comments: This ecological system occurs on loamy substrates typically below Chihuahuan Mixed Desert and Thorn Scrub (CES302.734) that is characteristic of gravelly mid to upper piedmont slopes.

DISTRIBUTION

Range: This extensive, lower elevation desert scrub ecological system occurs in the Chihuahuan Desert in broad desert basins and alluvial plains extending up into the lower bajada.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), MXSO?(MX), NM, TX

Map Zones: 14:C, 15:P, 24:?, 25:C, 26:C

USFS Ecomap Regions: 313C:PP, 315A:CC, 321A:CC, 322B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 24:C

SOURCES

References: Ahlstrand 1979, Brown 1982, Buffington and Herbel 1965, Comer et al. 2003, Dick-Peddie 1993, Donart 1984, Gibbens et al. 2005, Huerta-Martínez et al. 2004, MacMahon 1988, MacMahon and Wagner 1985, Muldavin et al. 2000b, Muldavin et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722941#references

Description Author: K.A. Schulz

Version: 29 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1100 CHIHUAHUAN MIXED DESERT AND THORN SCRUB (CES302.734)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated)

Non-Diagnostic Classifiers: Toeslope/Valley Bottom; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic; Xeromorphic Shrub; Thorn Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2100; ESLF 5306; ESP 1100

CONCEPT

Summary: This ecological system is the widespread desert scrub that occurs on gravelly mid to upper bajadas, foothills and dissected gravelly alluvial fans in the Chihuahuan Desert and has recently expanded into former desert grasslands in the northern portion of its range. It generally occurs on mid to upper piedmonts above the desert plains Chihuahuan Creosotebush Desert Scrub (CES302.731) and extends up to the chaparral zone. Soils are typically well-drained, non-saline, gravelly loams often with a petrocalcic layer.

Substrates are frequently derived from limestone although igneous rocks are common in some areas. Vegetation is characterized by the presence of *Larrea tridentata*, typically mixed with thornscrub or other desert scrub such as *Agave lechuguilla*, *Aloysia wrightii*, *Baccharis pteronioides*, *Dasyilirion leiophyllum*, *Flourensia cernua* (not bottomland), *Fouquieria splendens*, *Koeberlinia spinosa*, *Krameria erecta*, *Leucophyllum minus*, *Mimosa aculeaticarpa* var. *biuncifera*, *Mortonia scabrella* (= *Mortonia sempervirens* ssp. *scabrella*), *Opuntia engelmannii*, *Parthenium incanum*, *Prosopis glandulosa*, and *Rhus microphylla* (in drainages). Stands of *Acacia constricta*-, *Acacia neovernicosa*- or *Acacia greggii*-dominated thornscrub are included in this system, and limestone substrates appear important for at least these species. If present, *Prosopis glandulosa* has relatively low cover and does not dominate the shrub layer.

This system also includes upper piedmont stands of desert scrub that are strongly dominated by *Larrea tridentata*. Grasses are common but generally have lower cover than shrubs. Common species may include *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Bouteloua hirsuta*, *Bouteloua ramosa*, *Dasyochloa pulchella*, and *Muhlenbergia porteri*. Also included in this ecological system are shrublands with a sparse understory of *Larrea tridentata* that occur on gravelly piedmont slopes that may extend down gravelly upper basins. A pebbly desert pavement may be present on the soil surface. This may indicate remnant erosional surfaces from the early Holocene that are thought to be some of the historic distribution of *Larrea tridentata* desert scrub in the Chihuahuan Desert. Historically, much of this desert scrub was thought to be a steppe characterized by perennial desert grasses (typically *Bouteloua eriopoda*) with an open creosotebush - mixed desert shrub layer.

Similar Ecological Systems:

- Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733)

Related Concepts:

- Chihuahuan Desert Scrub (Mixed Desert Scrub Phase) (Henrickson and Johnston 1986) Equivalent
- Creosotebush - Tarbush (508) (Shiflet 1994) Finer
- Grama -Muhly - Threeawn (713) (Shiflet 1994) Intersecting
- MLRA 42 - Southern Desertic Basin (SD-2) Gravelly (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Gravelly Loam (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Gravelly Sand (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Limy (NRCS 2006) Broader

DESCRIPTION

Environment: This ecological system is the widespread desert scrub that occurs on gravelly mid to upper bajadas, foothills and dissected gravelly alluvial fans in the Chihuahuan Desert and has recently expanded into former desert grasslands in the northern portion of its range. It generally occurs on mid to upper piedmonts above the desert plains Chihuahuan Creosotebush Desert Scrub (CES302.731) and extends up to the chaparral zone. Soils are typically well-drained, non-saline, gravelly loams often with a petrocalcic layer. Substrates are frequently derived from limestone, although igneous rocks are common in some areas (Brown 1982, MacMahon and Wagner 1985, Henrickson and Johnston 1986, MacMahon 1988, Dick-Peddie 1993).

Vegetation: This mid to upper piedmont ecological system is characterized by the presence of *Larrea tridentata* typically mixed with thornscrub or other desertscrub such as *Agave lechuguilla*, *Aloysia wrightii*, *Baccharis pteronioides*, *Dasyilirion leiophyllum*, *Flourensia cernua* (not bottomland), *Fouquieria splendens*, *Koeberlinia spinosa*, *Krameria erecta*, *Leucophyllum minus*, *Mimosa aculeaticarpa* var. *biuncifera*, *Mortonia scabrella* (= *Mortonia sempervirens* ssp. *scabrella*), *Opuntia engelmannii*, *Parthenium incanum*, *Prosopis glandulosa*, and *Rhus microphylla* (in drainages). Stands of *Acacia constricta*-, *Acacia neovernicosa*- or *Acacia greggii*-dominated thornscrub are included in this system, and limestone substrates appear important for at least these species. If present, *Prosopis glandulosa* has lower cover than other shrubs and does not dominate the shrub layer. This system also includes upper piedmont stands of desert scrub that are strongly dominated by *Larrea tridentata*. Grasses are common but generally have lower cover than shrubs. Common species may include *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Bouteloua hirsuta*,

Bouteloua ramosa, *Dasyochloa pulchella*, and *Muhlenbergia porteri*. Also included in this ecological system are shrublands with a sparse understory of *Larrea tridentata* that occur on gravelly piedmont slopes that may extend down gravelly upper basins. A pebbly desert pavement may be present on the soil surface. This may indicate remnant erosional surfaces from the early Holocene that are thought to be some of the historic distribution of *Larrea tridentata* desert scrub in the Chihuahuan Desert (Muldavin et al. 2000b). Historically, much of this desert scrub was thought to be a steppe characterized by perennial desert grasses such as *Bouteloua eriopoda*, *Bouteloua ramosa*, *Muhlenbergia porteri*, *Bothriochloa barbinodis*, or *Digitaria californica* with an open creosotebush - mixed desert shrub layer.

Dynamics: In the U.S., much of this scrubland is thought to be a result of recent expansion of *Larrea tridentata* into former desert grasslands and steppe in the last 150 years as a result of drought, overgrazing by livestock, and/or decreases in fire over the last 70-250 years (Buffington and Herbel 1965, Ahlstrand 1979, Donart 1984, Dick-Peddie 1993, Gibbens et al. 2005). Dick-Peddie (1993) suggested that absence of *Flourensia cernua* as codominant and presence of *Dasyochloa pulchella*, *Acourtia nana*, and *Yucca elata* may be indicators of recent conversion of desert grasslands into desert scrub, but more research is needed. Conversely, sparse understory *Larrea tridentata* shrublands on remnant early Holocene erosional surfaces often with shallow calcareous soils and desert pavement may indicate historic distributions of *Larrea tridentata* desert scrub in the Chihuahuan Desert (Stein and Ludwig 1979, Muldavin et al. 2000b).

In the northern Chihuahuan Desert, this creosotebush mixed desert and thornscrub shrubland ecological system is thought to occur in presettlement conditions largely as mixed desert shrub-steppe on upper bajada gravelly soils and dissected gravelly alluvial fans (S. Yanoff pers. comm. 2006). This grama grass steppe with an open canopy of desert scrub species is a mostly historical grama grass steppe BpS that was described during Landfire MZ25 BpS modeling workshops as Chihuahuan Grama Grass Creosote Steppe. It is distinct from creosotebush mixed shrublands on similar sites because it has an open shrub layer characterized by dense perennial grasses (typically black grama).

MEMBERSHIP

Associations:

- *Acacia neovernicosa* / *Bouteloua hirsuta* - *Bouteloua gracilis* - *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL004244, GNR)
- *Acacia neovernicosa* / *Flourensia cernua* Shrubland (CEGL001341, G4)
- *Acacia neovernicosa* / *Muhlenbergia porteri* Shrubland (CEGL001342, GNRQ)
- *Flourensia cernua* / *Achnatherum eminens* Shrubland (CEGL001338, GNRQ)
- *Flourensia cernua* / *Bouteloua curtipendula* Shrubland (CEGL001336, GNRQ)
- *Fouquieria splendens* / *Bouteloua curtipendula* Shrubland (CEGL001376, GNR)
- *Fouquieria splendens* / *Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Fouquieria splendens* / *Parthenium incanum* Shrubland (CEGL001378, GNR)
- *Fouquieria splendens* / *Petrophyton caespitosum* Shrubland (CEGL001379, G3)
- *Larrea tridentata* - *Flourensia cernua* Shrubland (CEGL001270, G5?)
- *Larrea tridentata* - *Hechtia texensis* Shrubland (CEGL004565, G3?)
- *Larrea tridentata* - *Jatropha dioica* var. *graminea* Shrubland (CEGL004566, G3?)
- *Larrea tridentata* - *Parthenium incanum* Shrubland (CEGL001274, G5)
- *Larrea tridentata* - *Prosopis glandulosa* Shrubland (CEGL001275, GUQ)
- *Larrea tridentata* / *Bouteloua eriopoda* Shrubland (CEGL001265, G4)
- *Larrea tridentata* / *Bouteloua gracilis* Shrubland (CEGL001266, GNR)
- *Larrea tridentata* / *Bouteloua hirsuta* - *Bouteloua gracilis* - *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL004246, GNR)
- *Larrea tridentata* / *Bouteloua ramosa* Shrubland (CEGL004563, G3?)
- *Larrea tridentata* / *Dasyochloa pulchella* Shrubland (CEGL001269, G5)
- *Larrea tridentata* / Sparse Understory Shrubland (CEGL001276, GNR)
- *Lycium berlandieri* - *Larrea tridentata* var. *tridentata* Shrubland (CEGL001380, GUQ)
- *Mortonia scabrella* / *Dasyilirion wheeleri* Shrubland (CEGL001279, G4)

Alliances:

- *Acacia neovernicosa* Shrubland Alliance (A.1037)
- *Bouteloua hirsuta* - *Bouteloua gracilis* - *Bouteloua eriopoda* Shrub Herbaceous Alliance (A.1548)
- *Flourensia cernua* Shrubland Alliance (A.861)
- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Larrea tridentata* Shrubland Alliance (A.851)
- *Lycium berlandieri* - *Larrea tridentata* Shrubland Alliance (A.1058)
- *Mortonia sempervirens* Shrubland Alliance (A.859)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Chihuahuan Creosotebush Desert Scrub (CES302.731)

Adjacent Ecological System Comments: This system occurs on gravelly substrates typically above Chihuahuan Creosotebush Desert Scrub (CES302.731) that is characteristic of alluvial plains and broad desert basins.

DISTRIBUTION

Range: This system occurs in the Chihuahuan Desert.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), MXSO(MX), NM, TX

Map Zones: 14:C, 15:C, 24:P, 25:C, 26:C, 27:C

USFS Ecomap Regions: 313B:CP, 313C:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 24:C

SOURCES

References: Ahlstrand 1979, Brown 1982, Buffington and Herbel 1965, Comer et al. 2003, Dick-Peddie 1993, Donart 1984, Gibbens et al. 2005, MacMahon 1988, MacMahon and Wagner 1985, Muldavin et al. 2000b, Muldavin et al. 2002, Stein and Ludwig 1979, Yanoff pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722938#references

Description Author: K.A. Schulz

Version: 29 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West
ClassifResp: West

1075 CHIHUAHUAN MIXED SALT DESERT SCRUB (CES302.017)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; *Atriplex* spp.

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2075; ESLF 5252; ESP 1075

CONCEPT

Summary: This ecological system includes extensive open-canopied shrublands of typically saline basins in the Chihuahuan Desert. Stands often occur on alluvial flats and around playas, as well as in floodplains along the Rio Grande and Pecos rivers, possibly also extending into the San Simon of Southeastern Arizona. Substrates are generally fine-textured, saline soils. Vegetation is typically composed of one or more *Atriplex* species such as *Atriplex canescens*, *Atriplex obovata*, or *Atriplex polycarpa* along with species of *Allenrolfea*, *Flourensia*, *Salicornia*, *Suaeda*, or other halophytic plants. Graminoid species may include *Sporobolus airoides*, *Pleuraphis mutica*, or *Distichlis spicata* at varying densities.

DESCRIPTION

Environment: This system includes extensive open-canopied shrublands of typically saline basins in the Chihuahuan Desert. Stands often occur on alluvial flats, around playas and floodplains of the Rio Grande and Pecos rivers, possibly also extending into the San Simon of southeastern Arizona. Sites are flat to gently sloping with slopes up to 3%. Elevation ranges from 1000-1300 m (3300-4300 feet). Substrates are generally fine-textured, saline soils but may include moderately coarse-textured alluvium in the floodplains. Water tables are generally shallow but fluctuate within reach of deep-rooted plants, and in most places are high enough that salts accumulate on the surface of the soil.

Vegetation: Vegetation is typically composed of one or more *Atriplex* species, such as *Atriplex canescens*, *Atriplex obovata*, or *Atriplex polycarpa*, along with species of *Allenrolfea*, *Flourensia*, *Salicornia*, *Suaeda*, or other halophytic plants. Graminoid species may include *Sporobolus airoides*, *Sporobolus wrightii*, *Pleuraphis mutica*, or *Distichlis spicata* at varying densities. Occasional riparian species may be present near watercourses, such as *Prosopis pubescens* or *Populus deltoides ssp. wislizeni*.

MEMBERSHIP

Associations:

- *Atriplex canescens* / *Parthenium confertum* Shrubland (CEGL001290, GNRQ)
- *Atriplex canescens* / *Sporobolus airoides* Shrubland (CEGL001291, G5?)
- *Atriplex canescens* / *Sporobolus wrightii* Shrubland (CEGL001292, GNRQ)
- *Atriplex obovata* / *Tidestromia carnosus* Dwarf-shrubland (CEGL004575, G2?)
- *Atriplex polycarpa* / *Pleuraphis mutica* Shrubland (CEGL001319, GU)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Flourensia cernua* / *Achnatherum eminens* Shrubland (CEGL001338, GNRQ)
- *Flourensia cernua* / *Bouteloua curtipendula* Shrubland (CEGL001336, GNRQ)
- *Flourensia cernua* / *Pleuraphis mutica* Shrubland (CEGL001541, G4)
- *Flourensia cernua* / *Sporobolus airoides* Shrubland (CEGL001337, GNRQ)

Alliances:

- *Atriplex canescens* Shrubland Alliance (A.869)
- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Flourensia cernua* Shrubland Alliance (A.861)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North American Warm Desert Playa (CES302.751)

DISTRIBUTION

Range: This ecological system occurs in saline basins in the Chihuahuan Desert. Stands often occur around playas and on alluvial flats, as well as in floodplains along the Rio Grande and Pecos rivers, possibly also extending into the San Simon of southeastern Arizona.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), MXCO(MX), MXDU(MX), MXNU(MX), MXSO(MX), NM, TX

Map Zones: 14:C, 15:P, 24:?, 25:C, 26:C, 27:P, 34:?, 35:?, 36:P

USFS Ecomap Regions: 313C:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 24:C, 28:C, 29:?, 30:P

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000b, Muldavin et al. 2002, Shreve and Wiggins 1964

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722688#references

Description Author: K.A. Schulz

Version: 29 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1076 CHIHUAHUAN STABILIZED COPPICE DUNE AND SAND FLAT SCRUB (CES302.737)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Plain; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Sand Soil Texture; Aridic; Very Short Disturbance Interval; W-Landscape/High Intensity; Thorn Shrub; *Prosopis* spp.-dominated

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2076; ESLF 5253; ESP 1076

CONCEPT

Summary: This ecological system includes the open desert scrub of vegetated coppice dunes and sandsheets found in the Chihuahuan Desert. Stands are usually dominated by *Prosopis glandulosa* or *Artemisia filifolia* but also include *Atriplex canescens*, *Ephedra torreyana*, *Ephedra trifurca*, *Poliomintha incana*, and *Rhus microphylla* coppice and sand flat scrub usually with 10-30% total vegetation cover. *Yucca elata*, *Gutierrezia sarothrae*, *Bouteloua eriopoda*, and *Sporobolus flexuosus* are commonly present. In northern stands, *Artemisia filifolia* dominates and *Prosopis glandulosa* become less uncommon or absent. This system include degraded sandy desert plains grasslands now dominated by *Artemisia filifolia*.

Classification Comments: Heavy grazing in late 1800s and early 1900s may have caused mesquite to increase. Naturally occurring coppice dunes may have been limited to areas peripheral to active dunes. Coppice dunes in the Tularosa Basin and elsewhere are currently more extensive, resulting from sand movement due to degradation of desert grasslands and steppe. For Landfire mapzone 25 BpS modeling, this system is considered to be historically uncharacteristic of most sites where it occurs. Much of the current extent of this system is thought to have been formerly Chihuahuan Sandy Plains Semi-Desert Grassland (CES302.736).

Similar Ecological Systems:

- Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733)

Related Concepts:

- Mesquite (729) (Shiflet 1994) Intersecting
- MLRA 42 - Southern Desertic Basin (SD-1) Deep Sand (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-1) Sandy (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Deep Sand (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Sandy (NRCS 2006) Broader

DESCRIPTION

Dynamics: *Prosopis glandulosa* is more common on warmer, drier sites on sands with clays or carbonate substrates, whereas *Artemisia filifolia* is more common on relatively cooler/moisture sites with coarse, deep sand (S. Yanoff pers. comm. 2007).

MEMBERSHIP

Associations:

- *Atriplex canescens* / *Sporobolus wrightii* Shrubland (CEGL001292, GNRQ)
- *Ephedra torreyana* - *Achnatherum hymenoides* Hummock Shrubland (CEGL005802, GNR)
- *Prosopis glandulosa* / *Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa* / *Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa* / *Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa* / *Sporobolus flexuosus* Shrubland (CEGL001386, G4)
- *Psoralea scoparius* / *Sporobolus flexuosus* Shrubland (CEGL001695, G5)
- *Rhus microphylla* / *Bouteloua curtipendula* Shrubland (CEGL001354, GNR)

Alliances:

- *Atriplex canescens* Shrubland Alliance (A.869)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Psoralea scoparius* Shrubland Alliance (A.837)
- *Rhus microphylla* Shrubland Alliance (A.1040)

DISTRIBUTION

Range: This system occurs on dunes and sandsheets found in the Chihuahuan Desert.

Divisions: 302:C

Nations: MX, US

Subnations: MXCH(MX), NM, TX

Map Zones: 14:P, 15:P, 25:C, 26:C, 27:P

USFS Ecomap Regions: 313C:CC, 315A:CC, 315B:CC, 315H:CP, 321A:CC, 322B:??, M313A:CP, M313B:CC
TNC Ecoregions: 24:C

SOURCES

References: Bowers 1982, Bowers 1984, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000b, Yanoff pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722935#references

Description Author: K.A. Schulz

Version: 29 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1077 CHIHUAHUAN SUCCULENT DESERT SCRUB (CES302.738)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Temperate [Temperate Xeric]; Succulent Shrub; Cacti-dominated

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Aridic

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2077; ESLF 5254; ESP 1077

CONCEPT

Summary: This ecological system is found in the Chihuahuan Desert on colluvial slopes, upper bajadas, sideslopes, ridges, canyons, hills and mesas. Sites are hot and dry, typically with southerly aspects. Gravel and rock are often abundant on the ground surface. The vegetation is characterized by the relatively high cover of succulent species such as *Agave lechuguilla*, *Euphorbia antisyphilitica*, *Fouquieria splendens*, *Ferocactus* spp., *Opuntia engelmannii*, *Opuntia imbricata*, *Opuntia spinosior*, *Yucca baccata*, and many others. Perennial grass cover is generally low. The abundance of succulents is diagnostic of this desert scrub system, but desert shrubs are usually present. Stands in rolling topography may form a mosaic with more mesic desert scrub or desert grassland ecological systems that would occur on less xeric northerly slopes. *Agave lechuguilla* is more abundant in stands in the southern part of the mapzone. This system does not include loamy plains desert grasslands or shrub-steppe with a strong cacti component such as cholla grasslands.

Related Concepts:

- MLRA 42 - Southern Desertic Basin (SD-2) Limestone Hills (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) SD2 Hills (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) SD2 Malpais (NRCS 2006) Broader
- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Undetermined

MEMBERSHIP

Associations:

- *Larrea tridentata* - *Agave lechuguilla* Shrubland (CEGL004562, G4?)
- *Larrea tridentata* - *Euphorbia antisyphilitica* Shrubland (CEGL004564, G3)
- *Larrea tridentata* - *Opuntia schottii* Shrubland (CEGL004567, G4?)
- *Opuntia imbricata* Shrubland (CEGL004588, GNA)

Alliances:

- *Larrea tridentata* Shrubland Alliance (A.851)
- *Opuntia imbricata* Shrubland Alliance (A.878)

DISTRIBUTION

Range: This Chihuahuan Desert ecological system occurs on colluvial slopes, upper bajadas, sideslopes and mesas. It extends east to the Devils River in Texas.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), NM, TX

Map Zones: 14:C, 15:C, 24:P, 25:C, 26:C

USFS Ecomap Regions: 313C:CC, 315A:CC, 321A:CC, 322B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 22:P, 24:C, 29:?, 30:P

SOURCES

References: Comer et al. 2003, MacMahon 1988, Muldavin et al. 2000b, Muldavin et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722934#references

Description Author: NatureServe Western Ecology Team

Version: 29 Jan 2007

Stakeholders: Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

1078 COLORADO PLATEAU BLACKBRUSH-MORMON-TEA SHRUBLAND (CES304.763)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Temperate [Temperate Xeric]; Aridic

Non-Diagnostic Classifiers: Ridge/Summit/Upper Slope; Sideslope; Alkaline Soil; Sand Soil Texture; Very Long Disturbance Interval; F-Patch/High Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2078; ESLF 5255; ESP 1078

CONCEPT

Summary: This ecological system occurs in the Colorado Plateau on benchlands, colluvial slopes, pediments or bajadas. Elevation ranges from 560-1650 m. Substrates are shallow, typically calcareous, non-saline and gravelly or sandy soils over sandstone or limestone bedrock, caliche or limestone alluvium. It also occurs in deeper soils on sandy plains where it may have invaded desert grasslands. The vegetation is characterized by extensive open shrublands dominated by *Coleogyne ramosissima* often with *Ephedra viridis*, *Ephedra torreyana*, or *Grayia spinosa*. Sandy portions may include *Artemisia filifolia* as codominant. The herbaceous layer is sparse and composed of graminoids such as *Achnatherum hymenoides*, *Pleuraphis jamesii*, or *Sporobolus cryptandrus*.

Related Concepts:

- Blackbush (212) (Shiflet 1994) Broader

DESCRIPTION

Environment: This ecological system typically occurs on gentle to steep, bouldery or rocky slopes of mountains, canyons, and mesas with varying aspects. This system is an evergreen, microphyllous desert scrub with succulents, half-shrubs, and scattered deciduous shrubs typically found at elevations ranging from 580 to 1650 m. (1903-5413 feet). This shrubland system occurs in an arid to semi-arid climate with annual precipitation in the form of summer monsoons and winter storms averaging approximately 20 cm. Soils are highly variable and parent materials may include shale, sandstone, limestone, quartzites, and igneous rocks. Soils are generally coarse-textured, often rocky, shallow and well-drained. Effective soil moisture appears to be primarily controlled by regolith depth and position in relation to the water table. This brushland system occupies most sites where regolith is uniformly shallow. In association with blackbrush (*Coleogyne ramosissima*) sites, the soil moisture is concentrated on top of impermeable bedrock at a shallow depth. This perching effect allows for gradual uptake of moisture by the plants roots (Loope and West 1979). This permits growth of plants with more mesic habitat requirements (Warren et al. 1982). On sites with deep soil, blackbrush may occur in almost pure occurrences with only a few associated species (Warren et al. 1982). Dark-colored cryptogamic soil crusts, composed of lichens, mosses, fungi, and algae, are often present in this system in fairly undisturbed areas. Sandy soils may have more cryptogamic crusts than clayish or silty soil surfaces.

Vegetation: This ecological system is dominated by sparse to moderately dense shrubs. Dominant shrubs include *Coleogyne ramosissima*, *Ephedra nevadensis*, and *Ephedra viridis* (which may codominate with *Grayia spinosa*, *Salvia dorrii*, and *Lycium andersonii*). There is usually a sparse herbaceous layer with some perennial grasses and forbs. Annual grasses and forbs are present seasonally. Some characteristic species associated with this system include the shrubs *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, *Yucca baccata*, and *Krameria grayi*, succulents such as *Ferocactus cylindraceus* (= *Ferocactus acanthodes*), *Opuntia* spp., *Echinocereus* spp., *Echinocactus* spp., and *Agave* spp., the graminoid *Pleuraphis rigida*, and perennial forbs such as *Machaeranthera pinnatifida* and *Sphaeralcea ambigua*.

Dynamics: Fire does not appear to play a role in maintenance of shrublands within this system. Topographic breaks dissect the landscape, and isolated pockets of vegetation are separated by rock walls or steep canyons. Blackbrush is fire-intolerant (Loope and West 1979). Following fires, these communities are often colonized by non-native grasses, which serve to encourage recurrent fires and delay shrub regeneration (IVC 1999). In shallow regolith situations, secondary succession, in the sense of site preparation by seral plants, may not occur at all (Loope and West 1979).

MEMBERSHIP

Associations:

- *Artemisia filifolia* / *Bouteloua eriopoda* Shrubland (CEGL001077, G4)
- *Artemisia filifolia* Colorado Plateau Shrubland (CEGL002697, GNR)
- *Coleogyne ramosissima* - *Purshia stansburiana* - *Quercus havardii* var. *tuckeri* Shrubland (CEGL002348, G3G4)
- *Coleogyne ramosissima* / *Pleuraphis jamesii* Shrubland (CEGL001334, G5)
- *Coleogyne ramosissima* Shrubland (CEGL001332, G4G5)
- *Coleogyne ramosissima* Sparse Shrubland (CEGL003834, GNR)
- *Ephedra nevadensis* - *Ephedra viridis* - *Salvia dorrii* - *Lycium andersonii* Shrubland (CEGL001256, G4)
- *Ephedra nevadensis* / *Achnatherum hymenoides* Shrubland (CEGL001255, G4)
- *Ephedra torreyana* - (*Atriplex* spp.) / Nonvascular Gypsum Sparse Vegetation (CEGL002349, GNR)

- *Ephedra torreyana* / *Achnatherum hymenoides* - *Pleuraphis jamesii* Shrubland (CEGL002352, GNR)
- *Ephedra torreyana* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001731, G2)
- *Ephedra torreyana* / *Bouteloua gracilis* - *Pleuraphis jamesii* Shrubland (CEGL002351, GNR)
- *Ephedra torreyana* / *Pleuraphis jamesii* Shrubland (CEGL003772, GNR)
- *Ephedra viridis* / (*Achnatherum hymenoides*, *Hesperostipa comata*) Shrubland (CEGL002354, GNR)
- *Ephedra viridis* / *Achnatherum hymenoides* - *Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL001648, G2G4)
- *Ephedra viridis* / *Achnatherum hymenoides* - *Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001649, G2G4)
- *Ephedra viridis* / *Bromus tectorum* Semi-natural Shrubland (CEGL002355, GNA)
- *Ephedra viridis* / *Pleuraphis jamesii* Shrubland (CEGL002356, GNR)
- *Ephedra viridis* / *Pleuraphis rigida* Shrubland (CEGL001257, G3)
- *Eriogonum leptocladon* / *Muhlenbergia pungens* Dwarf-shrubland [Provisional] (CEGL002821, GNR)
- *Grayia spinosa* Shrubland (CEGL002358, GNR)
- *Poliomintha incana* - *Artemisia filifolia* - *Vancoveria stylosa* Shrubland (CEGL002418, GNR)
- *Quercus havardii* var. *tuckeri* Shrubland (CEGL002486, GNR)

Alliances:

- *Achnatherum hymenoides* Shrub Herbaceous Alliance (A.1543)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Coleogyne ramosissima* Shrubland Alliance (A.874)
- *Ephedra nevadensis* - *Ephedra viridis* Shrubland Alliance (A.856)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Ephedra torreyana* Sparsely Vegetated Alliance (A.2571)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Eriogonum* (*corymbosum*, *leptocladon*) Dwarf-shrubland Alliance (A.1126)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Poliomintha incana* Shrubland Alliance (A.862)
- *Quercus havardii* var. *tuckeri* Shrubland Alliance (A.2654)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Adjacent vegetation often includes *Atriplex* dominated shrubland communities and upland areas of pinyon-juniper woodlands. Grasslands dominated by *Pleuraphis jamesii*, *Hesperostipa comata*, and *Achnatherum hymenoides* also occur.

DISTRIBUTION

Range: Occurs in the Colorado Plateau on benchlands, colluvial slopes, pediments or bajadas. Elevation ranges from 560-1600 m.

Divisions: 304:C

Nations: US

Subnations: AZ, CO, NM, UT

Map Zones: 13:C, 14:?, 15:C, 16:P, 17:C, 23:C, 24:C, 28:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 322A:CC, 341B:CC, 341C:C?, 341F:CP, M331E:PP, M331H:PP, M341B:CC, M341C:CP

TNC Ecoregions: 18:C, 19:C

SOURCES

References: Comer et al. 2003, Loope and West 1979, Thatcher 1975, Tuhy and MacMahon 1988, Tuhy et al. 2002, Warren et al. 1982, West 1983d

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722909#references

Description Author: NatureServe Western Ecology Team

Version: 05 Oct 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1064 COLORADO PLATEAU MIXED LOW SAGEBRUSH SHRUBLAND (CES304.762)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Temperate [Temperate Xeric]; Aridic

Non-Diagnostic Classifiers: Alkaline Soil

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Evergreen dwarf-shrubland

National Mapping Codes: EVT 2064; ESLF 5201; ESP 1064

CONCEPT

Summary: This ecological system occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This type extends across northern New Mexico into the southern Great Plains on limestone hills. It includes open shrublands and steppe dominated by *Artemisia nova* or *Artemisia bigelovii* sometimes with *Artemisia tridentata* ssp. *wyomingensis* codominant. Semi-arid grasses such as *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, or *Poa fendleriana* are often present and may form a graminoid layer with over 25% cover.

Related Concepts:

- Black Sagebrush (405) (Shiflet 1994) Intersecting
- Other Sagebrush Types (408) (Shiflet 1994) Intersecting. *Artemisia bigelovii* shrublands are included in this ecological system.

MEMBERSHIP

Associations:

- *Artemisia arbuscula* ssp. *longiloba* / *Elymus lanceolatus* Shrubland (CEGL002585, GNR)
- *Artemisia bigelovii* - *Ephedra* (*viridis*, *torreyana*) Talus Shrubland (CEGL003755, GNR)
- *Artemisia bigelovii* / *Achnatherum hymenoides* Shrubland (CEGL000990, G3Q)
- *Artemisia bigelovii* / *Bouteloua eriopoda* Dwarf-shrub Herbaceous Vegetation (CEGL001741, GNRQ)
- *Artemisia bigelovii* / *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001742, GNR)
- *Artemisia bigelovii* Shrubland (CEGL000276, GNR)
- *Artemisia frigida* - (*Bouteloua gracilis*, *Achnatherum hymenoides*, *Poa secunda*) - Lichens Rocky Mesa Dwarf-shrubland (CEGL002344, GNR)
- *Artemisia nova* - *Ericameria nana* Shrubland (CEGL002773, G3)
- *Artemisia nova* - *Gutierrezia sarothrae* / *Bouteloua gracilis* - *Pleuraphis jamesii* Shrubland (CEGL001419, G4)
- *Artemisia nova* - *Purshia tridentata* / *Poa fendleriana* Shrubland (CEGL002345, GNR)
- *Artemisia nova* / *Achnatherum hymenoides* Shrubland (CEGL001422, G4G5)
- *Artemisia nova* / *Elymus elymoides* Shrubland (CEGL001418, G4G5)
- *Artemisia nova* / *Hesperostipa comata* Shrubland (CEGL001425, G3?)
- *Artemisia nova* / *Pleuraphis jamesii* Shrubland (CEGL001420, G3G5)
- *Artemisia nova* / *Poa fendleriana* Shrubland (CEGL002698, GNR)
- *Artemisia nova* / *Poa secunda* Shrubland (CEGL001423, G3)
- *Artemisia nova* / *Pseudoroegneria spicata* Shrubland (CEGL001424, G4G5)
- *Artemisia nova* Shrubland (CEGL001417, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Bouteloua gracilis* Shrubland (CEGL001041, G5)

Alliances:

- *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance (A.2549)
- *Artemisia bigelovii* Shrubland Alliance (A.1103)
- *Artemisia frigida* Dwarf-shrubland Alliance (A.2565)
- *Artemisia nova* Shrubland Alliance (A.1105)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Bouteloua eriopoda* Dwarf-shrub Herbaceous Alliance (A.1570)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Alliance (A.1571)

DISTRIBUTION

Range: Occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m.

Divisions: 303:C; 304:C

Nations: US

Subnations: AZ, CO, NM, UT

Map Zones: 15:P, 16:C, 17:P, 23:C, 24:C, 25:C, 27:C, 28:C, 34:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:C?, 315B:CC, 315H:CC, 321A:CC, 331B:CC, 341A:CC, 341B:CC, 341C:CC, 342G:??, M313A:CC, M313B:CC, M331D:CC, M331E:CC, M331F:CP, M331G:CC, M331H:CP, M341B:CC, M341C:CC

TNC Ecoregions: 18:C, 19:C, 20:C, 27:C, 28:C

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Francis 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722910#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1102 COLORADO PLATEAU PINYON-JUNIPER SHRUBLAND (CES304.766)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Mesa; Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate [Temperate Xeric]; Aridic; *Pinus edulis*, *Juniperus osteosperma*

Non-Diagnostic Classifiers: Foothill(s); Shrubland (Shrub-dominated); Sideslope; Alkaline Soil; Long Disturbance Interval; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2102; ESLF 5308; ESP 1102

CONCEPT

Summary: This ecological system is characteristic of the rocky mesatops and slopes on the Colorado Plateau and western slope of Colorado, but these stunted tree shrublands may extend further upslope along the low-elevation margins of taller pinyon-juniper woodlands. Sites are drier than Colorado Plateau Pinyon-Juniper Woodland (CES304.767). Substrates are shallow/rocky and shaly soils at lower elevations (1200-2000 m). Sparse examples of the system grade into Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765). The vegetation is dominated by dwarfed (usually <3 m tall) *Pinus edulis* and/or *Juniperus osteosperma* trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include *Artemisia nova*, *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, or *Coleogyne ramosissima*. Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids.

Similar Ecological Systems:

- Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765)
- Colorado Plateau Pinyon-Juniper Woodland (CES304.767)

Related Concepts:

- Juniper - Pinyon Pine Woodland (504) (Shiflet 1994) Intersecting
- Juniper - Pinyon Woodland (412) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Juniperus osteosperma* - (*Pinus edulis*) / *Coleogyne ramosissima* - *Purshia stansburiana* - *Quercus havardii* var. *tuckeri* Wooded Shrubland (CEGL003774, GNR)
- *Juniperus osteosperma* / *Bouteloua gracilis* Woodland [Provisional] (CEGL002361, GNR)
- *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Juniperus osteosperma* / Mixed Shrubs Talus Woodland (CEGL002266, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / (*Shepherdia rotundifolia*, *Amelanchier utahensis*) Wooded Shrubland (CEGL002334, G3G4)
- *Pinus edulis* - *Juniperus osteosperma* / *Arctostaphylos patula* Woodland (CEGL002939, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000779, G3)
- *Pinus edulis* - *Juniperus osteosperma* / *Cercocarpus ledifolius* Woodland (CEGL002940, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Coleogyne ramosissima* Woodland (CEGL000781, G3)
- *Pinus edulis* - *Juniperus osteosperma* / *Ephedra torreyana* - *Artemisia bigelovii* Woodland (CEGL002369, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / Mixed Shrubs Talus Woodland (CEGL002328, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Muhlenbergia pungens* Woodland (CEGL002373, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Pseudoroegneria spicata* - Cushion Plant Woodland (CEGL002819, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Purshia stansburiana* Woodland (CEGL000782, G4?)
- *Pinus edulis* - *Juniperus osteosperma* / *Purshia tridentata* Woodland (CEGL000789, G5)
- *Pinus edulis* - *Juniperus* spp. / *Cercocarpus montanus* - Mixed Shrubs Woodland (CEGL000780, G5)
- *Pinus edulis* / *Arctostaphylos pungens* Woodland (CEGL000775, G3)
- *Pinus edulis* / Rockland Woodland (CEGL000794, G5)

Alliances:

- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus edulis* - *Juniperus osteosperma* Wooded Shrubland Alliance (A.2649)

DISTRIBUTION

Range: Rocky mesa tops and slopes on the Colorado Plateau.

Divisions: 304:C; 306:?

Nations: US

Subnations: AZ, CO, NM, UT

Map Zones: 13:P, 15:P, 16:C, 23:C, 24:C, 25:C, 28:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CP, 322A:??, 341B:CC, 341C:CC, 342G:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M341B:CC, M341C:CC

TNC Ecoregions: 18:C, 19:C, 20:?

SOURCES

References: Comer et al. 2003, Tuhy et al. 2002, West et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722906#references

Description Author: NatureServe Western Ecology Team

Version: 05 Oct 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1065 COLUMBIA PLATEAU SCABLAND SHRUBLAND (CES304.770)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Basalt; Shallow Soil

Non-Diagnostic Classifiers: Plain; Plateau; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Aridic

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Evergreen dwarf-shrubland

National Mapping Codes: EVT 2065; ESLF 5202; ESP 1065

CONCEPT

Summary: This ecological system is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer. Total vegetation cover is typically low, generally less than 50% and often much less than that. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* along with other shrub and dwarf-shrub species, particularly *Eriogonum* spp. Other shrubs are uncommon in this system; mixes of *Artemisia rigida* and other *Artemisia* species typically belong to different ecological systems than this. Low cover of perennial bunch grasses, such as *Danthonia unispicata*, *Elymus elymoides*, *Festuca idahoensis*, or primarily *Poa secunda*, as well as scattered forbs, including species of *Allium*, *Antennaria*, *Balsamorhiza*, *Lomatium*, *Phlox*, and *Sedum*, characterize these sites. Individual sites can be dominated by grasses and semi-woody forbs, such as *Stenotus stenophyllus*. Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

Related Concepts:

- Bluegrass Scabland (106) (Shiflet 1994) Finer
- Stiff Sagebrush (407) (Shiflet 1994) Finer

MEMBERSHIP

Associations:

- *Artemisia rigida* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL002995, G2)
- *Artemisia rigida* / *Poa secunda* Shrub Herbaceous Vegetation (CEGL001528, G4)
- *Artemisia rigida* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001529, G3)
- *Danthonia californica* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001607, G1Q)
- *Danthonia unispicata* - *Poa secunda* Herbaceous Vegetation (CEGL001783, G3)
- *Eriogonum compositum* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001784, G2)
- *Eriogonum douglasii* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001785, G2)
- *Eriogonum microthecum* - *Physaria oregona* Dwarf-shrubland (CEGL001737, G2)
- *Eriogonum niveum* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001786, G3)
- *Eriogonum sphaerocephalum* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001448, G3)
- *Eriogonum strictum* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001788, G3)
- *Eriogonum thymoides* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001449, G3)
- *Lomatium cous* - *Poa secunda* Herbaceous Vegetation (CEGL001790, G4)

Alliances:

- *Artemisia rigida* Shrub Herbaceous Alliance (A.1574)
- *Danthonia californica* Herbaceous Alliance (A.1254)
- *Eriogonum microthecum* Dwarf-shrubland Alliance (A.1107)
- *Poa secunda* Dwarf-shrub Herbaceous Alliance (A.1568)
- *Poa secunda* Herbaceous Alliance (A.1291)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Columbia Plateau Vernal Pool (CES304.057)

DISTRIBUTION

Range: This system occurs in the Columbia Plateau region of southern Idaho, eastern Oregon and eastern Washington, and extreme northern Nevada.

Divisions: 304:C

Nations: US

Subnations: CA?, ID, NV, OR, UT?, WA

Map Zones: 1:C, 7:C, 8:C, 9:C, 12:?, 17:?, 18:P

USFS Ecomap Regions: 331A:CC, 341E:C?, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:C?, M261G:CC, M332G:CC, M333A:PP, M341A:CC
TNC Ecoregions: 6:C, 7:C, 68:C

SOURCES

References: Comer et al. 2003, Copeland 1980a, Daubenmire 1970, Ganskopp 1979, Hall 1973, Johnson and Simon 1985, Poulton 1955

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722902#references

Description Author: Western Ecology Group, mod. M.S. Reid

Version: 25 Apr 2006

Concept Author: J. Kagan

Stakeholders: West
ClassifResp: West

1393 EDWARDS PLATEAU LIMESTONE SHRUBLAND (CES303.041)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Plain; Plateau; Shrubland (Shrub-dominated); Alkaline Soil; Very Shallow Soil; Xeric

Non-Diagnostic Classifiers: Lowland [Foothill]; Calcareous

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2393; ESLF 5324; ESP 1393

CONCEPT

Summary: This ecological system occurs as a matrix on relatively thin-soiled surfaces of plateaus of the massive limestones such as the Edwards limestone. These short to tall shrublands are variable in density depending on the relative amount of, and depth to, bedrock. *Quercus sinuata* var. *breviloba* is an important component of the system, with some areas dominated by *Quercus fusiformis*. *Juniperus ashei* is often an important component of this system. In the west, *Pinus remota* may also contribute to a scattered emergent overstory. Other shrub species may include *Rhus virens*, *Rhus lanceolata*, *Cercis canadensis* var. *texensis*, *Forestiera pubescens*, *Forestiera reticulata*, *Fraxinus texensis*, *Ungnadia speciosa*, *Sophora secundiflora*, *Diospyros texana*, *Salvia ballotiflora*, *Mimosa borealis*, *Condalia hookeri*, *Rhus trilobata*, *Opuntia engelmannii*, and *Mahonia trifoliolata*. This system also includes *Quercus mohriana*- or *Quercus vaseyana*-dominated shrublands that are more common to the west, often sharing dominance with *Juniperus pinchotii*. Herbaceous cover may be patchy and is generally graminoid with species including *Schizachyrium scoparium*, *Bouteloua curtipendula*, *Bouteloua rigidisetata*, *Bouteloua trifida*, *Hilaria belangeri*, *Bothriochloa laguroides* ssp. *torreyana*, *Nassella leucotricha*, *Erioneuron pilosum*, *Aristida* spp., and others. Disturbances such as fire may be important processes maintaining this system. However, it appears to persist on thin-soiled sites. In the western portions of the Edwards Plateau, more xeric conditions lead to the slow succession of sites to woodlands, resulting in long-persisting shrublands.

Classification Comments: This system represents naturally occurring shrublands that are maintained over long periods (greater than 50 years) as shrublands. It tends to occur on shallow soils over massive hard-bedded limestone formations and/or in the western and drier portions of the Edwards Plateau of Texas. Early-successional vegetation of Edwards Plateau Limestone Savanna and Woodland (CES303.660) may exhibit a composition and structure similar to the vegetation described and classified here, but the temporal dynamics are different. This system was modeled for mapzone 26, however, Edwards Plateau Limestone Savanna and Woodland (CES303.660) was not. Both systems occur on the far eastern edge of the mapzone on the Stockton Plateau.

Similar Ecological Systems:

- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)
- Tamaulipan Arroyo Shrubland (CES301.992)
- Tamaulipan Calcareous Thornscurb (CES301.986)

DESCRIPTION

Environment: This system occurs on thin soils over limestone in the Edwards Plateau of Texas.

Vegetation: In the interior of the Edwards Plateau ecoregion, *Quercus sinuata* var. *breviloba* is an important component of the system, with some areas dominated by a shinnery of *Quercus fusiformis*, although monotypic stands of *Quercus fusiformis* occupying the shrub layer are uncommon. *Juniperus ashei* is also an important component of this system throughout much of the ecoregion. In the northwest corner of the ecoregion, this system may occur as a *Quercus mohriana*-dominated shrubland (a type more common in the Southern Shortgrass Prairie ecoregion), often sharing dominance with *Juniperus pinchotii*. Towards the southwest, *Quercus vaseyana* (= *Quercus pungens* var. *vaseyana*) becomes an important component of the system, and areas dominated by *Sophora secundiflora*, *Diospyros texana*, and other shrub species become more common. In the southwest corner of the ecoregion, on the Stockton Plateau, this system may be represented by *Acacia berlandieri* shrublands. A sparse overstory canopy of *Juniperus ashei*, *Quercus fusiformis*, *Pinus remota*, *Prosopis glandulosa*, *Quercus sinuata* var. *breviloba*, *Quercus vaseyana*, *Celtis* spp., or other species may sometimes be present. Where shrub cover is distributed in a patchy mosaic, such sites may be used by black-capped vireos (*Vireo atricapilla*).

Dynamics: This system occurs in a steady state on thin-soiled xeric sites. Shrub cover can be 100% in patches, but overall cover may be 40-50%. Patches of dense shrubs may be interspersed with bare rock and grasslands over shallow soil. Farther west this system grades into other shallow-soiled shrubland systems.

MEMBERSHIP

Associations:

- *Juniperus ashei* Semi-natural Forest (CEGL004159, GNA)
- *Quercus mohriana* - *Juniperus pinchotii* / *Bouteloua curtipendula* Shrubland (CEGL002173, G4)
- *Quercus sinuata* var. *breviloba* Shrubland (CEGL004453, G2G3)
- *Sophora secundiflora* - *Diospyros texana* - (*Mahonia trifoliolata*) Shrubland (CEGL004924, GNA)

Alliances:

- *Juniperus ashei* Semi-natural Forest Alliance (A.2023)
- *Quercus mohriana* Shrubland Alliance (A.782)
- *Quercus sinuata* var. *breviloba* Shrubland Alliance (A.907)
- *Sophora secundiflora* - *Diospyros texana* Shrubland Alliance (A.751)

SPATIAL CHARACTERISTICS**Adjacent Ecological Systems:**

- Edwards Plateau Carbonate Glade and Barrens (CES303.655)
- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)
- Edwards Plateau Upland Depression (CES303.654)
- Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)

DISTRIBUTION

Range: This system is limited in occurrence to the Edwards Plateau of Texas.

Divisions: 302:P; 303:C

Nations: US

Subnations: TX

Map Zones: 26:C, 27:?, 34:?, 35:C

USFS Ecomap Regions: 255E:CC, 315C:CC, 315D:CC, 315G:CC, 321B:CC

TNC Ecoregions: 24:P, 28:P, 29:C

SOURCES

References: Comer et al. 2003, TNC 2004b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722668#references

Description Author: L. Elliott and K.A. Schulz, mod. J. Teague

Version: 04 Feb 2009

Concept Author: L. Elliott, K. Schulz

Stakeholders: Southeast, West

ClassifResp: Southeast

1103 GREAT BASIN SEMI-DESERT CHAPARRAL (CES304.001)

CLASSIFIERS

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Broad-Leaved Evergreen Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2103; ESLF 5309; ESP 1103

CONCEPT

Summary: This system includes chaparral on sideslopes transitioning from low-elevation desert landscapes up into pinyon-juniper woodlands of the western and central Great Basin. There are limited occurrences extending as far west as the inner Coast Ranges in central California. These are typically fairly open-canopy shrublands with open spaces either bare or supporting patchy grasses and forbs. Characteristic species may include *Arctostaphylos patula*, *Arctostaphylos pungens*, *Ceanothus greggii*, *Ceanothus velutinus*, *Cercocarpus montanus* var. *glaber*, *Cercocarpus intricatus*, *Eriogonum fasciculatum*, *Garrya flavescens*, *Quercus turbinella*, *Purshia stansburiana*, and *Rhus trilobata*. *Cercocarpus ledifolius* is generally absent. Typical fire regime in these systems varies with the amount of organic accumulation.

Related Concepts:

- Bittercherry (419) (Shiflet 1994) Intersecting
- Chokecherry - Serviceberry - Rose (421) (Shiflet 1994) Intersecting. Moist inclusions of this system can be dominated by chokecherry, serviceberry and rose.
- Littleleaf Mountain-Mahogany (417) (Shiflet 1994) Intersecting
- Snowbush (420) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Arctostaphylos patula* - *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) Shrubland (CEGL002694, GNR)
- *Arctostaphylos patula* - *Quercus gambelii* - (*Amelanchier utahensis*) Shrubland (CEGL002695, GNR)
- *Arctostaphylos patula* / *Ceanothus velutinus* - *Ceanothus prostratus* Shrubland (CEGL000957, G3)
- *Arctostaphylos patula* Shrubland (CEGL002696, GNR)
- *Arctostaphylos pungens* Shrubland (CEGL000958, G4)
- *Ceanothus greggii* - *Fremontodendron californicum* Shrubland [Placeholder] (CEGL003026, G3?)
- *Ceanothus leucodermis* Shrubland [Placeholder] (CEGL003028, G4?)
- *Cercocarpus montanus* var. *glaber* - *Eriogonum fasciculatum* Shrubland [Placeholder] (CEGL003036, G3?)
- *Purshia stansburiana* / *Pseudoroegneria spicata* Shrubland (CEGL001053, G2G4)
- *Purshia stansburiana* Shrubland [Provisional] (CEGL002957, GNR)
- *Quercus turbinella* - (*Amelanchier utahensis*) Colluvial Shrubland (CEGL002950, GNR)
- *Quercus turbinella* - *Ephedra viridis* Shrubland (CEGL000980, G3?)
- *Quercus turbinella* - *Juniperus osteosperma* Shrubland (CEGL000981, G4?)

Alliances:

- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Arctostaphylos pungens* Shrubland Alliance (A.789)
- *Ceanothus greggii* - *Fremontodendron californicum* Shrubland Alliance (A.766)
- *Ceanothus leucodermis* Shrubland Alliance (A.767)
- *Cercocarpus montanus* - *Eriogonum fasciculatum* Shrubland Alliance (A.848)
- *Purshia* (*stansburiana*, *mexicana*) Shrubland Alliance (A.833)
- *Quercus turbinella* Shrubland Alliance (A.793)

DISTRIBUTION

Range: Western and central Great Basin.

Divisions: 206:C; 304:C

Nations: US

Subnations: CA, NV

Map Zones: 4:?, 6:C, 7:P, 9:C, 12:C, 13:C, 15:C, 16:?, 17:C, 18:C

USFS Ecomap Regions: 313A:??, 341A:CP, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342J:CP, M261E:CC, M341A:CC, M341D:CP

TNC Ecoregions: 11:C, 12:C, 15:P

SOURCES

References: Barbour and Major 1977, Comer et al. 2003, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722704#references

Description Author: K. Schulz, P. Comer

Version: 24 Mar 2003

Concept Author: K. Schulz, P. Comer

Stakeholders: West

ClassifResp: West

1079 GREAT BASIN XERIC MIXED SAGEBRUSH SHRUBLAND (CES304.774)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Aridic; Low *Artemisia* spp.

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Foothill(s); Hill(s); Piedmont; Plain; Plateau; Alluvial fan; Sideslope; Alluvial plain; Temperate [Temperate Continental]; Alkaline Soil; Shallow Soil

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2079; ESLF 5256; ESP 1079

CONCEPT

Summary: This ecological system occurs in the Great Basin on dry flats and plains, alluvial fans, rolling hills, rocky hillslopes, saddles and ridges at elevations between 1000 and 2600 m. Sites are dry, often exposed to desiccating winds, with typically shallow, rocky, non-saline soils. Shrublands are dominated by *Artemisia nova* (mid and low elevations), *Artemisia arbuscula* ssp. *longicaulis*, or *Artemisia arbuscula* ssp. *longiloba* (higher elevation) and may be codominated by *Artemisia tridentata* ssp. *wyomingensis* or *Chrysothamnus viscidiflorus*. Other shrubs that may be present include *Atriplex confertifolia*, *Ephedra* spp., *Ericameria* spp., *Grayia spinosa*, *Lycium shockleyi*, *Picrothamnus desertorum*, *Sarcobatus vermiculatus*, and *Tetradymia* spp. The herbaceous layer is likely sparse and composed of perennial bunch grasses, such as *Achnatherum hymenoides*, *Achnatherum speciosum*, *Achnatherum thurberianum*, *Elymus elymoides*, or *Poa secunda*.

Related Concepts:

- Black Sagebrush (405) (Shiflet 1994) Intersecting
- Low Sagebrush (406) (Shiflet 1994) Intersecting. Drier portions of this SRM type overlap with this system.
- Wyoming Big Sagebrush (403) (Shiflet 1994) Intersecting. Drier portions of this SRM type overlap with this ecological system in the Great Basin region.

DESCRIPTION

Environment: This ecological system is widely distributed in the western United States. Climate is generally arid with 20 to 30 cm of annual precipitation and warm summers and cold winters. This shrubland system occurs at elevations from 1000 to 2600 m in the southwestern United States. It occupies flat to steeply sloping upland sites, on a wide variety of landform positions. These include toeslopes, lower and middle slopes, badly eroded badland slopes, and foothills. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils that are well-drained. Sloping sites tend to have southerly aspects. Soil texture is loam, sandy loam, or clay loam (Hansen and Hoffman 1988), and there is often a significant amount of coarse fragments in the soil profile. Hironaka et al. (1983) reported that most of the habitat occurred on calcareous soils, often with a cemented duripan or silica hardpan at about 1 m in depth.

Dynamics: This shrubland system is associated with shallow, rocky soils which experience extreme drought in summer. The plants are low and widely spaced, which tends to decrease the risk of fire (Chappell et al. 1997). Barbour and Major (1988) report that *Artemisia nova* is utilized by livestock to a much greater degree than other species of *Artemisia*, resulting in low, pruned plants. *Artemisia nova* dwarf-shrublands grow in more xeric sites than other *Artemisia* shrublands. Blackburn and Tueller (1970) noted rapid invasion of these communities by *Juniperus osteosperma* and *Pinus monophylla* in Nevada, citing overgrazing coupled with fire suppression, and possibly climate change as causative variables.

MEMBERSHIP

Associations:

- *Artemisia arbuscula* ssp. *arbuscula* - *Artemisia tridentata* ssp. *wyomingensis* / *Festuca idahoensis* Shrubland [Provisional] (CEGL002983, GNR)
- *Artemisia arbuscula* ssp. *longicaulis* - *Grayia spinosa* Shrubland (CEGL002984, G4)
- *Artemisia arbuscula* ssp. *longicaulis* / *Bromus tectorum* Semi-natural Shrubland (CEGL002985, GNA)
- *Artemisia arbuscula* ssp. *longicaulis* / *Elymus elymoides* Shrubland (CEGL002986, G3)
- *Artemisia arbuscula* ssp. *longiloba* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001522, G2)
- *Artemisia arbuscula* ssp. *longiloba* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001415, GU)
- *Artemisia arbuscula* ssp. *longiloba* / *Poa secunda* Shrub Herbaceous Vegetation (CEGL001523, G3Q)
- *Artemisia arbuscula* ssp. *longiloba* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001416, GNR)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland (CEGL001414, G4G5)
- *Artemisia nova* - *Ericameria nana* Shrubland (CEGL002773, G3)
- *Artemisia nova* - *Gutierrezia sarothrae* / *Bouteloua gracilis* - *Pleuraphis jamesii* Shrubland (CEGL001419, G4)
- *Artemisia nova* / *Achnatherum hymenoides* Shrubland (CEGL001422, G4G5)
- *Artemisia nova* / *Elymus elymoides* Shrubland (CEGL001418, G4G5)
- *Artemisia nova* / *Hesperostipa comata* Shrubland (CEGL001425, G3?)

- *Artemisia nova* / *Pleuraphis jamesii* Shrubland (CEGL001420, G3G5)
- *Artemisia nova* / *Poa fendleriana* Shrubland (CEGL002698, GNR)
- *Artemisia nova* / *Poa secunda* Shrubland (CEGL001423, G3)
- *Artemisia nova* / *Pseudoroegneria spicata* Shrubland (CEGL001424, G4G5)
- *Artemisia nova* Shrubland (CEGL001417, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis* - *Atriplex confertifolia* Shrubland (CEGL001040, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis* - *Purshia tridentata* / *Pseudoroegneria spicata* Shrubland (CEGL001050, G3Q)
- *Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum hymenoides* Shrubland (CEGL001046, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum thurberianum* Shrubland (CEGL001052, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / *Balsamorhiza sagittata* Shrubland (CEGL000994, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Bouteloua gracilis* Shrubland (CEGL001041, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Elymus elymoides* Shrubland (CEGL001043, G4G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Shrubland (CEGL001051, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Poa secunda* Shrubland (CEGL001049, G4)
- *Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535, G4)
- *Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrubland (CEGL001009, G5?)
- *Grayia spinosa* / *Achnatherum hymenoides* Shrubland (CEGL001350, G4)
- *Grayia spinosa* / *Artemisia nova* / *Achnatherum speciosum* Shrubland (CEGL001344, G4)

Alliances:

- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)
- *Artemisia arbuscula* ssp. *longicaulis* Shrubland Alliance (A.2548)
- *Artemisia arbuscula* ssp. *longiloba* Shrub Herbaceous Alliance (A.2552)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance (A.2549)
- *Artemisia nova* Shrubland Alliance (A.1105)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Grayia spinosa* Shrubland Alliance (A.1038)

DISTRIBUTION

Range: This system occurs in the Great Basin on dry flats and plains, alluvial fans, rolling hills, rocky hillslopes, saddles and ridges at elevations between 1000 and 2600 m.

Divisions: 206:C; 304:C

Nations: US

Subnations: CA, ID?, NV, OR, UT

Map Zones: 4:?, 6:P, 7:?, 9:C, 10:C, 12:C, 13:P, 16:C, 17:C, 18:C

USFS Ecomap Regions: 322A:CC, 341A:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342J:CC, M261E:CC, M261G:C?, M331D:CC, M332G:CC, M341A:CC, M341C:CP, M341D:CC

TNC Ecoregions: 6:P, 11:C, 12:C, 18:P

SOURCES

References: Baker and Kennedy 1985, Barbour and Major 1988, Blackburn and Tueller 1970, Chappell et al. 1997, Comer et al. 2003, Hansen and Hoffman 1988, Hironaka et al. 1983, West 1983a

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722898#references

Description Author: Western Ecology Group, mod. M.S. Reid

Version: 25 Apr 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1080 INTER-MOUNTAIN BASINS BIG SAGEBRUSH SHRUBLAND (CES304.777)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Deep Soil; Aridic; *Artemisia tridentata* ssp. *tridentata*

Non-Diagnostic Classifiers: Plain; Alluvial plain; Temperate [Temperate Continental]; Alkaline Soil; Xeromorphic Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2080; ESLF 5257; ESP 1080

CONCEPT

Summary: This ecological system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500 and 2300 m elevation. Soils are typically deep, well-drained and non-saline. These shrublands are dominated by *Artemisia tridentata* ssp. *tridentata* (not as common in Wyoming or Montana but possibly on stabilized part of Killpecker Dunes in Wyoming) and/or *Artemisia tridentata* ssp. *wyomingensis* (predominant in Wyoming and Montana). Scattered *Juniperus* spp., *Sarcobatus vermiculatus*, and *Atriplex* spp. may be present in some stands. *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Purshia tridentata* (not commonly in Montana or Wyoming), or *Symphoricarpos oreophilus* may codominate disturbed stands (e.g., in burned stands, these may become more predominant). Perennial herbaceous components typically contribute less than 25% vegetative cover. Common graminoid species can include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus lanceolatus*, *Festuca idahoensis* (not in Montana or Wyoming), *Hesperostipa comata*, *Leymus cinereus*, *Pleuraphis jamesii* (not present in northeastern portions of the range), *Pascopyrum smithii*, *Poa secunda*, or *Pseudoroegneria spicata* (not in Wyoming). Some semi-natural communities are included that often originate on abandoned agricultural land or on other disturbed sites. In these locations, *Bromus tectorum* or other annual bromes and invasive weeds can be abundant. Most *Artemisia tridentata* ssp. *wyomingensis* communities in Wyoming are placed in Inter-Mountain Basins Big Sagebrush Steppe (CES304.778); the shrubland system is more restricted in environmental setting than the steppe. Dunes in the Red Desert have areas of large basin big sage with very dense canopies. In Wyoming, this system is likely to only contain *Artemisia tridentata* ssp. *tridentata*.

Related Concepts:

- Basin Big Sagebrush (401) (Shiflet 1994) Intersecting
- Bitterbrush (210) (Shiflet 1994) Intersecting. *Purshia tridentata* shrublands included in this ecological system.
- Bitterbrush - Bluebunch Wheatgrass (317) (Shiflet 1994) Finer. Bitterbrush-dominated communities are included in the big sage steppe and shrubland systems.
- Bitterbrush - Idaho Fescue (318) (Shiflet 1994) Finer. Bitterbrush-dominated communities are included in the big sage steppe and shrubland systems.
- Bitterbrush - Rough Fescue (319) (Shiflet 1994) Finer. Bitterbrush-dominated communities are included in the big sage steppe and shrubland systems.
- Threetip Sagebrush - Idaho Fescue (324) (Shiflet 1994) Broader. *Artemisia tripartita* ssp. *tripartita* communities are included in this ecological system.
- Wyoming Big Sagebrush (403) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) / *Pseudoroegneria spicata* - *Poa secunda* Shrub Herbaceous Vegetation (CEGL001019, G1)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001018, G1)
- *Artemisia tridentata* - (*Ericameria nauseosa*) / *Bromus tectorum* Semi-natural Shrubland (CEGL002699, GNA)
- *Artemisia tridentata* - *Ephedra nevadensis* Shrubland (CEGL001002, G5)
- *Artemisia tridentata* - *Ephedra viridis* Shrubland (CEGL001003, G5)
- *Artemisia tridentata* / *Achnatherum hymenoides* Shrubland (CEGL001006, G3G5)
- *Artemisia tridentata* / *Achnatherum lettermanii* Shrubland (CEGL001011, G5)
- *Artemisia tridentata* / *Bouteloua gracilis* - *Pascopyrum smithii* Shrubland (CEGL000997, G5)
- *Artemisia tridentata* / *Bouteloua gracilis* - *Pleuraphis jamesii* Shrubland (CEGL000996, G5)
- *Artemisia tridentata* / *Bouteloua gracilis* Shrubland (CEGL000995, G4)
- *Artemisia tridentata* / *Chrysothamnus viscidiflorus* / *Poa secunda* Shrubland (CEGL000999, G5)
- *Artemisia tridentata* / *Elymus elymoides* Shrubland (CEGL001001, G5?)
- *Artemisia tridentata* / *Ericameria nauseosa* Shrubland (CEGL000998, G5)
- *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata* / *Leymus cinereus* Shrub Herbaceous Vegetation (CEGL001458, G2G4)

- *Artemisia tridentata* / *Pleuraphis jamesii* Shrubland (CEGL001005, G5)
- *Artemisia tridentata* / *Symphoricarpos longiflorus* Shrubland (CEGL001012, G5)
- *Artemisia tridentata* Shrubland (CEGL000991, G5?)
- *Artemisia tridentata* ssp. *tridentata* - *Grayia spinosa* Shrubland (CEGL001004, G5)
- *Artemisia tridentata* ssp. *tridentata* / *Distichlis spicata* Shrubland (CEGL001000, G5)
- *Artemisia tridentata* ssp. *tridentata* / *Festuca idahoensis* Shrubland (CEGL001014, G4?)
- *Artemisia tridentata* ssp. *tridentata* / *Hesperostipa comata* Shrubland (CEGL002966, G4?)
- *Artemisia tridentata* ssp. *tridentata* / *Leymus cinereus* Shrubland (CEGL001016, G2)
- *Artemisia tridentata* ssp. *tridentata* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrubland (CEGL001017, G3?)
- *Artemisia tridentata* ssp. *tridentata* / *Pleuraphis jamesii* Shrubland (CEGL001015, G2G4)
- *Artemisia tridentata* ssp. *tridentata* / *Poa secunda* Shrubland (CEGL001008, G3G5)
- *Artemisia tridentata* ssp. *tridentata* / *Sporobolus airoides* Shrubland (CEGL002200, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Pascopyrum smithii* Shrubland (CEGL001028, G3?)
- *Artemisia tridentata* ssp. *wyomingensis* - *Peraphyllum ramosissimum* / *Festuca idahoensis* Shrubland (CEGL001048, G2)
- *Artemisia tridentata* ssp. *wyomingensis* - *Purshia tridentata* / *Pseudoroegneria spicata* Shrubland (CEGL001050, G3Q)
- *Artemisia tridentata* ssp. *wyomingensis* / (*Agropyron cristatum*, *Psathyrostachys juncea*) Seeded Grasses Semi-natural Shrubland (CEGL002185, GNA)
- *Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum hymenoides* Shrubland (CEGL001046, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum pinetorum* Shrubland (CEGL002810, GNR)
- *Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum thurberianum* Shrubland (CEGL001052, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / *Balsamorhiza sagittata* Shrubland (CEGL000994, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Bouteloua gracilis* Shrubland (CEGL001041, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Carex filifolia* Shrubland (CEGL001042, G1Q)
- *Artemisia tridentata* ssp. *wyomingensis* / Disturbed Understory Semi-natural Shrubland (CEGL002083, GNA)
- *Artemisia tridentata* ssp. *wyomingensis* / *Elymus albicans* Shrubland (CEGL001044, G4)
- *Artemisia tridentata* ssp. *wyomingensis* / *Elymus elymoides* Shrubland (CEGL001043, G4G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Colorado Plateau Shrubland (CEGL002761, GNR)
- *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Shrubland (CEGL001051, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / *Leymus ambiguus* Shrubland (CEGL001045, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / *Leymus salinus* Shrubland (CEGL002813, GNR)
- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001047, G4)
- *Artemisia tridentata* ssp. *wyomingensis* / *Pleuraphis jamesii* Shrubland (CEGL002084, GNR)
- *Artemisia tridentata* ssp. *wyomingensis* / *Poa fendleriana* Shrubland (CEGL002775, GNR)
- *Artemisia tridentata* ssp. *wyomingensis* / *Poa secunda* Shrubland (CEGL001049, G4)
- *Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535, G4)
- *Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrubland (CEGL001009, G5?)
- *Artemisia tridentata* ssp. *wyomingensis* / Sparse Understory Shrubland (CEGL002768, GNR)
- *Artemisia tridentata* Upperzone Community Shrubland (CEGL001013, G5?)
- *Ericameria nauseosa* Shrubland (CEGL002713, G5)
- *Grayia spinosa* / *Achnatherum hymenoides* Shrubland (CEGL001350, G4)
- *Krascheninnikovia lanata* / *Hesperostipa comata* Dwarf-shrubland (CEGL001327, G3)

Alliances:

- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (A.831)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)

DISTRIBUTION

Range: This system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500-2300 m elevation. It occurs as far east as central and eastern Montana, although much of the sagebrush in this region is more steppe in physiognomy.

Divisions: 303:C; 304:C; 306:C

Nations: US

Subnations: CA, CO, ID, MT, NV, OR, UT, WA, WY

Map Zones: 6:P, 7:C, 8:C, 9:C, 10:C, 12:C, 13:C, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:P, 27:?, 28:C, 29:C, 30:P, 31:?, 33:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315H:CC, 321A:??, 322A:CC, 331A:CC, 331D:CP, 331E:CP, 331F:CC, 331G:CC, 331H:C?, 331J:CC, 331K:CC, 331L:CP, 331M:CP, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:C?, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333C:C?, M333D:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 26:C, 27:C

SOURCES

References: Barbour and Billings 1988, Barbour and Major 1977, Comer et al. 2003, Holland and Keil 1995, West 1983a

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722895#references

Description Author: NatureServe Western Ecology Team

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

1066 INTER-MOUNTAIN BASINS MAT SALTBUSH SHRUBLAND (CES304.783)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Plain; Shrubland (Shrub-dominated); Alluvial flat; Alluvial plain; Alkaline Soil; Saline Substrate Chemistry; Calcareous; Silt Soil Texture; Clay Soil Texture; Dwarf-Shrub; *Atriplex* spp.

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Oligotrophic Soil; Basin floor

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Evergreen dwarf-shrubland

National Mapping Codes: EVT 2066; ESLF 5203; ESP 1066

CONCEPT

Summary: This ecological system occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos shale and arid, windswept basins and plains across parts of Wyoming. It is also found in eastern Wyoming in Great Plains areas, and may extend north into Montana and Canada. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. These landscapes typically support dwarf-shrublands composed of relatively pure stands of *Atriplex* spp., such as *Atriplex corrugata* (in Colorado and Utah) or *Atriplex gardneri* (Wyoming and Montana into Canada). Other dominant or codominant dwarf-shrubs may include *Artemisia longifolia*, *Artemisia pedatifida* (very important in Wyoming, rare in Colorado stands), or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs, such as *Krascheninnikovia lanata* or *Tetradymia spinosa*. *Atriplex confertifolia* or *Atriplex canescens* may be present but do not codominate. *Artemisia tridentata* ssp. *wyomingensis* can occur in patches within this system. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*; perennial grasses *Achnatherum hymenoides*, *Bouteloua gracilis* (not in Wyoming), *Elymus elymoides*, *Elymus lanceolatus* ssp. *lanceolatus*, *Pascopyrum smithii*, *Poa secunda*, or *Sporobolus airoides* may dominate the herbaceous layer. In less saline areas, there may be inclusions of grasslands dominated by *Hesperostipa comata*, *Leymus salinus*, *Pascopyrum smithii*, or *Pseudoroegneria spicata*. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops dominated by cushion plants such as *Arenaria hookeri* and *Phlox hoodii* without dwarf-shrubs may be present (these are not restricted to this system). Annuals are seasonally present and may include *Eriogonum inflatum*, *Plantago tweedyi*, *Monolepis nuttalliana*, and the introduced annual grass *Bromus tectorum*. In Montana, *Atriplex gardneri* also occurs associated with badlands, and determining which system it falls into may be difficult.

Classification Comments: Reviewers have proposed renaming this system to be more "broad" than just mat saltbush (*Atriplex corrugata*), but an alternative name has not yet been identified.

Related Concepts:

- Other Sagebrush Types (408) (Shiflet 1994) Intersecting
- Saltbush - Greasewood (501) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This ecological system occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos shale and arid, windswept plains and basins across parts of Wyoming. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops may be present.

Vegetation: This ecological system typically supports dwarf-shrublands composed of relatively pure stands of *Atriplex* spp., such as *Atriplex corrugata* or *Atriplex gardneri*. Other dominant or codominant dwarf-shrub may include *Artemisia longifolia*, *Artemisia pedatifida*, or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs, such as *Krascheninnikovia lanata* or *Tetradymia spinosa*. *Atriplex confertifolia* or *Atriplex canescens* may be present but do not codominate. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*, and the perennial grasses *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, *Elymus lanceolatus* ssp. *lanceolatus*, *Pascopyrum smithii*, or *Sporobolus airoides* may dominate the herbaceous layer. In less saline areas, there may be inclusions of grasslands dominated by *Hesperostipa comata*, *Leymus salinus*, *Pascopyrum smithii*, or *Pseudoroegneria spicata*. In Wyoming and possibly elsewhere, vegetation dominated by cushion plants such as *Arenaria hookeri* and *Phlox hoodii* without dwarf-shrubs may be present and occurs on inclusions of non-saline, gravelly barrens or rock outcrops. Annuals are seasonally present and may include *Eriogonum inflatum*, *Plantago tweedyi*, and the introduced annual grass *Bromus tectorum*.

MEMBERSHIP

Associations:

- *Artemisia pedatifida* / *Elymus elymoides* Shrubland (CEGL001450, G3?)
- *Artemisia pedatifida* / *Festuca idahoensis* Shrubland (CEGL001526, G2?)
- *Artemisia pedatifida* / *Pascopyrum smithii* Shrubland (CEGL001451, G3?)
- *Artemisia pedatifida* / *Pseudoroegneria spicata* Shrubland (CEGL001527, G3)
- *Atriplex corrugata* Dwarf-shrubland (CEGL001437, G5)

- *Atriplex cuneata* - *Frankenia jamesii* / *Sporobolus airoides* Shrubland (CEGL001316, G1?)
- *Atriplex gardneri* - *Picrothamnus desertorum* Dwarf-shrubland (CEGL001439, G2G3)
- *Atriplex gardneri* / *Achnatherum hymenoides* Dwarf-shrubland (CEGL001444, G3)
- *Atriplex gardneri* / *Artemisia tridentata* Dwarf-shrubland (CEGL001440, G3)
- *Atriplex gardneri* / *Leymus salinus* Dwarf-shrubland (CEGL001442, G2?)
- *Atriplex gardneri* / *Monolepis nuttalliana* Dwarf-shrubland (CEGL001443, G3?)
- *Atriplex gardneri* / *Pascopyrum smithii* Dwarf-shrubland (CEGL001445, G3)
- *Atriplex gardneri* / *Pleuraphis jamesii* Dwarf-shrubland (CEGL001441, G3G5)
- *Atriplex gardneri* / *Xylorhiza venusta* Dwarf-shrubland (CEGL001446, G3G5)
- *Atriplex gardneri* Dwarf-shrubland (CEGL001438, G3G5)

Alliances:

- *Artemisia pedatifida* Shrubland Alliance (A.1127)
- *Atriplex corrugata* Dwarf-shrubland Alliance (A.1109)
- *Atriplex cuneata* Shrubland Alliance (A.871)
- *Atriplex gardneri* Dwarf-shrubland Alliance (A.1110)

DISTRIBUTION

Range: This system occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos shale and arid, windswept basins and plains across parts of Wyoming, and possibly into Montana and Canada.

Divisions: 304:C

Nations: US

Subnations: AZ, CO, MT, NM, UT, WY

Map Zones: 13:?, 15:?, 16:P, 22:C, 23:C, 24:P, 28:P, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 341B:CC, 341C:CC, 342E:C?, 342F:C?, 342G:CC, 342J:C?, M331B:CC, M331D:C?, M331E:CC, M331G:CC, M331H:CC, M331J:C?, M341B:CC, M341C:CC

TNC Ecoregions: 10:C, 19:C

SOURCES

References: Branson et al. 1976, Comer et al. 2003, Knight 1994, Potter et al. 1985, Welsh 1957

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722889#references

Description Author: NatureServe Western Ecology Team

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1081 INTER-MOUNTAIN BASINS MIXED SALT DESERT SCRUB (CES304.784)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Plain; Shrubland (Shrub-dominated); Alluvial flat; Alluvial plain; Alkaline Soil; Saline Substrate Chemistry; Calcareous; Silt Soil Texture; Clay Soil Texture; Xeromorphic Shrub; Dwarf-Shrub; *Atriplex* spp.

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Oligotrophic Soil; Basin floor

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2081; ESLF 5258; ESP 1081

CONCEPT

Summary: This extensive ecological system includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain western U.S. This type also extends in limited distribution into the southern Great Plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species, such as *Atriplex confertifolia*, *Atriplex canescens*, *Atriplex polycarpa*, or *Atriplex spinifera*. *Grayia spinosa* tends to occur on coppice dunes that may have a silty component to them. Northern occurrences lack *Atriplex* species and are typically dominated by *Grayia spinosa*, *Krascheninnikovia lanata*, and/or *Artemisia tridentata*. Other shrubs present to codominant may include *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Ephedra nevadensis*, *Grayia spinosa*, *Krascheninnikovia lanata*, *Lycium* spp., *Picrothamnus desertorum*, or *Tetradymia* spp. In Wyoming, occurrences are typically a mix of *Atriplex confertifolia*, *Grayia spinosa*, *Artemisia tridentata* ssp. *wyomingensis*, *Sarcobatus vermiculatus*, *Krascheninnikovia lanata*, and various *Ericameria* or *Chrysothamnus* species. Some places are a mix of *Atriplex confertifolia* and *Artemisia tridentata* ssp. *wyomingensis*. In the Great Basin, *Sarcobatus vermiculatus* is generally absent but, if present, does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus lanceolatus* ssp. *lanceolatus*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pleuraphis rigida*, *Poa secunda*, or *Sporobolus airoides*. Various forbs are also present

Similar Ecological Systems:

- Inter-Mountain Basins Active and Stabilized Dune (CES304.775)

Related Concepts:

- Salt Desert Shrub (414) (Shiflet 1994) Broader
- Saltbush - Greasewood (501) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This salt-desert shrubland system is a matrix system in the Intermountain West. This system is comprised of arid to semi-arid shrublands on lowland and upland sites usually at elevations between 1520 and 2200 m (4987-7218 feet). Sites can be found on all aspects and include valley bottoms, alluvial and alkaline flats, mesas and plateaus, playas, drainage terraces, washes and interdune basins, bluffs, and gentle to moderately steep sandy or rocky slopes. Slopes are typically gentle to moderately steep but are sometimes unstable and prone to surface movement. Many areas within this system are degraded due to erosion and may resemble "badlands." Soil surface is often very barren in occurrences of this system. The interspaces between the characteristic plant clusters are commonly covered by a microphytic crust (West 1982).

This is typically a system of extreme climatic conditions, with warm to hot summers and freezing winters. Annual precipitation ranges from approximately 13-33 cm. In much of the ecological system, the period of greatest moisture will be mid- to late summer, although in the more northern areas a moist period is to be expected in the cold part of the year. However, plotted seasonality of occurrence is probably of less importance on this desert system than in other ecosystems because desert precipitation comes with an extreme irregularity that does not appear in graphs of long-term seasonal or monthly averages (Blaisdell and Holmgren 1984). Soils are shallow to moderately deep, poorly developed, and a product of an arid climate and little precipitation. Soils are often alkaline or saline. Vegetation within this system is tolerant of these soil conditions but not restricted to it. The shallow soils of much of the area are poorly developed Entisols. Vegetation within this system can occur on level pediment remnants where coarse-textured and well-developed soil profiles have been derived from sandstone gravel and are alkaline, or on Mancos shale badlands, where soil profiles are typically fine-textured and non-alkaline throughout (West and Ibrahim 1968). They can also occur in alluvial basins where parent materials from the other habitats have been deposited over Mancos shale and the soils are heavy-textured and saline-alkaline throughout the profile (West and Ibrahim 1968).

Vegetation: Occurrences of this ecological system vary from almost pure occurrences of single species to fairly complex mixtures. The characteristic mix of low shrubs and grasses is sparse, with large open spaces between the plants (Blaisdell and Holmgren 1984). Occurrences have a sparse to moderately dense cover of woody species that is dominated by *Atriplex canescens* (may codominate with *Artemisia tridentata*), *Atriplex confertifolia* (may codominate with *Lycium andersonii*), *Atriplex obovata*, *Picrothamnus desertorum*, or *Krascheninnikovia lanata*. Other shrubs that may occur within these occurrences include *Purshia stansburiana*, *Psoralea polydenius*, *Ephedra* spp., *Acacia greggii*, *Encelia frutescens*, *Tiquilia lator*, *Parthenium confertum*, *Atriplex polycarpa*, *Atriplex*

lentiformis, *Atriplex spinifera*, *Picrothamnus desertorum* (= *Artemisia spinescens*), *Frankenia salina*, *Artemisia frigida*, *Chrysothamnus* spp., *Lycium* spp., *Suaeda* spp., *Yucca glauca*, and *Tetradymia spinosa*. Dwarf-shrubs include *Gutierrezia sarothrae* and *Eriogonum* spp. Warm-season medium-tall and short perennial grasses dominate in the sparse to moderately dense graminoid layer. The species present depend on the geographic range of the grasses, alkalinity/salinity and past land use. Species may include *Pleuraphis jamesii*, *Bouteloua gracilis*, *Sporobolus airoides*, *Sporobolus cryptandrus*, *Achnatherum hymenoides*, *Elymus elymoides*, *Distichlis spicata*, *Leymus salinus*, *Pascopyrum smithii*, *Hesperostipa comata*, *Pseudoroegneria spicata*, *Poa secunda*, *Leymus ambiguus*, and *Muhlenbergia torreyi*. A number of annual species may also grow in association with the shrubs and grasses of this system, although they are usually rare and confined to areas of recent disturbance (Blaisdell and Holmgren 1984). Forb cover is generally sparse. Perennial forbs that might occur include *Sphaeralcea coccinea*, *Chaetopappa ericoides*, *Xylorhiza venusta*, *Descurainia sophia*, and *Mentzelia* species. Annual natives include *Plantago* spp., *Vulpia octoflora*, or *Monolepis nuttalliana*. Associated halophytic annuals include *Salicornia rubra*, *Salicornia bigelovii*, and *Suaeda* species. Exotic annuals that may occur include *Salsola kali*, *Bromus rubens*, and *Bromus tectorum*. Cacti like *Opuntia* spp. and *Echinocereus* spp. may be present in some occurrences. Trees are not usually present but some scattered *Juniperus* spp. may be found.

Dynamics: West (1982) stated that "salt desert shrub vegetation occurs mostly in two kinds of situations that promote soil salinity, alkalinity, or both. These are either at the bottom of drainages in enclosed basins or where marine shales outcrop." However, salt-desert shrub vegetation may be an indication of climatically dry as well as physiologically dry soils (Blaisdell and Holmgren 1984). Not all salt-desert shrub soils are salty, and their hydrologic characteristics may often be responsible for the associated vegetation (Naphan 1966). Species of the salt-desert shrub complex have different degrees of tolerance to salinity and aridity, and they tend to sort themselves out along a moisture/salinity gradient (West 1982). Species and communities are apparently sorted out along physical, chemical, moisture, and topographic gradients through complex relations that are not understood and are in need of further study (Blaisdell and Holmgren 1984).

The winter months within this system are a good time for soil moisture accumulation and storage. There is generally at least one good snow storm per season that will provide sufficient moisture to the vegetation. The winter moisture accumulation amounts will affect spring plant growth. Plants may grow as little as a few inches to 1 m. Unless more rains come in the spring, the soil moisture will be depleted in a few weeks, growth will slow and ultimately cease, and the perennial plants will assume their various forms of dormancy (Blaisdell and Holmgren 1984). If effective rain comes later in the warm season, some of the species will renew their growth from the stage at which it had stopped. Others, having died back, will start over as if emerging from winter dormancy (Blaisdell and Holmgren 1984). *Atriplex confertifolia* shrubs often develop large leaves in the spring, which increase the rate of photosynthesis. As soil moisture decreases, the leaves are lost, and the plant takes on a dead appearance. During late fall, very small overwintering leaves appear which provide some photosynthetic capability through the remainder of the year (IVC 1999). Other communities are maintained by intra- or inter-annual cycles of flooding followed by extended drought, which favor accumulation of transported salts. The moisture supporting these intermittently flooded wetlands is usually derived off-site, and they are dependent upon natural watershed function for persistence (Reid et al. 1999).

In summary, desert communities of perennial plants are dynamic and changing. The composition within this system may change dramatically and may be both cyclic and unidirectional. Superimposed on the compositional change is great variation from year to year in growth of all the vegetation, the sum of varying growth responses of individual species to specific conditions of different years (Blaisdell and Holmgren 1984). Desert plants grow when temperature is satisfactory, but only if soil moisture is available at the same time. Because amount of moisture is variable from year to year and because different species flourish under different seasons of soil moisture, seldom do all components of the vegetation thrive in the same year (Blaisdell and Holmgren 1984).

MEMBERSHIP

Associations:

- *Artemisia tridentata* - *Atriplex canescens* - *Sarcobatus vermiculatus* / (*Achnatherum hymenoides*) Shrubland (CEGL001355, G1)
- *Artemisia tridentata* ssp. *wyomingensis* - *Atriplex confertifolia* Shrubland (CEGL001040, G3G5)
- *Atriplex* (*lentiformis*, *polycarpa*) Shrubland [Placeholder] (CEGL003016, G3)
- *Atriplex canescens* - *Artemisia tridentata* Shrubland (CEGL001282, G4)
- *Atriplex canescens* - *Ephedra viridis* Talus Shrubland (CEGL001287, G4)
- *Atriplex canescens* - *Krascheninnikovia lanata* Shrubland (CEGL001285, G5)
- *Atriplex canescens* / *Achnatherum hymenoides* Shrubland (CEGL001289, G3G5)
- *Atriplex canescens* / *Bouteloua gracilis* Shrubland (CEGL001283, G3)
- *Atriplex canescens* / *Calycoseris parryi* Shrubland (CEGL001284, G2)
- *Atriplex canescens* / *Parthenium confertum* Shrubland (CEGL001290, GNRQ)
- *Atriplex canescens* / *Pleuraphis jamesii* Shrubland (CEGL001288, G3G4)
- *Atriplex canescens* / *Purshia stansburiana* Shrubland (CEGL001286, GUQ)
- *Atriplex canescens* / *Sporobolus airoides* Shrubland (CEGL001291, G5?)
- *Atriplex canescens* / *Sporobolus wrightii* Shrubland (CEGL001292, GNRQ)
- *Atriplex canescens* Shrubland (CEGL001281, G5)
- *Atriplex confertifolia* - *Ephedra nevadensis* Shrubland (CEGL001303, G5)
- *Atriplex confertifolia* - *Krascheninnikovia lanata* Shrubland (CEGL001301, G3G5)
- *Atriplex confertifolia* - *Lycium andersonii* Shrubland (CEGL001308, G3)
- *Atriplex confertifolia* - *Lycium pallidum* / *Mirabilis pudica* Shrubland (CEGL001309, G3G4Q)
- *Atriplex confertifolia* - *Lycium shockleyi* Shrubland (CEGL001310, G4)

- *Atriplex confertifolia* - *Picrothamnus desertorum* / *Achnatherum hymenoides* Shrubland (CEGL001297, G5?)
- *Atriplex confertifolia* - *Picrothamnus desertorum* / *Krascheninnikovia lanata* Shrubland (CEGL001296, G5?)
- *Atriplex confertifolia* - *Picrothamnus desertorum* / *Sarcobatus vermiculatus* Shrubland (CEGL001298, G5?)
- *Atriplex confertifolia* - *Picrothamnus desertorum* Shrubland (CEGL001295, G5)
- *Atriplex confertifolia* - *Sarcobatus vermiculatus* Shrubland (CEGL001313, G5)
- *Atriplex confertifolia* / *Achnatherum hymenoides* Shrubland (CEGL001311, G3)
- *Atriplex confertifolia* / *Elymus elymoides* Shrubland (CEGL001302, G3G5)
- *Atriplex confertifolia* / *Ericameria nauseosa* Shrubland (CEGL001300, G3Q)
- *Atriplex confertifolia* / *Hesperostipa comata* Shrubland (CEGL001314, G2)
- *Atriplex confertifolia* / *Kochia americana* Shrubland (CEGL001305, G3G5)
- *Atriplex confertifolia* / *Leymus salinus* Shrubland (CEGL001307, G3G5)
- *Atriplex confertifolia* / *Leymus salinus ssp. salmonis* Shrubland (CEGL001306, G2Q)
- *Atriplex confertifolia* / *Pleuraphis jamesii* Shrubland (CEGL001304, G3G5)
- *Atriplex confertifolia* / *Pseudoroegneria spicata* Shrubland (CEGL001312, G3)
- *Atriplex confertifolia* / *Tetradymia glabrata* Shrubland (CEGL001315, G3G5)
- *Atriplex confertifolia* Great Basin Shrubland (CEGL001294, G5)
- *Atriplex confertifolia* Wyoming Basins Shrubland (CEGL001293, G5)
- *Atriplex obovata* / *Sporobolus airoides* - *Pleuraphis jamesii* Shrub Herbaceous Vegetation (CEGL001775, GU)
- *Atriplex obovata* / *Sporobolus airoides* - *Sporobolus cryptandrus* Dwarf-shrubland (CEGL001447, G1Q)
- *Atriplex obovata* / *Tidestromia carnososa* Dwarf-shrubland (CEGL004575, G2?)
- *Atriplex parryi* Shrubland [Placeholder] (CEGL002711, G3)
- *Atriplex polycarpa* / *Pleuraphis mutica* Shrubland (CEGL001319, GU)
- *Atriplex polycarpa* Shrubland (CEGL001318, G5)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Krascheninnikovia lanata* / *Achnatherum hymenoides* Dwarf-shrubland (CEGL001323, G4)
- *Krascheninnikovia lanata* / *Hesperostipa comata* Dwarf-shrubland (CEGL001327, G3)
- *Krascheninnikovia lanata* Dwarf-shrubland (CEGL001320, G5?)
- *Picrothamnus desertorum* / *Elymus elymoides* Shrubland [Provisional] (CEGL002992, GNR)
- *Picrothamnus desertorum* Shrubland (CEGL001452, G3G4)

Alliances:

- *Artemisia tridentata ssp. wyomingensis* Shrubland Alliance (A.832)
- *Atriplex (lentiformis, polycarpa)* Shrubland Alliance (A.864)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Atriplex confertifolia* Shrubland Alliance (A.870)
- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Atriplex parryi* Shrubland Alliance (A.2507)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Picrothamnus desertorum* Shrubland Alliance (A.1128)
- *Sporobolus airoides* - (*Pleuraphis jamesii*) Shrub Herbaceous Alliance (A.1532)

DISTRIBUTION

Range: This system occurs in the Intermountain western U.S., extending in limited distribution into the southern Great Plains. In Wyoming, this system occurs in the Great Divide and Bighorn basins.

Divisions: 303:C; 304:C; 306:C

Nations: US

Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 6:P, 7:C, 8:P, 9:C, 10:C, 12:C, 13:C, 15:C, 16:C, 17:C, 18:C, 19:C, 21:?, 22:C, 23:C, 24:C, 25:C, 27:P, 28:C, 29:C, 30:?, 33:?, 34:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315B:CP, 315H:CC, 321A:CC, 322A:CC, 331A:CP, 331B:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:PP, M261D:CP, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CP, M332E:CC, M332F:CC, M332G:CP, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 4:?, 6:C, 8:?, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C, 27:C, 28:C

SOURCES

References: Barbour and Major 1988, Blaisdell and Holmgren 1984, Branson et al. 1967, Branson et al. 1976, Brown 1982, Campbell 1977, Comer et al. 2003, Francis 1986, Holland and Keil 1995, Knight 1994, Knight et al. 1987, Reid et al. 1999, Shiflet 1994, West 1979, West 1982, West 1983b, West and Ibrahim 1968

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722888#references

Description Author: NatureServe Western Ecology Team

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

1101 MADREAN ORIENTAL CHAPARRAL (CES302.031)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Shrubland (Shrub-dominated); Shallow Soil; Xeric; F-Patch/High Intensity

Non-Diagnostic Classifiers: Temperate [Temperate Xeric]

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2101; ESLF 5307; ESP 1101

CONCEPT

Summary: This ecological system occurs in mountains across southeastern New Mexico (Guadalupe Mountains), Trans-Pecos Texas (Chisos and Davis mountains) and Madrean Oriental in northern Mexico. It often dominates along the mid-elevation transition from the Chihuahuan Desert into mountains (1700-2500 m). It occurs on foothills, mountain slopes and canyons in drier habitats below the encinal and pine woodlands, and is often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes many shrub oak species, such as *Quercus emoryi*, *Quercus grisea*, *Quercus intricata*, *Quercus invaginata*, *Quercus laceyi*, *Quercus mohriana*, *Quercus pringlei*, *Quercus pungens*, and *Quercus vaseyana*, and several widespread chaparral species, such as *Arctostaphylos pungens*, *Ceanothus greggii*, *Cercocarpus montanus*, *Fallugia paradoxa*, and *Garrya wrightii*; other species characteristic of this system include *Arbutus xalapensis* (= *Arbutus texana*), *Fraxinus greggii*, *Fendlera rigida* (= *Fendlera linearis*), *Garrya ovata*, *Purshia mexicana*, *Rhus virens* var. *choriophylla* (= *Rhus choriophylla*), *Salvia lycioides* (= *Salvia ramosissima*), *Salvia roemeriana*, and *Salvia reglia*. In the Trans-Pecos of Texas, disjunct *Quercus gambelii* may occur as a significant component of this shrubland. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires. Grass cover may be significant. Dominant grasses often include *Bouteloua curtipendula*, *Bouteloua hirsuta*, and *Muhlenbergia emersleyi*.

Classification Comments: The similar Mogollon chaparral system has floristics mostly derived from the Sierra Madre Occidentale, whereas floristics of this system are derived from the Sierra Madre Oriental. However, this system is not matorral (thornscrub) as it is typically dominated by shrubby evergreen oaks and chaparral species, not thornscrub species. More survey is needed to determine if *Quercus turbinella*, common in the Mogollon Chaparral system, also occurs in the Madrean Oriental Chaparral.

Related Concepts:

- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Undetermined

MEMBERSHIP

Associations:

- *Cercocarpus montanus* / *Muhlenbergia pauciflora* Shrubland (CEGL001089, GNR)
- *Quercus intricata* - *Dasyliion leiophyllum* Shrubland (CEGL004530, GNR)
- *Quercus pungens* - *Cercocarpus montanus* Shrubland (CEGL003832, G3?)
- *Rhus virens* var. *choriophylla* / *Cercocarpus montanus* var. *paucidentatus* Shrubland (CEGL001123, G3)

Alliances:

- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Quercus intricata* Shrubland Alliance (A.781)
- *Quercus pungens* Shrubland Alliance (A.783)
- *Rhus virens* var. *choriophylla* Shrubland Alliance (A.922)

DISTRIBUTION

Range: This system is found on mountains across southeastern New Mexico, Trans-Pecos Texas and northern Mexico. It often dominates along the mid-elevation transition from the Chihuahuan Desert into mountains (1700-2500 m elevation).

Divisions: 301:P; 302:C; 305:P; 306:C

Nations: MX, US

Subnations: MXCH(MX), MXCO(MX), NM, TX?

Map Zones: 25:C, 26:C, 27:P

USFS Ecomap Regions: 315A:PP, 321A:CC, M313B:CC

TNC Ecoregions: 21:P, 22:P, 24:P

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 1994a, Muldavin et al. 2000b, Muldavin et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722675#references

Description Author: K. Schulz and P. Comer

Version: 10 Apr 2007
Concept Author: K. Schulz and P. Comer

Stakeholders: Latin America, Southeast, West
ClassifResp: West

1067 MEDITERRANEAN CALIFORNIA ALPINE FELL-FIELD (CES206.900)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Alpine Mosaic; Ridge/Summit/Upper Slope; Temperate [Temperate Oceanic]; Very Shallow Soil; Cushion plants

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Herbaceous; Moss/Lichen (Nonvascular); Talus (Landform); Sideslope; Talus (Substrate); Avalanche chute; Glaciated; W-Landscape/High Intensity; Dwarf-Shrub; Nonvascular; Cirque; Colluvial slope

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Mixed evergreen-deciduous dwarf-shrubland

National Mapping Codes: EVT 2067; ESLF 5204; ESP 1067

CONCEPT

Summary: This ecological system occurs in limited alpine environments mostly concentrated in the Sierra Nevada but also on Mount Shasta and as far south as the Peninsular Ranges and White Mountains. Alpine elevations begin around 3500 m (10,600 feet) in the southern mountain ranges and 2700 m (8200 feet) in the southern Cascades. Wind scours fell-fields free of snow in the winter, exposing the plants to severe environmental stress. These systems typically have immature soils. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes, and often densely hairy and thickly cutinized. Common species include *Ribes cereum*, *Leptodactylon pungens*, *Ericameria discoidea*, *Castilleja nana*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Phlox condensata*, *Draba densifolia*, *Oxyria digyna*, and *Aquilegia pubescens*. Plants cover 15-50%, while exposed rock makes up the rest. Fell-fields are usually nested within or adjacent to alpine tundra dry meadows.

Related Concepts:

- Alpine Grassland (213) (Shiflet 1994) Broader. SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub dominated, and wet meadows.

DISTRIBUTION

Range: This system occurs in limited alpine environments mostly concentrated in the Sierra Nevada but also on Mount Shasta and as far south as the Peninsular Ranges and White Mountains.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), NV, OR

Map Zones: 3:?, 4:P, 6:C, 7:C

USFS Ecomap Regions: M261D:CP, M261E:CC

TNC Ecoregions: 5:C, 12:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722781#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

1104 MOGOLLON CHAPARRAL (CES302.741)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Intermediate Disturbance Interval; F-Patch/High Intensity; Evergreen Sclerophyllous Shrub

Non-Diagnostic Classifiers: Montane [Montane]; Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Temperate [Temperate Xeric]; Xeric; Aridic; Broad-Leaved Evergreen Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2104; ESLF 5310; ESP 1104

CONCEPT

Summary: This ecological system occurs across central Arizona (Mogollon Rim), western New Mexico, and southern Utah and Nevada. It often dominates along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into mountains (1000-2200 m). It occurs on foothills, mountain slopes and canyons in hotter and drier habitats below the encinal and *Pinus ponderosa* woodlands. Stands are often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes species such as *Quercus turbinella*, *Quercus toumeyi*, *Cercocarpus montanus* var. *paucidentatus*, *Canotia holacantha*, *Ceanothus greggii*, *Garrya wrightii*, *Purshia stansburiana*, *Rhus ovata*, *Rhus trilobata*, and *Arctostaphylos pungens* and *Arctostaphylos pringlei* at higher elevations. Scattered remnant pinyon and juniper trees may be present. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

Related Concepts:

- Arizona Chaparral (503) (Shiflet 1994) Equivalent

MEMBERSHIP

Associations:

- *Arctostaphylos patula* - *Quercus gambelii* - (*Amelanchier utahensis*) Shrubland (CEGL002695, GNR)
- *Arctostaphylos patula* Shrubland (CEGL002696, GNR)
- *Arctostaphylos pungens* Shrubland (CEGL000958, G4)
- *Cercocarpus montanus* / *Garrya flavescens* Shrubland (CEGL001088, GNR)
- *Cercocarpus montanus* / *Muhlenbergia pauciflora* Shrubland (CEGL001089, GNR)
- *Mortonia scabrella* / *Dasyliirion wheeleri* Shrubland (CEGL001279, G4)
- *Purshia stansburiana* - *Arctostaphylos patula* Shrubland [Provisional] (CEGL002948, GNR)
- *Quercus pungens* - *Cercocarpus montanus* Shrubland (CEGL003832, G3?)
- *Quercus toumeyi* / *Bouteloua curtipendula* Shrubland (CEGL000975, G1)
- *Quercus turbinella* - (*Amelanchier utahensis*) Colluvial Shrubland (CEGL002950, GNR)
- *Quercus turbinella* - *Cercocarpus montanus* Shrubland (CEGL000979, G4)
- *Quercus turbinella* - *Coleogyne ramosissima* Shrubland (CEGL000982, G4)
- *Quercus turbinella* - *Ephedra viridis* Shrubland (CEGL000980, G3?)
- *Quercus turbinella* - *Garrya flavescens* - *Arctostaphylos pungens* Shrubland (CEGL000977, G4)
- *Quercus turbinella* - *Juniperus osteosperma* Shrubland (CEGL000981, G4?)
- *Quercus turbinella* / *Bouteloua eriopoda* Shrubland (CEGL000978, GNR)

Alliances:

- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Arctostaphylos pungens* Shrubland Alliance (A.789)
- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Mortonia sempervirens* Shrubland Alliance (A.859)
- *Purshia* (*stansburiana*, *mexicana*) Shrubland Alliance (A.833)
- *Quercus pungens* Shrubland Alliance (A.783)
- *Quercus toumeyi* Shrubland Alliance (A.792)
- *Quercus turbinella* Shrubland Alliance (A.793)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Sonoran Mid-Elevation Desert Scrub (CES302.035)

DISTRIBUTION

Range: This system occurs across central Arizona (Mogollon Rim), western New Mexico and southern Utah. It often dominates

along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into mountains (1000-2200 m elevation). It does not occur as far west as California.

Divisions: 302:C; 304:P; 306:P

Nations: MX?, US

Subnations: AZ, MXSO?(MX), NM, NV, UT

Map Zones: 12:?, 13:P, 14:C, 15:C, 16:P, 17:C, 23:C, 24:C, 25:C, 26:C, 27:P, 28:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, 341A:CP, 341F:CC, M313A:CC, M313B:CC, M341C:CC

TNC Ecoregions: 17:C, 19:C, 21:C, 22:C, 23:C, 24:C

SOURCES

References: Carmichael et al. 1978, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 1994a, Muldavin et al. 2000b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722931#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Stakeholders: Latin America, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

1082 MOJAVE MID-ELEVATION MIXED DESERT SCRUB (CES302.742)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Evergreen Sclerophyllous Tree

Non-Diagnostic Classifiers: Sideslope; Temperate [Temperate Xeric]; Aridic; Xeromorphic Shrub; Succulent Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2082; ESLF 5259; ESP 1082

CONCEPT

Summary: This ecological system represents the extensive desert scrub in the transition zone above *Larrea tridentata* - *Ambrosia dumosa* desert scrub and below the lower montane woodlands (700-1800 m elevations) that occur in the eastern and central Mojave Desert. It is also common on lower piedmont slopes in the transition zone into the southern Great Basin. The vegetation in this ecological system is quite variable. Codominants and diagnostic species include *Coleogyne ramosissima*, *Eriogonum fasciculatum*, *Ephedra nevadensis*, *Grayia spinosa*, *Lycium* spp., *Menodora spinescens*, *Nolina* spp., *Opuntia acanthocarpa*, *Salazaria mexicana*, *Viguiera parishii*, *Yucca brevifolia*, or *Yucca schidigera*. Less common are stands with scattered Joshua trees and a saltbush short-shrub layer dominated by *Atriplex canescens*, *Atriplex confertifolia*, or *Atriplex polycarpa*, or occasionally *Hymenoclea salsola*. In some areas in the western Mojave, *Juniperus californica* is common with the yuccas. Desert grasses, including *Achnatherum hymenoides*, *Achnatherum speciosum*, *Muhlenbergia porteri*, *Pleuraphis jamesii*, *Pleuraphis rigida*, or *Poa secunda*, may form an herbaceous layer. Scattered *Juniperus osteosperma* or desert scrub species may also be present.

Related Concepts:

- Blackbush (212) (Shiflet 1994) Broader
- Creosote Bush Scrub (211) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Artemisia tridentata* ssp. *tridentata* - *Grayia spinosa* Shrubland (CEGL001004, G5)
- *Coleogyne ramosissima* - *Eriogonum fasciculatum* Shrubland (CEGL001333, G5)
- *Coleogyne ramosissima* - *Purshia stansburiana* Shrubland (CEGL002720, G4?)
- *Coleogyne ramosissima* - *Thamnosma montana* Shrubland (CEGL002718, G4?)
- *Coleogyne ramosissima* Shrubland (CEGL001332, G4G5)
- *Ephedra nevadensis* - *Ericameria cooperi* Shrubland (CEGL001253, G3G4)
- *Ephedra nevadensis* - *Eriogonum fasciculatum* Shrubland (CEGL001254, G4)
- *Ephedra nevadensis* / *Achnatherum hymenoides* Shrubland (CEGL001255, G4)
- *Ephedra viridis* / *Pleuraphis rigida* Shrubland (CEGL001257, G3)
- *Ericameria parryi* Shrubland [Provisional] (CEGL003040, G3G4)
- *Ericameria teretifolia* Shrubland [Placeholder] (CEGL002963, GNR)
- *Eriogonum fasciculatum* Rock Outcrop Shrubland (CEGL001260, G5?)
- *Eriogonum fasciculatum* Shrubland (CEGL001258, G5)
- *Grayia spinosa* - *Lycium andersonii* Shrubland (CEGL001347, G5)
- *Grayia spinosa* - *Lycium pallidum* Shrubland (CEGL001348, G5)
- *Grayia spinosa* - *Menodora spinescens* Shrubland (CEGL001349, G5)
- *Juniperus californica* Wooded Shrubland (CEGL003058, G4?)
- *Menodora spinescens* Dwarf-shrubland [Placeholder] (CEGL002767, G4?)
- *Nolina bigelovii* Shrubland (CEGL003064, G3?)
- *Nolina parryi* Shrubland [Placeholder] (CEGL002956, GNR)
- *Peucephyllum schottii* Shrubland [Placeholder] (CEGL002722, G4)
- *Salazaria mexicana* Shrubland [Placeholder] (CEGL002961, GNR)
- *Viguiera parishii* Shrubland [Placeholder] (CEGL002721, G4)
- *Yucca brevifolia* - *Juniperus osteosperma* / *Artemisia tridentata* Wooded Shrubland (CEGL002744, G2G3)
- *Yucca brevifolia* / *Pleuraphis rigida* Wooded Herbaceous Vegetation (CEGL002725, G2?)
- *Yucca brevifolia* Wooded Shrubland [Placeholder] (CEGL003116, G4)
- *Yucca schidigera* Shrubland [Placeholder] (CEGL003117, G3?)

Alliances:

- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Coleogyne ramosissima* Shrubland Alliance (A.874)
- *Ephedra nevadensis* Shrubland Alliance (A.857)

- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria parryi* Shrubland Alliance (A.818)
- *Ericameria teretifolia* Shrubland Alliance (A.2540)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)
- *Grayia spinosa* Intermittently Flooded Shrubland Alliance (A.1045)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Juniperus californica* Wooded Shrubland Alliance (A.502)
- *Menodora spinescens* Dwarf-shrubland Alliance (A.2515)
- *Nolina bigelovii* Shrubland Alliance (A.2534)
- *Nolina parryi* Shrubland Alliance (A.2535)
- *Peucephyllum schottii* Shrubland Alliance (A.2516)
- *Salazaria mexicana* Shrubland Alliance (A.2538)
- *Viguiera parishii* Shrubland Alliance (A.2526)
- *Yucca brevifolia* Wooded Herbaceous Alliance (A.2527)
- *Yucca brevifolia* Wooded Shrubland Alliance (A.884)
- *Yucca schidigera* Shrubland Alliance (A.881)

SPATIAL CHARACTERISTICS

Spatial Summary: Transition zone shrublands desert scrub above Mojave desert scrub and below the lower montane woodlands.

DISTRIBUTION

Range: This system is found in the eastern and central Mojave Desert and on lower piedmont slopes in the transition zone into the southern Great Basin.

Divisions: 206:P; 302:C; 304:P

Nations: MX? , US

Subnations: AZ, CA, NV, UT

Map Zones: 4:C, 6:?, 12:C, 13:C, 14:C, 15:C, 16:?, 17:C, 23:P, 24:?

USFS Ecomap Regions: 313A:CC, 322A:CC, 322B:CC, 322C:CC, 341D:CP, 341E:C?, 341F:CC, 342B:PP, M261E:CC, M341A:CC, M341D:C?

TNC Ecoregions: 11:C, 12:P, 17:C, 23:P

SOURCES

References: Barbour and Major 1988, Beatley 1976, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Ostler et al. 2000, Sawyer and Keeler-Wolf 1995, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722930#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, West
ClassifResp: West

1083 NORTH PACIFIC AVALANCHE CHUTE SHRUBLAND (CES204.854)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Montane]; Shrubland (Shrub-dominated); Avalanche

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Lower Montane]; Temperate [Temperate Continental]

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2083; ESLF 5260; ESP 1083

CONCEPT

Summary: This tall shrubland system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north into the mountains of British Columbia. This system occurs on sideslopes of mountains on glacial till or colluvium. These habitats range from moderately xeric to wet and occur on snow avalanche chutes at montane elevations. In the mountains of Washington, talus sites and snow avalanche chutes very often coincide spatially. On the west side of the Cascades, the major dominant species are *Acer circinatum*, *Alnus viridis ssp. sinuata*, *Rubus parviflorus*, and small trees, especially *Chamaecyparis nootkatensis*. Forbs, grasses, or other shrubs can also be locally dominant. *Prunus virginiana*, *Amelanchier alnifolia*, *Vaccinium membranaceum* or *Vaccinium scoparium*, and *Fragaria* spp. are common species on drier avalanche tracks on the east side of the Cascades. The main feature of this system is that it occurs on steep, frequently disturbed (snow avalanches) slopes. Avalanche chutes can be quite long, extending from the subalpine into the montane and foothill toeslopes.

Classification Comments: Avalanche slopes in the Cascades and mountains of southern British Columbia are probably drier than those found further north in Alaska, where the precipitation regime does not have a seasonal component to it. Hence, these have been split into two different systems. Exactly where they transition from one to another is yet to be determined.

Similar Ecological Systems:

- Alaskan Pacific Maritime Avalanche Slope Shrubland (CES204.162)

Related Concepts:

- \$Sitka alder - Devil's club (ICHvc/51) (Banner et al. 1993) Intersecting
- \$Sitka alder - Devil's club (ICHwc/51) (Banner et al. 1993) Intersecting
- Avalanche track (CWHvm1/51) (Banner et al. 1993) Intersecting
- Avalanche track (CWHvm2/51) (Banner et al. 1993) Intersecting
- Avalanche track (CWHwm/51) (Banner et al. 1993) Intersecting
- Avalanche track (CWHws2/51) (Banner et al. 1993) Intersecting
- Avalanche track (ESSFmc/51) (Banner et al. 1993) Intersecting
- Avalanche track (ESSFmk/51) (Banner et al. 1993) Intersecting
- Avalanche track (ESSFwv/51) (Banner et al. 1993) Intersecting
- Avalanche track (MHmm1/51) (Banner et al. 1993) Intersecting
- Avalanche track (MHmm2/51) (Banner et al. 1993) Intersecting

MEMBERSHIP

Associations:

- *Alnus viridis ssp. sinuata* / *Acer circinatum* Shrubland (CEGL001155, G4G5)
- *Chamaecyparis nootkatensis* / *Oplopanax horridus* Forest (CEGL000349, G3)

Alliances:

- *Alnus viridis ssp. sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Chamaecyparis nootkatensis* Temporarily Flooded Forest Alliance (A.178)

DISTRIBUTION

Range: This system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north to the mountains of British Columbia.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 6:?, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CP, 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M332G:CC

TNC Ecoregions: 1:C, 3:C, 4:C, 69:C, 81:C

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722821#references

Description Author: K. Boggs and G. Kittel, mod. C. Chappell and M.S. Reid

Version: 08 Dec 2008

Concept Author: K. Boggs and G. Kittel

Stakeholders: Canada, West

ClassifResp: West

1068 NORTH PACIFIC DRY AND MESIC ALPINE DWARF-SHRUBLAND, FELL-FIELD AND MEADOW (CES204.862)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Shrubland (Shrub-dominated)

Non-Diagnostic Classifiers: Long (>500 yrs) Persistence; Temperate [Temperate Oceanic]; W-Landscape/High Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Mixed evergreen-deciduous dwarf-shrubland

National Mapping Codes: EVT 2068; ESLF 5205; ESP 1068

CONCEPT

Summary: This system occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest Coast. It is confined to the coldest, wind-blown areas above treeline and above the subalpine parkland. This system is found at elevations above 2350 m (7200 feet) in the Klamath Mountains and Cascades north into the Cascade and Coastal mountains of British Columbia. It is commonly comprised of a mosaic of plant communities with characteristic species including *Cassiope mertensiana*, *Phyllodoce empetriformis*, *Phyllodoce glanduliflora*, *Luetkea pectinata*, *Saxifraga tolmiei*, and *Carex* spp. It occurs on slopes and depressions where snow lingers, the soil has become relatively stabilized, and the water supply is more or less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This system includes all vegetated areas in the alpine zone of the North Pacific. Typically it is a mosaic of dwarf-shrublands, fell-fields, tundra (sedge turfs), and sparsely vegetated snowbed communities. Small patches of krummholz (shrub-form trees) are also part of this system and occur at the lower elevations. Communities are dominated by graminoids, foliose lichens, dwarf-shrubs, and/or forbs. Vegetation cover ranges from about 5 or 10% (snowbeds) to nearly 100%. The alpine tundra of the northern Cascades has floristic affinities with many mountain regions in western North America. The strongest relationships are with the Arctic and Cordilleran regions to the north and east.

Classification Comments: Alpine systems in Alaska are placed into different types than this.

Related Concepts:

- Alpine Idaho Fescue (108) (Shiflet 1994) Intersecting
- AM Alpine Meadow (Ecosystems Working Group 1998) Broader
- AT Alpine Tundra (Ecosystems Working Group 1998) Broader
- no data (CMAunp/) (BCMF 2006) Intersecting
- no data (IMAunp/) (BCMF 2006) Intersecting

DESCRIPTION

Dynamics: Landfire VDDT models: #RALME includes this and Rocky Mountain alpine systems.

MEMBERSHIP

Associations:

- *Antennaria lanata* Herbaceous Vegetation (CEGL001949, G4)
- *Arabis lyallii* - *Packera cana* Herbaceous Vegetation (CEGL001950, G3?)
- *Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL001392, G3G4)
- *Calamagrostis purpurascens* Herbaceous Vegetation (CEGL001850, G2)
- *Carex breweri* Herbaceous Vegetation (CEGL001805, G3?)
- *Carex capitata* Herbaceous Vegetation (CEGL001807, G3?)
- *Carex nardina* Scree Herbaceous Vegetation (CEGL001812, GNR)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)
- *Carex proposita* Herbaceous Vegetation (CEGL001859, G3?)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Vegetation (CEGL001865, G3?)
- *Cassiope mertensiana* - *Phyllodoce empetriformis* Dwarf-shrubland (CEGL001398, G5)
- *Cassiope mertensiana* / *Luetkea pectinata* Dwarf-shrubland (CEGL001397, G3G4)
- *Cassiope mertensiana* Dwarf-shrubland (CEGL001395, G3G4)
- *Dryas octopetala* Dwarf-shrub Herbaceous Vegetation (CEGL001891, G3?)
- *Empetrum nigrum* / *Lupinus sellulus* var. *lobbii* Dwarf-shrubland (CEGL001400, G3G4)
- *Empetrum nigrum* Dwarf-shrubland (CEGL001399, G3G4)
- *Erigeron aureus* - *Lupinus sellulus* var. *lobbii* Herbaceous Vegetation (CEGL001961, G3G4)
- *Eriogonum pyrolifolium* - *Luzula piperi* Herbaceous Vegetation (CEGL001963, G4)
- *Festuca roemerii* - *Phlox diffusa* ssp. *longistylis* Herbaceous Vegetation (CEGL001622, G2)
- *Pedicularis contorta* - *Carex spectabilis* Herbaceous Vegetation (CEGL001977, G3?)
- *Phlox diffusa* ssp. *longistylis* - *Arenaria capillaris* Herbaceous Vegetation (CEGL001978, G3?)
- *Phlox diffusa* ssp. *longistylis* - *Carex spectabilis* Herbaceous Vegetation (CEGL001979, GNR)

- *Phyllodoce glanduliflora* / *Oreostemma alpigenum* Dwarf-shrubland (CEGL001408, G3G4)
- *Salix cascadenis* / *Festuca brachyphylla* Dwarf-shrubland (CEGL001433, G3G4)
- *Salix nivalis* / *Festuca brachyphylla* Dwarf-shrubland (CEGL001434, G3G4)
- *Saxifraga tolmiei* - *Luzula piperi* Herbaceous Vegetation (CEGL001986, G4)

Alliances:

- *Antennaria lanata* Herbaceous Alliance (A.1640)
- *Arabis lyallii* Herbaceous Alliance (A.1641)
- *Arctostaphylos uva-ursi* Dwarf-shrubland Alliance (A.1079)
- *Calamagrostis purpurascens* Herbaceous Alliance (A.1301)
- *Carex breweri* Herbaceous Alliance (A.1296)
- *Carex capitata* Herbaceous Alliance (A.1297)
- *Carex nardina* Herbaceous Alliance (A.1299)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex proposita* Herbaceous Alliance (A.1305)
- *Carex scirpoidea ssp. pseudoscirpoidea* Herbaceous Alliance (A.1306)
- *Cassiope mertensiana* Dwarf-shrubland Alliance (A.1081)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Empetrum nigrum* Dwarf-shrubland Alliance (A.1078)
- *Erigeron aureus* Herbaceous Alliance (A.1643)
- *Eriogonum pyrolifolium* Herbaceous Alliance (A.1644)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Pedicularis contorta* Herbaceous Alliance (A.1649)
- *Phlox diffusa* Herbaceous Alliance (A.1650)
- *Phyllodoce glanduliflora* Dwarf-shrubland Alliance (A.1084)
- *Salix (reticulata, nivalis)* Dwarf-shrubland Alliance (A.1119)
- *Salix cascadenis* Dwarf-shrubland Alliance (A.1118)
- *Saxifraga tolmiei* Herbaceous Alliance (A.1653)

DISTRIBUTION

Range: This system occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest Coast. Alpine systems in Alaska are placed into different types than this.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: M242A:CC, M242B:CC, M242C:CC, M242D:CC

TNC Ecoregions: 1:C, 3:C, 69:?, 81:C

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Holland and Keil 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722813#references

Description Author: K. Boggs, C. Chappell, R. Crawford

Version: 31 Mar 2005

Concept Author: K. Boggs, C. Chappell, R. Crawford

Stakeholders: Canada, West

ClassifResp: West

1084 NORTH PACIFIC MONTANE SHRUBLAND (CES204.087)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated)

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2084; ESLF 5261; ESP 1084

CONCEPT

Summary: This system occurs as small to large patches scattered throughout the North Pacific region, but it is largely absent from the windward sides of the coastal mountains where fires are rare due to very wet climates. It is defined as long-lived seral shrublands that persist for several decades or more after major wildfires, or smaller patches of shrubland on dry sites that are marginal for tree growth and that have typically also experienced fire. This system occurs on ridgetops and upper to middle mountain slopes and is more common on sunny southern aspects. It occurs from about 152 m (500 feet) elevation up to the lower limits of subalpine parkland. Vegetation is mostly deciduous broadleaf shrubs, sometimes mixed with shrub-statured trees or sparse evergreen needleleaf trees. It can also be dominated by evergreen shrubs, especially *Xerophyllum tenax* (usually considered a forb). Species composition is highly variable; some of most common species include *Acer circinatum*, *Arctostaphylos nevadensis*, *Acer glabrum*, *Vaccinium membranaceum*, *Ceanothus velutinus*, *Holodiscus discolor*, *Shepherdia canadensis*, *Sorbus* spp., and *Rubus parviflorus*. On the west side of the Cascades, *Gaultheria shallon* is an important dominant.

Related Concepts:

- Snowbush (420) (Shiflet 1994) Intersecting. *Ceanothus velutinus* shrublands in the southern Cascades are included in this ecological system.

MEMBERSHIP

Associations:

- *Acer circinatum* / *Athyrium filix-femina* - *Tolmiea menziesii* Shrubland (CEGL003291, G5)
- *Amelanchier alnifolia* / *Xerophyllum tenax* Herbaceous Vegetation (CEGL001066, GNRQ)
- *Rubus parviflorus* / *Chamerion angustifolium* - *Heracleum maximum* Shrubland (CEGL001127, G4)
- *Vaccinium membranaceum* / *Xerophyllum tenax* Shrubland (CEGL005891, G3?)
- *Xerophyllum tenax* - *Sanguisorba officinalis* Herbaceous Vegetation (CEGL003439, G1)

Alliances:

- *Acer circinatum* Shrubland Alliance (A.2600)
- *Rubus parviflorus* Shrubland Alliance (A.931)
- *Vaccinium membranaceum* Shrubland Alliance (A.2632)
- *Xerophyllum tenax* Herbaceous Alliance (A.1600)

DISTRIBUTION

Range: This system occurs as small to large patches scattered throughout mountainous regions of the Pacific Northwest, from the southern Cascade and Coast ranges north to southern British Columbia. Its northernmost distribution is not clear, but it does not appear to occur in Alaska.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC

TNC Ecoregions: 1:C, 3:C, 4:C, 81:C

SOURCES

References: Chappell and Christy 2004, Franklin and Dyrness 1973, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768078#references

Description Author: C. Chappell, mod. G. Kittel, M.S. Reid

Version: 21 Aug 2008

Concept Author: C. Chappell

Stakeholders: Canada, West
ClassifResp: West

1105 NORTHERN AND CENTRAL CALIFORNIA DRY-MESIC CHAPARRAL (CES206.931)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Mediterranean [Mediterranean Xeric-Oceanic]; Sand Soil Texture; Ustic; Intermediate Disturbance Interval; F-Landscape/High Intensity; *Ceanothus cuneatus*, *Adenostoma fasciculatum*

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Sideslope; Xeric

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2105; ESLF 5311; ESP 1105

CONCEPT

Summary: This ecological system includes chaparral typically located inland from maritime chaparral up to 1500 m (4550 feet) elevation in central and northern California through the northern end of the Central Valley and north into Oregon. This system includes extensive areas on coarse-grained soils with annual precipitation up to 75 cm (winter rain but not snow). Adjacent fine-textured soils support savanna under similar climatic regimes. These areas have supported extensive stand-replacing wildfires. This system is made up of a mixture of mostly obligate seeders. Characteristic species include *Adenostoma fasciculatum*, *Ceanothus cuneatus*, *Arctostaphylos viscida*, *Arctostaphylos manzanita*, *Arctostaphylos glauca*, *Arctostaphylos glandulosa*, *Arctostaphylos stanfordiana*, *Fremontodendron californicum*, *Malacothamnus fasciculatus*, *Dendromecon rigida*, and *Pickeringia montana*. Common shrubs in Oregon include *Arctostaphylos viscida*, *Cercocarpus montanus* var. *glaber*, and *Ceanothus cordulatus*. Fire regimes are intense, stand-replacing crownfires. Scattered and young trees may occur, such as *Pinus ponderosa*, *Pinus sabiniana*, *Pseudotsuga menziesii*, and *Quercus wislizeni*.

Related Concepts:

- *Ceanothus* Mixed Chaparral (208) (Shiflet 1994) Broader
- Chamise Chaparral (206) (Shiflet 1994) Broader. SRM groups all *Adenostoma*-dominated communities into one range type; several ecological systems can have *Adenostoma fasciculatum* as a dominant.

MEMBERSHIP

Associations:

- *Adenostoma fasciculatum* - *Arctostaphylos glandulosa* - *Ceanothus jepsonii* / *Calamagrostis ophitidis* Shrubland (CEGL003176, G2)
- *Adenostoma fasciculatum* - *Arctostaphylos glandulosa* - *Quercus wislizeni* Shrubland (CEGL003177, G3)
- *Adenostoma fasciculatum* - *Ceanothus cuneatus* Sierran Chaparral Shrubland (CEGL003468, G4?)
- *Adenostoma fasciculatum* - *Diplacus aurantiacus* Shrubland (CEGL003178, G3)
- *Adenostoma fasciculatum* Sierran Chaparral Shrubland (CEGL005816, G5?)
- *Arctostaphylos glandulosa* - *Quercus wislizeni* Shrubland (CEGL003180, G3)
- *Arctostaphylos glandulosa* Shrubland [Placeholder] (CEGL003007, G3G4)
- *Arctostaphylos glauca* Shrubland (CEGL003008, G3G4)
- *Arctostaphylos viscida* Sierran Chaparral Shrubland (CEGL005817, G5?)
- *Ceanothus cuneatus* / Poaceae Shrubland (CEGL003158, GNR)
- *Ceanothus cuneatus* Shrubland (CEGL003025, G4?)
- *Ceanothus greggii* - *Fremontodendron californicum* Shrubland [Placeholder] (CEGL003026, G3?)

Alliances:

- *Adenostoma fasciculatum* Shrubland Alliance (A.755)
- *Arctostaphylos glandulosa* Shrubland Alliance (A.757)
- *Arctostaphylos glauca* Shrubland Alliance (A.759)
- *Arctostaphylos viscida* Shrubland Alliance (A.790)
- *Ceanothus cuneatus* Shrubland Alliance (A.765)
- *Ceanothus greggii* - *Fremontodendron californicum* Shrubland Alliance (A.766)

DISTRIBUTION

Range: This system is located inland from maritime chaparral up to 1500 m (4550 feet) elevation in central and northern California, and southwestern Oregon, through the north end of the California Central Valley.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C, 5:C, 6:C, 7:C

USFS Ecomap Regions: 242B:??, 262A:CC, 263A:CC, M242A:P?, M242B:PP, M261A:CC, M261B:CC, M261C:CC, M261D:CC,

M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 5:P, 12:C, 13:C, 14:C, 15:P

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722750#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 16 Jan 2009

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1522 NORTHERN ATLANTIC COASTAL PLAIN HEATHLAND AND GRASSLAND (CES203.895)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Glaciated plains; Shrubland (Shrub-dominated); Grassland, Savanna, Steppe (graminoid-dominated); North Atlantic Coastal Plain; Sandplains/Glacial Outwash or Flats; Temperate; Sand Soil Texture; Very Short Disturbance Interval; Coastal plain

Non-Diagnostic Classifiers: Salt Spray

National Mapping Codes: EVT 2522; ESLF 5275; ESP 1522

CONCEPT

Summary: Sandplain grasslands and heathlands of the southern New England / New York coast are areas of graminoid- and shrub-dominated vegetation maintained by extreme conditions and periodic fire or other disturbance. Developing on acidic, nutrient-poor, and very well-drained soils within a few kilometers of the ocean, they may occur as heathlands, grasslands, or support a patchwork of grass and shrub vegetation. Characteristic species include *Gaylussacia baccata*, *Arctostaphylos uva-ursi*, *Corema conradii*, *Amelanchier nantucketensis*, *Hudsonia ericoides*, *Hudsonia tomentosa*, *Vaccinium angustifolium*, *Deschampsia flexuosa*, *Schizachyrium scoparium*, and *Carex pensylvanica*. They provide habitat for several rare or uncommon forbs including *Liatris scariosa* var. *novae-angliae* and *Agalinis acuta*. They are important habitat for several bird and other animal species including the short-eared owl and regal fritillary, and (along with brushy plains and woodlands) provided habitat for the extinct heath hen.

Classification Comments: This system includes both the very distinctive Hempstead Plains grasslands of Long Island, New York (which occur a bit further inland than other sites), as well as the maritime heathlands/grasslands of Cape Cod and nearby islands. Grass-dominated and shrub-dominated expressions are separated at the association level; they can occur together and intergrade at some sites. This system is related to dune grasslands but occurs on sandplains, not dunes, and lacks significant amounts of *Ammophila breviligulata*. In the absence of disturbance (fire, grazing, mowing), coverage by *Pinus rigida* and *Quercus ilicifolia* can increase, creating vegetation similar to a pitch pine - scrub oak barren (hence the inclusion of CEGLO06315 in the associations list); or in some cases, a tall-shrub community can develop in the absence of fire (CEGL006379). Neither of these associations is core to the concept of this system. Its landscape position and dynamics are sufficiently distinct that it is segregated rather than being treated as a phase or a patch of the coastal pine barrens system.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)
- Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

Related Concepts:

- Coastal Heathland and Sandplain Grassland (Dunwiddie 1989) Equivalent
- Coastal Heathland and Sandplain Grassland (Dunwiddie et al. 1996) Equivalent
- Maritime Heathland, Maritime Grassland, Hempstead Plains Grassland (Edinger et al. 2002) Equivalent
- Sandplain Grassland and Sandplain Heathland (Lundgren et al. 2000) Equivalent
- Sandplain Grassland and Sandplain Heathland (Swain and Kearsley 2000) Equivalent

DESCRIPTION

Environment: Sandplain grasslands and heathlands of the southern New England / New York coast are areas of graminoid- and shrub-dominated vegetation maintained by extreme conditions and periodic fire or other disturbance. Developing on acidic, nutrient-poor, and very well-drained soils, they may occur as heathlands, grasslands, or support a patchwork of grass and shrub vegetation.

Vegetation: Characteristic species include *Gaylussacia baccata*, *Arctostaphylos uva-ursi*, *Corema conradii*, *Amelanchier nantucketensis*, *Hudsonia ericoides*, *Hudsonia tomentosa*, *Vaccinium angustifolium*, *Deschampsia flexuosa*, *Schizachyrium scoparium*, and *Carex pensylvanica*. They provide habitat for several rare or uncommon forbs including *Liatris scariosa* var. *novae-angliae* and *Agalinis acuta*.

Dynamics: Prior to European settlement, this system is believed to have occurred in limited areas near the coast, where the effects of wind and salt spray prevented tree growth (Motzkin and Foster 2002); there may also have been patches in the vicinity of Native American settlements, based on the prevalence of charcoal in some palynological cores (Dunwiddie 1989). Presettlement grasslands appear to have been more likely on portions of Long Island (Hempstead Plains and Montauk) and Martha's Vineyard than on Nantucket, Block Island, or Cape Cod (Motzkin and Foster 2002). Extensive areas of this system, whether graminoid- or low-shrub-dominated, largely post-date land clearing following European settlement. They appear to have been maintained as open areas by a combination of agriculture, grazing and fire, and following agricultural abandonment were maintained in an open state by occasional fires. Some heathlands may have developed on severely disturbed soils following the abandonment of agriculture and grazing (Motzkin and Foster 2002). During the 20th century, this system's extent was reduced by incursion of tall shrubs and trees in the absence of disturbance, with development an added pressure in the latter half of the century. Efforts to reverse the conversion of

these heathlands and grasslands to tall shrublands or woodlands have generally used a mixture of prescribed fire and mowing, and less commonly grazing.

MEMBERSHIP

Associations:

- *Amelanchier canadensis* - *Viburnum* spp. - *Morella pensylvanica* Scrub Forest (CEGL006379, GNR)
- *Gaylussacia baccata* - *Vaccinium angustifolium* - *Arctostaphylos uva-ursi* / *Schizachyrium littorale* Dwarf-shrubland (CEGL006066, G3)
- *Morella pensylvanica* / *Schizachyrium littorale* - *Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067, G2)
- *Pinus rigida* / *Quercus ilicifolia* / *Morella pensylvanica* Woodland (CEGL006315, G3)
- *Quercus stellata* - *Sassafras albidum* / *Smilax glauca* Woodland (CEGL006372, GNR)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Hypoxis hirsuta* - *Baptisia tinctoria* Herbaceous Vegetation (CEGL006187, G1Q)

Alliances:

- *Pinus rigida* Woodland Alliance (A.524)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium littorale* Shrub Herbaceous Alliance (A.1533)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Dwarf-shrubland Alliance (A.1113)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as a large-patch system, some presently reduced to small-patch.

Size: Historically occurred in small to large patches (100 ha plus, with the Hempstead Plains upward of 14,000 ha), but most have been reduced by land-use changes or conversion. Some of the remnants are naturally small, occurring on islands.

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)

DISTRIBUTION

Range: This system is endemic to a small area ranging from the southern New York coastline north to Cape Cod, Massachusetts.

Divisions: 203:C

Nations: US

Subnations: CT?, MA, NY, RI

Map Zones: 65:C

USFS Ecomap Regions: 221Ab:CCC, 221Ac:CCC, 221Ad:CCP, 221An:CCC

TNC Ecoregions: 62:C

SOURCES

References: Dunwiddie 1989, Dunwiddie and Caljouw 1990, Dunwiddie et al. 1993, Dunwiddie et al. 1996, Dunwiddie et al. 1997, Eastern Ecology Working Group n.d., Harper 1912, Lundgren et al. 2000, Motzkin and Foster 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.802851#references

Description Author: S. Gawler

Version: 20 Aug 2007

Concept Author: L.A. Sneddon

Stakeholders: East

ClassifResp: East

1128 NORTHERN CALIFORNIA COASTAL SCRUB (CES206.932)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Marine Sedimentary; Mediterranean [Mediterranean Xeric-Oceanic]; Bluff; *Baccharis pilularis*

Non-Diagnostic Classifiers: Dune (Landform); Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Herbaceous; Terrace; Sideslope; Intermediate Disturbance Interval; F-Landscape/High Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2128; ESLF 5457; ESP 1128

CONCEPT

Summary: This ecological system includes a variety of mixed and single-species-dominated shrublands along a narrow coastal strip with maritime and summer fog influences, on marine sediments, coastal bluffs, terraces, stabilized dunes, and hills below 500 m (1500 feet) elevation from southern Oregon south through central California. It is restricted to coastal plateaus and lower slopes of the Coast Ranges where precipitation ranges from 50-200 cm annually. These are dominated by evergreen, microphyllous-leaved or hemi-sclerophyllous shrub taxa; drought-deciduous species are unimportant or absent in this system. Dense shrublands typically include a well-developed woody and herbaceous understory. Characteristic species include *Baccharis pilularis*, *Lupinus arboreus*, *Ceanothus thyrsiflorus*, *Eriophyllum stoechadifolium*, *Diplacus aurantiacus* (= *Mimulus aurantiacus*), *Toxicodendron diversilobum*, *Rubus ursinus*, *Rubus parviflorus*, *Rubus spectabilis*, *Frangula californica* (= *Rhamnus californica*), *Holodiscus discolor*, *Gaultheria shallon*, *Heracleum maximum* (= *Heracleum lanatum*), and *Polystichum munitum*. These areas have supported extensive stand-replacing wildfires. This system has direct seral relationships with California Northern Coastal Grassland (CES206.941) as, in the absence of fire and grazing, the grassland will usually succeed to this system. In the absence of fire in this system, conifers (*Abies grandis*, *Pseudotsuga menziesii*) can invade and become prominent.

Classification Comments: Transitions to Southern California Coastal Scrub (CES206.933) begin in the northern San Francisco Bay area where *Artemisia californica* begins to mix with *Baccharis* and others. Further south in the Santa Lucia Range (Big Sur area of Monterey County), *Baccharis pilularis* and *Artemisia californica* tend to codominate, and other southern coastal sage species such as *Salvia leucophylla* and *Eriogonum fasciculatum* become more prominent. South of Monterey County most of the northern California coastal scrub influence is gone, and coastal shrublands shift to Southern California Coastal Scrub (CES206.933). The combination of <30% relative cover of *Artemisia californica* or *Salvia* spp. and high cover *Baccharis* and *Rhamnus*, or having *Polystichum munitum*, *Gaultheria shallon*, and *Heracleum maximum* makes it Northern California Coastal Scrub (CES206.932).

Similar Ecological Systems:

- Southern California Coastal Scrub (CES206.933)

Related Concepts:

- North Coastal Shrub (204) (Shiflet 1994) Broader. Nearly equivalent, but SRM type includes coastal salal shrublands which are in a different ecological system.

MEMBERSHIP

Associations:

- *Baccharis pilularis* - *Artemisia californica* Shrubland (CEGL003184, G5)
- *Baccharis pilularis* - *Ceanothus thyrsiflorus* Shrubland (CEGL003186, G3)
- *Baccharis pilularis* - *Eriophyllum stoechadifolium* Shrubland (CEGL003190, G3)
- *Baccharis pilularis* - *Frangula californica* - *Rubus parviflorus* Shrubland (CEGL003191, G2)
- *Baccharis pilularis* - *Holodiscus discolor* Shrubland (CEGL003192, G3)
- *Baccharis pilularis* - *Lupinus* (*arboreus*, *chamissonis*) Shrubland (CEGL003193, G3)
- *Baccharis pilularis* - *Rubus ursinus* / Weedy Herbs Shrubland (CEGL003196, G5)
- *Baccharis pilularis* - *Toxicodendron diversilobum* Shrubland (CEGL003197, G5)
- *Baccharis pilularis* / Annual Grass - Herb Shrubland (CEGL003183, G5)
- *Baccharis pilularis* / *Carex obnupta* - *Juncus patens* Shrubland (CEGL003185, G3)
- *Baccharis pilularis* / *Danthonia californica* Shrubland (CEGL003187, G2)
- *Baccharis pilularis* / *Deschampsia caespitosa* Shrubland (CEGL003188, G2)
- *Baccharis pilularis* / *Dudleya farinosa* Shrubland (CEGL003189, G3)
- *Baccharis pilularis* / *Nassella pulchra* Shrubland (CEGL003194, G3)
- *Baccharis pilularis* / *Polystichum munitum* Shrubland (CEGL003195, G3)
- *Ceanothus thyrsiflorus* - *Baccharis pilularis* - *Toxicodendron diversilobum* Shrubland (CEGL003198, G4?)
- *Frangula californica* ssp. *californica* - *Baccharis pilularis* / *Scrophularia californica* Shrubland [Provisional] (CEGL003316, G4)
- *Lupinus arboreus* Shrubland [Placeholder] (CEGL003061, G3?)

- *Rubus spectabilis* Wet Shrubland (CEGL003472, G4)
- *Toxicodendron diversilobum* - *Baccharis pilularis* - *Rubus parviflorus* Shrubland (CEGL003473, G3)

Alliances:

- *Baccharis pilularis* Shrubland Alliance (A.836)
- *Ceanothus thyrsiflorus* Shrubland Alliance (A.741)
- *Lupinus arboreus* Shrubland Alliance (A.739)
- *Rubus spectabilis* Shrubland Alliance (A.2609)
- *Toxicodendron diversilobum* Shrubland Alliance (A.2610)

DISTRIBUTION

Range: This system occurs along a narrow coastal strip below 500 m (1500 feet) elevation from southern Oregon south through central California.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:P, 3:C, 4:C

USFS Ecomap Regions: 263A:CC, M242A:PP

TNC Ecoregions: 14:C, 15:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722749#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1106 NORTHERN ROCKY MOUNTAIN MONTANE-FOOTHILL DECIDUOUS SHRUBLAND (CES306.994)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Broad-Leaved Deciduous Shrub

Non-Diagnostic Classifiers: Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Ustic

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2106; ESLF 5312; ESP 1106

CONCEPT

Summary: This shrubland ecological system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. They also occur in the ponderosa pine and Douglas-fir zones, but rarely up into the subalpine zone (on dry sites). The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands, but they typically will persist on sites for long periods. These communities develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones. *Physocarpus malvaceus*, *Prunus emarginata*, *Prunus virginiana*, *Rosa* spp., *Rhus glabra*, *Acer glabrum*, *Amelanchier alnifolia*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, and *Holodiscus discolor* are the most common dominant shrubs, occurring alone or any combination. *Rubus parviflorus* and *Ceanothus velutinus* are other important shrubs in this system, being more common in montane occurrences than in subalpine situations. Occurrences in central and eastern Wyoming can include *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus*, but neither of these are dominant, and where they occur, the stands are truly mixes of shrubs, often with *Amelanchier alnifolia*, *Prunus virginiana*, and others being the predominant taxa. In moist areas, *Crataegus douglasii* can be common. *Shepherdia canadensis* and *Spiraea betulifolia* can be abundant in some cases but also occur in Northern Rocky Mountain Subalpine Deciduous Shrubland (CES306.961). *Festuca idahoensis*, *Festuca campestris*, *Calamagrostis rubescens*, *Carex geyeri*, *Koeleria macrantha*, *Pseudoroegneria spicata*, and *Poa secunda* are the most important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Poa pratensis* and *Phleum pratense* are common introduced grasses. *Geum triflorum*, *Potentilla gracilis*, *Lomatium triternatum*, *Balsamorhiza sagittata*, and species of *Eriogonum*, *Phlox*, and *Erigeron* are important forbs.

Classification Comments: Seral shrub fields of comparable composition that typically will develop into a seral stage with trees (within 50 years) are excluded from this shrub system and are included in their appropriate forest system.

Related Concepts:

- Bittercherry (419) (Shiflet 1994) Intersecting
- Chokecherry - Serviceberry - Rose (421) (Shiflet 1994) Intersecting
- MS Montane Shrub/Grassland Dry Subdivision sites (Ecosystems Working Group 1998) Broader

MEMBERSHIP

Associations:

- *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland (CEGL005885, GNR)
- *Crataegus douglasii* / *Rosa woodsii* Shrubland (CEGL001095, G2)
- *Holodiscus discolor* Shrubland [Placeholder] (CEGL003053, G4?)
- *Physocarpus malvaceus* - *Symphoricarpos albus* Shrubland (CEGL001171, G3)
- *Prunus virginiana* - (*Prunus americana*) Shrubland (CEGL001108, G4Q)
- *Rhamnus alnifolia* Shrubland (CEGL001132, G3)
- *Rhus glabra* / *Aristida purpurea* var. *longiseta* Shrub Herbaceous Vegetation (CEGL001507, G1)
- *Rhus glabra* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001122, G2)
- *Ribes lacustre* / *Chamerion angustifolium* Shrubland [Provisional] (CEGL005889, G2?)
- *Rosa woodsii* Shrubland (CEGL001126, G5)
- *Spiraea betulifolia* Shrubland (CEGL005835, G3?)
- *Spiraea douglasii* Shrubland (CEGL001129, G5)
- *Symphoricarpos albus* - *Rosa nutkana* Shrubland (CEGL001130, G3)
- *Symphoricarpos albus* Shrubland (CEGL005890, G4?)

Alliances:

- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Crataegus douglasii* Shrubland Alliance (A.917)
- *Holodiscus discolor* Shrubland Alliance (A.901)
- *Physocarpus malvaceus* Shrubland Alliance (A.928)

- *Prunus virginiana* Shrubland Alliance (A.919)
- *Rhamnus alnifolia* Temporarily Flooded Shrubland Alliance (A.962)
- *Rhus glabra* Shrub Herbaceous Alliance (A.1536)
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)
- *Rosa woodsii* Temporarily Flooded Shrubland Alliance (A.959)
- *Spiraea betulifolia* Shrubland Alliance (A.2636)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)
- *Symphoricarpos albus* Shrubland Alliance (A.925)

DISTRIBUTION

Range: This system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies, including east into central Montana around the "Sky Island" ranges. It also occurs farther south into central and eastern Wyoming, where it forms compositionally diverse shrublands.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, BC, ID, MT, OR, WA, WY

Map Zones: 1:C, 7:C, 8:C, 9:C, 10:C, 16:?, 17:?, 18:C, 19:C, 20:C, 21:C, 22:C, 29:C

USFS Ecomap Regions: 331A:CC, 331D:CP, 331N:CC, 341G:PP, 342A:CP, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:PP, M261G:P?, M331A:CC, M331B:CC, M331D:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:PP

TNC Ecoregions: 6:C, 7:C, 8:C, 26:C, 68:C

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Knight 1994, Poulton 1955, Shiflet 1994, Tisdale 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722711#references

Description Author: M. Reid, J. Kagan, mod. R. Crawford

Version: 26 Jan 2007

Concept Author: M. Reid, J. Kagan

Stakeholders: Canada, West
ClassifResp: West

1169 NORTHERN ROCKY MOUNTAIN SUBALPINE DECIDUOUS SHRUBLAND (CES306.961)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane [Upper Montane]; Shrubland (Shrub-dominated); Very Shallow Soil; Broad-Leaved Deciduous Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Deciduous shrubland

National Mapping Codes: EVT 2169; ESLF 5326; ESP 1169

CONCEPT

Summary: This shrubland ecological system is found within the zone of continuous forest in the upper montane and lower subalpine zones of the northern Rocky Mountains. Soils tend to be moist to wet. Stands are typically initiated by fires and will persist on sites for long periods because of repeated burns and changes in the presence of volatile oils in the soil which impedes tree regeneration.

Menziesia ferruginea, *Rhamnus alnifolia*, *Ribes lacustre*, *Rubus parviflorus*, *Alnus viridis*, *Rhododendron albiflorum*, *Sorbus scopulina*, *Sorbus sitchensis*, *Vaccinium myrtillus*, *Vaccinium scoparium*, and *Vaccinium membranaceum* are the most common dominant shrubs, occurring alone or in any combination. Other shrubs can include *Shepherdia canadensis* and *Ceanothus velutinus*, but these also commonly occur in Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994). *Rubus parviflorus* and *Ceanothus velutinus* are occasionally present, being more common in montane shrublands than in this subalpine system. Important forbs include *Xerophyllum tenax*, *Chamerion angustifolium*, and *Pteridium aquilinum*, reflecting the mesic nature of many of these shrublands.

Classification Comments: This system is floristically somewhat similar to Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801), but the avalanche chutes originate from very different processes, tend to be more diverse within stands, and are wetter, being driven ecologically by snow-loading and concomitant snowmelt. Seral shrub fields of comparable composition that typically will develop into a seral stage with trees (within 50 years) are excluded from this shrub system and are included in their appropriate forest system.

MEMBERSHIP

Associations:

- *Menziesia ferruginea* / *Xerophyllum tenax* Shrubland (CEGL005888, G3G4)
- *Rhamnus alnifolia* Shrubland (CEGL001132, G3)
- *Ribes lacustre* / *Chamerion angustifolium* Shrubland [Provisional] (CEGL005889, G2?)
- *Vaccinium membranaceum* / *Xerophyllum tenax* Shrubland (CEGL005891, G3?)

Alliances:

- *Menziesia ferruginea* Shrubland Alliance (A.2633)
- *Rhamnus alnifolia* Temporarily Flooded Shrubland Alliance (A.962)
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)
- *Vaccinium membranaceum* Shrubland Alliance (A.2632)

DISTRIBUTION

Range: This system is found in the subalpine and upper montane zones in the northern Rockies, south and west around the Columbia Basin.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, BC, ID, MT, OR, WA, WY

Map Zones: 8:?, 9:C, 10:C, 18:P, 19:C, 20:C, 21:P, 22:?, 29:C

USFS Ecomap Regions: M331A:CP, M331B:CC, M331D:CP, M331E:CP, M331J:C?, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:C?, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 6:C, 7:C, 8:C, 26:C, 68:C

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Poulton 1955, Tisdale 1986, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.786451#references

Description Author: M.S. Reid

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1085 NORTHWESTERN GREAT PLAINS SHRUBLAND (CES303.662)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Ustic; G-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2085; ESLF 5262; ESP 1085

CONCEPT

Summary: This ecological system ranges from South Dakota into southern Canada on moderately shallow to deep, fine to sandy loam soils. These sites are typically more mesic than most of the surrounding area. This system may be located along upper terraces of rivers and streams, gently inclined slopes near breaklands, and upland sandy loam areas throughout its range. This system is dominated by shrub species such as *Amelanchier alnifolia*, *Rhus trilobata*, *Symphoricarpos* spp., *Shepherdia argentea*, *Crataegus douglasii*, *Elaeagnus commutata*, *Dasiphora fruticosa* ssp. *floribunda*, and dwarf-shrubs such as *Juniperus horizontalis*. Midgrasses such as *Festuca* spp., *Koeleria macrantha*, and *Pseudoroegneria spicata* and species such as *Carex filifolia* can co-occur. This system differs from Northwestern Great Plains Mixedgrass Prairie (CES303.674) in that it contains greater than 10% cover in conjunction with topographic relief (breaks) of natural shrub species. Fire and grazing constitute the primary dynamics affecting this system; drought can also impact this system. This system may include areas of Northwestern Great Plains Mixedgrass Prairie (CES303.674) where fire suppression has allowed for a greater cover of shrub species. This system is similar to Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994) but occurs in the grassland matrix of the Great Plains, whereas the Rocky Mountain system occurs adjacent to the lower treeline of generally forested mountains and highlands. Floristically their shrub composition is similar, but associated grasses and forbs will differ somewhat given their respective adjacent vegetation types.

Classification Comments: This may not be a separate system from the prairie matrix. Those areas that have increased shrub cover due to fire suppression should be considered part of Northwestern Great Plains Mixedgrass Prairie (CES303.674). More information from Canada is probably needed to fully define this system.

Similar Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Southwestern Great Plains Canyon (CES303.664)

Related Concepts:

- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. Some *Artemisia cana* ssp. *cana* shrublands occur in this ecological system if they are not associated with stream terraces.

DESCRIPTION

Environment: Climate and growing season length for the region this system occurs are intermediate to the shortgrass regions to the west and the tallgrass regions to the east with a shorter growing season with semi-arid moisture conditions. This system occurs on sites more mesic than most of the surrounding area such as upper river terraces, gently inclined slopes, and upland sandy areas. Soils range from shallow to deep and fine to sandy loams.

Vegetation: This system is dominated by shrub and dwarf-shrub species such as *Amelanchier alnifolia*, *Rhus trilobata*, *Symphoricarpos* spp., *Dasiphora fruticosa* ssp. *floribunda*, and *Juniperus horizontalis*. Mid grasses such as *Festuca* spp., *Koeleria macrantha*, and *Pseudoroegneria spicata* can also occur. This system differs from Northwestern Great Plains Mixedgrass Prairie (CES303.674) in that it contains greater than 60% cover of natural shrub species.

Dynamics: Fire and grazing constitute the primary dynamics affecting this system. Drought can also impact this system. Conversion to agriculture can impact this system, and its range has probably been decreased by human activities.

MEMBERSHIP

Associations:

- *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065, G3G4Q)
- *Amelanchier alnifolia* Shrubland (CEGL002183, GNR)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001503, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Schizachyrium scoparium* Shrub Herbaceous Vegetation (CEGL002198, G3G4)
- *Elaeagnus commutata* / *Pascopyrum smithii* Shrubland (CEGL001099, G3?)
- *Juniperus horizontalis* / *Schizachyrium scoparium* Dwarf-shrubland (CEGL001394, G4)
- *Rhus trilobata* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001457, G3Q)
- *Rhus trilobata* / *Carex filifolia* Shrub Herbaceous Vegetation (CEGL001504, G3)
- *Rhus trilobata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001505, G2?)
- *Rhus trilobata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001120, G4)
- *Rhus trilobata* / *Schizachyrium scoparium* Shrub Herbaceous Vegetation (CEGL001506, G3)

- *Sarcobatus vermiculatus* / *Artemisia tridentata* Shrubland (CEGL001359, G4)

Alliances:

- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)
- *Elaeagnus commutata* Shrubland Alliance (A.918)
- *Juniperus horizontalis* Dwarf-shrubland Alliance (A.1080)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Canyon (CES303.658)
- Northwestern Great Plains Mixedgrass Prairie (CES303.674)

Adjacent Ecological System Comments: This system may include areas of Northwestern Great Plains Mixedgrass Prairie (CES303.674) where fire suppression has allowed for a greater cover of shrub species.

DISTRIBUTION

Range: This system extends from South Dakota into southern Canada, west into the foothills of north-central Montana. The U.S. range corresponds to Bailey et al. (1994) sections Northeast Glaciated Plains (332A), Western Glaciated Plains (332B), North Central Glaciated Plains - extreme western part (251B), and in Canada to the Moist Mixed Grassland and Fescue Grassland.

Divisions: 303:C

Nations: CA, US

Subnations: AB?, MB, MT, ND, SD, SK, WY?

Map Zones: 20:C, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331K:CC, 331L:CC, 331M:CP, 331N:CC, 342F:CC, M334A:CC

TNC Ecoregions: 26:C, 34:C, 66:P, 67:P

SOURCES

References: Bailey et al. 1994, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722996#references

Description Author: S. Menard and K. Kindscher, mod. G. Kittel and M.S. Reid

Version: 26 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, West
ClassifResp: Midwest

1070 ROCKY MOUNTAIN ALPINE DWARF-SHRUBLAND (CES306.810)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine Slopes; Alpine/AltiAndino [Alpine/AltiAndino]; Patterned ground (undifferentiated); Glaciated; Acidic Soil; Udic; Very Long Disturbance Interval; Dwarf-Shrub

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Mineral: W/ A-Horizon >10 cm; Bryophyte

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Evergreen dwarf-shrubland

National Mapping Codes: EVT 2070; ESLF 5207; ESP 1070

CONCEPT

Summary: This widespread ecological system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana and in the mountains of Alberta. This system occurs in areas of level or concave glacial topography, with late-lying snow and subirrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist but well-drained, strongly acidic, and often with substantial peat layers. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This ecological system is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tufts of graminoids and scattered forbs occur. *Dryas octopetala* or *Dryas integrifolia* communities are not included here, except for one very moist association, because they occur on more windswept and drier sites than the heath communities. Within these communities, *Cassiope mertensiana*, *Salix arctica*, *Salix reticulata*, *Salix vestita*, or *Phyllodoce empetriformis* can be dominant shrubs. *Vaccinium* spp., *Ledum glandulosum*, *Phyllodoce glanduliflora*, and *Kalmia microphylla* may also be shrub associates. The herbaceous layer is a mixture of forbs and graminoids, especially sedges, including, *Erigeron* spp., *Luetkea pectinata*, *Antennaria lanata*, *Oreostemma alpigenum* (= *Aster alpigenus*), *Pedicularis* spp., *Castilleja* spp., *Deschampsia caespitosa*, *Caltha leptosepala*, *Erythronium* spp., *Juncus parryi*, *Luzula piperi*, *Carex spectabilis*, *Carex nigricans*, and *Polygonum bistortoides*. Fellfields often intermingle with the alpine dwarf-shrubland.

Related Concepts:

- Alpine Rangeland (410) (Shiflet 1994) Broader
- AT Alpine Tundra (Ecosystems Working Group 1998) Broader

MEMBERSHIP

Associations:

- *Cassiope mertensiana* - *Phyllodoce empetriformis* Dwarf-shrubland (CEGL001398, G5)
- *Cassiope mertensiana* / *Carex paysonis* Dwarf-shrubland (CEGL001396, G3?)
- *Dryas integrifolia* - *Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001890, G3Q)
- *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894, G3?)
- *Kalmia microphylla* / *Carex scopulorum* Dwarf-shrubland (CEGL001403, G3G4)
- *Phyllodoce empetriformis* / *Antennaria lanata* Dwarf-shrubland (CEGL001405, G3?)
- *Phyllodoce empetriformis* / *Lupinus latifolius* Dwarf-shrubland (CEGL001406, G4?)
- *Phyllodoce empetriformis* / *Vaccinium deliciosum* Dwarf-shrubland (CEGL001407, G4)
- *Phyllodoce empetriformis* Parkland Dwarf-shrubland (CEGL001404, G5)
- *Phyllodoce glanduliflora* / *Oreostemma alpigenum* Dwarf-shrubland (CEGL001408, G3G4)
- *Phyllodoce glanduliflora* / *Sibbaldia procumbens* Dwarf-shrubland (CEGL005877, G2G3)
- *Salix arctica* - (*Salix petrophila*, *Salix nivalis*) / *Polygonum bistortoides* Dwarf-shrubland (CEGL001431, G2G3Q)
- *Salix arctica* - *Salix nivalis* Dwarf-shrubland (CEGL001432, G2Q)
- *Salix arctica* - *Salix petrophila* / *Caltha leptosepala* Dwarf-shrubland (CEGL001429, G2G3)
- *Salix arctica* / *Carex nigricans* Dwarf-shrubland (CEGL005878, GNR)
- *Salix arctica* / *Geum rossii* Dwarf-shrubland (CEGL001430, G4)
- *Salix glauca* Shrubland (CEGL001136, G3?)
- *Salix nivalis* / *Geum rossii* Dwarf-shrubland (CEGL005936, GNR)
- *Salix reticulata* / *Caltha leptosepala* Dwarf-shrubland (CEGL001435, G3)
- *Vaccinium (caespitosum, scoparium)* Dwarf-shrubland (CEGL001140, G4)
- *Vaccinium (myrtillus, scoparium)* / *Luzula glabrata* var. *hitchcockii* Dwarf-shrubland (CEGL005879, G2G3)

Alliances:

- *Cassiope mertensiana* Dwarf-shrubland Alliance (A.1081)
- *Cassiope mertensiana* Temporarily Flooded Dwarf-shrubland Alliance (A.1089)

- *Dryas integrifolia* Dwarf-shrub Herbaceous Alliance (A.1576)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Kalmia microphylla* Saturated Dwarf-shrubland Alliance (A.1096)
- *Phyllodoce empetriformis* Dwarf-shrubland Alliance (A.1083)
- *Phyllodoce glanduliflora* Dwarf-shrubland Alliance (A.1084)
- *Salix (reticulata, nivalis)* Dwarf-shrubland Alliance (A.1119)
- *Salix arctica* Dwarf-shrubland Alliance (A.1117)
- *Salix arctica* Saturated Dwarf-shrubland Alliance (A.1124)
- *Salix glauca* Temporarily Flooded Shrubland Alliance (A.963)
- *Salix reticulata* Saturated Dwarf-shrubland Alliance (A.1125)
- *Vaccinium (caespitosum, myrtilus, scoparium)* Dwarf-shrubland Alliance (A.1114)

DISTRIBUTION

Range: This system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 1:P, 9:P, 10:C, 16:C, 17:C, 18:?, 19:C, 21:C, 22:?, 23:P, 24:P, 25:C, 28:C, 29:?

USFS Ecomap Regions: 331J:CC, 341G:PP, 342J:PP, M242B:CC, M242C:C?, M242D:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CP, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:PP, M341B:PP, M341C:PP

TNC Ecoregions: 4:P, 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:P

SOURCES

References: Anderson 1999a, Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Ecosystems Working Group 1998, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Schwan and Costello 1951, Thilenius 1975, Willard 1963

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722863#references

Description Author: NatureServe Western Ecology Team, mod. M.S. Reid

Version: 01 Sep 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1107 ROCKY MOUNTAIN GAMBEL OAK-MIXED MONTANE SHRUBLAND (CES306.818)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Shallow Soil; Mineral: W/ A-Horizon <10 cm; Loam Soil Texture; Sand Soil Texture; Ustic; Unconsolidated; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; Broad-Leaved Deciduous Shrub

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Ridge/Summit/Upper Slope; Sideslope; Temperate [Temperate Continental]; F-Patch/Medium Intensity; F-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2107; ESLF 5313; ESP 1107

CONCEPT

Summary: This ecological system occurs in the mountains, plateaus and foothills of the southern Rocky Mountains and Colorado Plateau, including the Uinta and Wasatch ranges and the Mogollon Rim. These shrublands are most commonly found along dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 2000 to 2900 m in elevation, and are often situated above pinyon-juniper woodlands. Substrates are variable and include soil types ranging from calcareous, heavy, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand, or coarse gravel. The vegetation is typically dominated by *Quercus gambelii* alone or codominant with *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata*, *Cercocarpus montanus*, *Prunus virginiana*, *Purshia stansburiana*, *Purshia tridentata*, *Robinia neomexicana*, *Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. There may be inclusions of other mesic montane shrublands with *Quercus gambelii* absent or as a relatively minor component. This ecological system intergrades with the lower montane-foothills shrubland system and shares many of the same site characteristics. Density and cover of *Quercus gambelii* and *Amelanchier* spp. often increase after fire.

Classification Comments: Disjunct *Quercus gambelii*-dominated shrublands found in the Davis Mountains and probably the Guadalupe Range in the Trans-Pecos of Texas are included in the concept of Madrean Oriental Chaparral (CES302.031).

Landfire modeled this BpS with Coahuilan Chaparral (Madrean Oriental Chaparral (CES302.031)). *Quercus gambelii* apparently occurs as a significant component of a shrubland of the Trans-Pecos of Texas, however, most of the other species that codominate in this system do not occur in the Trans-Pecos. This system is not currently attributed to Texas, and it seems more appropriate to modify the description of CES302.031 to allow for the presence of *Quercus gambelii* as a significant component of some occurrences. However, *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland (CEGL001117) is an association found in the Trans-Pecos. Also, there is a need to clarify the relationship with Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822).

Similar Ecological Systems:

- Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)

Related Concepts:

- Gambel Oak (413) (Shiflet 1994) Equivalent

DESCRIPTION

Environment: This ecological system typically occupies the lower slope positions of the foothill and lower montane zones. They may occur on level to steep slopes, cliffs, escarpments, rimrock slopes, rocky outcrops, and scree slopes. Climate is semi-arid and characterized by mostly hot-dry summers with mild to cold winters and annual precipitation of 25 to 70 cm. Precipitation mostly occurs as winter snows but may also consist of some late-summer rains. Soils are typically poorly developed, rocky to very rocky, and well-drained. Parent materials include alluvium, colluvium, and residuum derived from igneous, metamorphic, or sedimentary rocks such as granite, gneiss, limestone, quartz, monzonite, rhyolite, sandstone, schist, and shale. Although this is a shrub-dominated system, some trees may be present. In older occurrences, or occurrences on mesic sites, some of the shrubs may acquire tree-like sizes. Adjacent communities often include woodlands or forests of *Abies concolor*, *Pinus ponderosa*, *Pseudotsuga menziesii*, or *Populus tremuloides* at higher elevations, and *Pinus edulis* and *Juniperus osteosperma* on the lower and adjacent elevations. Shrublands of *Artemisia tridentata* or grasslands of *Festuca* sp., *Stipa* sp., or *Pseudoroegneria* sp. may also be present at the lower elevations.

Vegetation: Vegetation types in this system may occur as sparse to dense shrublands composed of moderate to tall shrubs.

Occurrences may be multi-layered, with some short shrubby species occurring in the understory of the dominant overstory species. In many occurrences of this system, the canopy is dominated by the broad-leaved deciduous shrub *Quercus gambelii*, which occasionally reaches small tree size. Occurrences can range from dense thickets with little understory to relatively mesic mixed-shrublands with a rich understory of shrubs, grasses and forbs. These shrubs often have a patchy distribution with grass growing in between. Scattered trees are occasionally present in stands and typically include species of *Pinus* or *Juniperus*. Characteristic shrubs that may co-occur, or be singularly dominant, include *Amelanchier alnifolia*, *Amelanchier utahensis*, *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus montanus*, *Ptelea trifoliata*, *Prunus virginiana*, *Purshia stansburiana*, *Robinia neomexicana*, *Rosa* spp., *Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is sparse to moderately dense, ranging from 1-40% cover.

Perennial graminoids are the most abundant species, particularly *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Aristida* spp., *Carex inops*, *Carex geyeri*, *Elymus arizonicus*, *Eragrostis* spp., *Festuca* spp., *Koeleria macrantha*, *Muhlenbergia* spp., and *Stipa* spp. Many forb and fern species can occur, but none have much cover. Commonly present forbs include *Achillea millefolium*, *Artemisia* spp., *Geranium* spp., *Maianthemum stellatum*, *Thalictrum fendleri*, and *Vicia americana*. Ferns include species of *Cheilanthes* and *Woodsia*. Annual grasses and forbs are seasonally present, and weedy annuals are often present, at least seasonally. **Dynamics:** Fire typically plays an important role in this system, causing die-back of the dominant shrub species in some areas, promoting stump sprouting of the dominant shrubs in other areas, and controlling the invasion of trees into the shrubland system. Natural fires typically result in a system with a mosaic of dense shrub clusters and openings dominated by herbaceous species. In some instances these associations may be seral to the adjacent *Pinus ponderosa*, *Abies concolor*, and *Pseudotsuga menziesii* woodlands and forests. Ream (1964) noted that on many sites in Utah, Gambel oak may be successional and replaced by bigtooth maple (*Acer grandidentatum*).

MEMBERSHIP

Associations:

- *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland (CEGL005885, GNR)
- *Amelanchier alnifolia* / *Artemisia tridentata* / *Festuca idahoensis* Shrubland (CEGL001064, G4Q)
- *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065, G3G4Q)
- *Amelanchier alnifolia* / *Symphoricarpos oreophilus* Shrubland (CEGL002569, GNR)
- *Amelanchier utahensis* - Mixed Shrub / *Carex geyeri* Shrubland (CEGL001068, G2G3)
- *Amelanchier utahensis* / *Pseudoroegneria spicata* Shrubland (CEGL001069, G2G3)
- *Amelanchier utahensis* Shrubland (CEGL001067, G4)
- *Arctostaphylos patula* - *Quercus gambelii* - (*Amelanchier utahensis*) Shrubland (CEGL002695, GNR)
- *Juniperus scopulorum* - *Quercus gambelii* Woodland [Provisional] (CEGL002967, GNR)
- *Quercus gambelii* - *Cercocarpus montanus* / (*Carex geyeri*) Shrubland (CEGL001113, G3)
- *Quercus gambelii* - *Holodiscus dumosus* Shrubland (CEGL002341, GNR)
- *Quercus gambelii* / *Amelanchier alnifolia* Shrubland (CEGL001109, G3G5)
- *Quercus gambelii* / *Amelanchier utahensis* Shrubland (CEGL001110, G3G5)
- *Quercus gambelii* / *Artemisia tridentata* Shrubland (CEGL001111, G4G5)
- *Quercus gambelii* / *Carex geyeri* Shrubland [Provisional] (CEGL005995, GNR)
- *Quercus gambelii* / *Carex inops* Shrubland (CEGL001112, GU)
- *Quercus gambelii* / *Festuca thurberi* Shrubland (CEGL002805, GNR)
- *Quercus gambelii* / *Hesperostipa comata* Shrubland [Provisional] (CEGL002915, GU)
- *Quercus gambelii* / *Paxistima myrsinites* Shrubland (CEGL001114, GU)
- *Quercus gambelii* / *Poa fendleriana* Shrubland [Provisional] (CEGL002949, GNR)
- *Quercus gambelii* / *Prunus virginiana* Shrubland [Provisional] (CEGL005994, GNR)
- *Quercus gambelii* / *Rhus trilobata* Shrubland (CEGL002338, GNR)
- *Quercus gambelii* / *Robinia neomexicana* / *Symphoricarpos rotundifolius* Shrubland (CEGL001116, GU)
- *Quercus gambelii* / *Robinia neomexicana* Shrubland (CEGL001115, G4)
- *Quercus gambelii* / Sparse Understory Shrubland (CEGL002337, GNR)
- *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland (CEGL001117, G5)
- *Quercus gambelii* Shrubland (CEGL002477, GNR)

Alliances:

- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Amelanchier utahensis* Shrubland Alliance (A.916)
- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Quercus gambelii* Shrubland Alliance (A.920)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Rocky Mountain Bigtooth Maple Ravine Woodland (CES306.814)

DISTRIBUTION

Range: This system occurs in the mountains, plateaus and foothills of the southern Rocky Mountains and Colorado Plateau, including the Uinta and Wasatch ranges and the Mogollon Rim.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, NM, UT, WY

Map Zones: 12:?, 15:C, 16:C, 17:C, 22:C, 23:C, 24:C, 25:C, 27:C, 28:C, 33:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:C?, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 331B:CC, 331F:CC, 331G:CC, 331I:CC, 331J:CC, 331M:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CC, 342A:CC, 342E:CC, 342G:CC, 342J:CC, M313A:CC, M313B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC

TNC Ecoregions: 10:P, 18:C, 19:C, 20:C, 21:C

SOURCES

References: Christensen 1955, Comer et al. 2002, Comer et al. 2003, Johnston and Hendzel 1985, Kunzler and Harper 1980, Kunzler et al. 1981, McKell 1950, Neely et al. 2001, Price and Brotherson 1987, Ream 1960, Ream 1964, Rondeau 2001, Shepperd 1990, Tuhy et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722855#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1086 ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL SHRUBLAND (CES306.822)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Foothill(s); Gulch; Midslope; Ridge; Temperate [Temperate Continental]; Mineral: W/ A-Horizon <10 cm; Canyon; Colluvial slope

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2086; ESLF 5263; ESP 1086

CONCEPT

Summary: This ecological system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico, extending north into Wyoming, and west into the Intermountain West region. These shrublands occur between 1500 and 2900 m elevation and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. It is common where *Quercus gambelii* is absent, such as the northern Colorado Front Range and in drier foothills and prairie hills. This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) but may include mesic montane shrublands where *Quercus gambelii* does not occur. *Cercocarpus montanus* dominates pure stands in parts of Wyoming and Colorado. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs, including *Amelanchier utahensis*, *Cercocarpus montanus*, *Purshia tridentata*, *Rhus trilobata*, *Ribes cereum*, *Symphoricarpos oreophilus*, or *Yucca glauca*. Grasses are represented as species of *Muhlenbergia*, *Bouteloua*, *Hesperostipa*, and *Pseudoroegneria spicata*. Fires play an important role in this system as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. *Cercocarpus montanus* requires a disturbance such as fire to reproduce, either by seed sprout or root-crown sprouting. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth. In Wyoming, stands where *Cercocarpus montanus* is a component of mixed shrublands are placed in Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994).

Classification Comments: Some reviewers have requested that this system be renamed in such a way as to more strongly indicate that it is dominated primarily by *Cercocarpus montanus*. However, while *Cercocarpus montanus* is an important shrub in this system, it is not the only dominant, and in many occurrences is not found at all.

Similar Ecological Systems:

- Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

Related Concepts:

- Littleleaf Mountain-Mahogany (417) (Shiflet 1994) Intersecting
- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Intersecting
- Snowbush (420) (Shiflet 1994) Intersecting. CEAVEL dominated, CAN to CA to CO
- True Mountain-Mahogany (416) (Shiflet 1994) Finer

MEMBERSHIP

Associations:

- *Amelanchier (utahensis, alnifolia) - Cercocarpus montanus* Shrubland (CEGL001070, G2?)
- *Amelanchier utahensis / Pseudoroegneria spicata* Shrubland (CEGL001069, G2G3)
- *Amelanchier utahensis* Shrubland (CEGL001067, G4)
- *Artemisia frigida / Bouteloua gracilis* Dwarf-shrubland [Provisional] (CEGL002782, GNR)
- *Artemisia nova / Leymus salinus* Shrub Herbaceous Vegetation (CEGL001421, G1G2Q)
- *Bromus inermis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation (CEGL005264, GNA)
- *Cercocarpus montanus - Artemisia tridentata* Shrubland (CEGL005805, GNR)
- *Cercocarpus montanus - Rhus trilobata / Andropogon gerardii* Shrubland (CEGL002912, G2G3)
- *Cercocarpus montanus / Achnatherum scribneri* Shrubland (CEGL002913, G3)
- *Cercocarpus montanus / Bouteloua curtipendula* Shrubland (CEGL001086, G5)
- *Cercocarpus montanus / Elymus lanceolatus ssp. lanceolatus* Shrubland (CEGL001087, GU)
- *Cercocarpus montanus / Garrya flavescens* Shrubland (CEGL001088, GNR)
- *Cercocarpus montanus / Hesperostipa comata* Shrubland (CEGL001092, G2)
- *Cercocarpus montanus / Hesperostipa neomexicana* Shrubland (CEGL002911, G2G3)
- *Cercocarpus montanus / Muhlenbergia emersleyi* Shrub Herbaceous Vegetation (CEGL001500, G4)
- *Cercocarpus montanus / Muhlenbergia montana* Shrubland (CEGL002914, GU)
- *Cercocarpus montanus / Muhlenbergia pauciflora* Shrubland (CEGL001089, GNR)

- *Cercocarpus montanus* / *Pseudoroegneria spicata* Shrubland (CEGL001090, G4)
- *Cercocarpus montanus* / *Rhus trilobata* var. *trilobata* Shrubland (CEGL001091, GNRQ)
- *Cercocarpus montanus* Shale Shrubland [Provisional] (CEGL002798, GNR)
- *Cercocarpus montanus* var. *paucidentatus* / *Petrophyton caespitosum* Shrubland (CEGL004589, G3?)
- *Prunus virginiana* - (*Prunus americana*) Shrubland (CEGL001108, G4Q)
- *Purshia tridentata* / *Artemisia frigida* / *Hesperostipa comata* Shrubland (CEGL001055, G1G2)
- *Purshia tridentata* / *Muhlenbergia montana* Shrubland (CEGL001057, G2)
- *Rhus trilobata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001505, G2?)
- *Rhus trilobata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001120, G4)
- *Rhus trilobata* Rocky Mountain Shrub Herbaceous Vegetation (CEGL002910, G2)
- *Ribes cereum* / *Leymus ambiguus* Shrubland (CEGL001124, G2)
- *Spiraea betulifolia* Shrubland (CEGL005835, G3?)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Symphoricarpos oreophilus* Shrubland (CEGL002951, GNR)

Alliances:

- *Amelanchier utahensis* Shrubland Alliance (A.916)
- *Artemisia frigida* Dwarf-shrubland Alliance (A.2565)
- *Artemisia nova* Shrub Herbaceous Alliance (A.1567)
- *Bromus inermis* Semi-natural Herbaceous Alliance (A.3561)
- *Cercocarpus montanus* Shrub Herbaceous Alliance (A.1538)
- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Prunus virginiana* Shrubland Alliance (A.919)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)
- *Ribes cereum* Shrubland Alliance (A.923)
- *Spiraea betulifolia* Shrubland Alliance (A.2636)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Symphoricarpos oreophilus* Shrubland Alliance (A.2530)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Canyon (CES303.658)

DISTRIBUTION

Range: This system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico, extending north into Wyoming, and west into the Intermountain West region.

Divisions: 303:C; 306:C

Nations: US

Subnations: CO, MT, NE?, NM, SD, WY

Map Zones: 15:C, 16:C, 18:C, 21:P, 22:C, 23:C, 25:C, 26:C, 27:C, 28:C, 29:C, 30:?, 31:P, 33:C, 34:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 315A:CC, 315B:CC, 315H:CP, 321A:CC, 331B:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341B:CC, 341C:CC, 342E:CC, 342F:CC, 342G:CC, M313B:CC, M331A:CP, M331B:CP, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332G:??, M334A:??, M341B:CC

TNC Ecoregions: 10:C, 20:C, 21:C, 25:C, 26:C, 27:C

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, Hess 1981, Hess and Wasser 1982, Hoffman and Alexander 1987, Marriott and Faber-Langendoen 2000, Mueggler and Stewart 1980, Muldavin 1994, Muldavin et al. 2000b, Neely et al. 2001, Roughton 1972, Thilenius et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722851#references

Description Author: NatureServe Western Ecology Team

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

1071 SIERRA NEVADA ALPINE DWARF-SHRUBLAND (CES206.924)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Alpine Mosaic; Shrubland (Shrub-dominated); Dwarf-Shrub

Non-Diagnostic Classifiers: Herbaceous; Ridge/Summit/Upper Slope; Temperate [Temperate Oceanic]; Shallow Soil;

W-Patch/High Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Evergreen dwarf-shrubland

National Mapping Codes: EVT 2071; ESLF 5208; ESP 1071

CONCEPT

Summary: This ecological system is found only at the highest elevations, usually above 2800 m (8500 feet), throughout the Sierra Nevada and surrounding high mountain ranges. The system is commonly comprised of a mosaic of plant communities that include *Arenaria kingii*, *Cassiope mertensiana*, *Ericameria discoidea*, *Artemisia arbuscula*, *Phlox covillei*, *Eriogonum incanum*, *Eriogonum ovalifolium*, *Eriogonum roseum*, *Kalmia microphylla*, *Polygonum shastense*, *Leptodactylon pungens*, *Phyllodoce breweri*, *Salix arctica*, *Salix nivalis*, *Salix reticulata*, and *Vaccinium caespitosum*. Floristically, communities within this system have desert affinities, rather than cordilleran affinities. Vegetation in these areas is controlled by the absence of persistent snow, wind desiccation, permafrost, and a short growing season.

Related Concepts:

- Alpine Grassland (213) (Shiflet 1994) Broader. SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub dominated, and wet meadows.

MEMBERSHIP

Associations:

- *Phlox covillei* - *Elymus elymoides* - *Podistera nevadensis* Herbaceous Vegetation [Provisional] (CEGL003488, G3?)

DISTRIBUTION

Range: This system is found only at the highest elevations, usually above 2800 m (8500 feet), throughout the Sierra Nevada and surrounding high mountain ranges.

Divisions: 204:C; 206:C

Nations: US

Subnations: CA, NV

Map Zones: 4:?, 6:C, 7:C, 12:C, 13:C

USFS Ecomap Regions: 322A:CC, 341D:CC, 341F:CP, 342B:CC, M261A:CP, M261D:CC, M261E:CC, M261G:CC

TNC Ecoregions: 4:C, 5:C, 12:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722757#references

Description Author: P. Comer, T. Keeler-Wolf, mod. G. Kittel

Version: 25 Apr 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1087 SONORA-MOJAVE CREOSOTEBUSH-WHITE BURSAGE DESERT SCRUB (CES302.756)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic; Xeromorphic Shrub

Non-Diagnostic Classifiers: Toeslope/Valley Bottom; Alkaline Soil; W-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2087; ESLF 5264; ESP 1087

CONCEPT

Summary: This ecological system forms the vegetation matrix in broad valleys, lower bajadas, plains and low hills in the Mojave and lower Sonoran deserts. This desert scrub is characterized by a sparse to moderately dense layer (2-50% cover) of xeromorphic microphyllous and broad-leaved shrubs. *Larrea tridentata* and *Ambrosia dumosa* are typically dominants, but many different shrubs, dwarf-shrubs, and cacti may codominate or form typically sparse understories. Associated species may include *Atriplex canescens*, *Atriplex hymenelytra*, *Encelia farinosa*, *Ephedra nevadensis*, *Fouquieria splendens*, *Lycium andersonii*, and *Opuntia basilaris*. The herbaceous layer is typically sparse, but may be seasonally abundant with ephemerals. Herbaceous species such as *Chamaesyce* spp., *Eriogonum inflatum*, *Dasyochloa pulchella*, *Aristida* spp., *Cryptantha* spp., *Nama* spp., and *Phacelia* spp. are common. This system can often appear as very open sparse vegetation, with the mostly barren ground surface being the predominant feature.

Related Concepts:

- Creosote Bush Scrub (211) (Shiflet 1994) Finer
- Creosotebush - Bursage (506) (Shiflet 1994) Finer

MEMBERSHIP

Associations:

- *Ambrosia deltoidea* / *Simmondsia chinensis* Shrubland (CEGL000953, G4)
- *Ambrosia dumosa* - *Ephedra nevadensis* Dwarf-shrubland (CEGL000954, GNR)
- *Ambrosia dumosa* - *Larrea tridentata* var. *tridentata* Dwarf-shrubland (CEGL000956, G4)
- *Ambrosia dumosa* / *Pleuraphis rigida* Dwarf-shrubland (CEGL000955, G2)
- *Eriogonum fasciculatum* - *Purshia glandulosa* Shrubland (CEGL001259, G4)
- *Eriogonum fasciculatum* Rock Outcrop Shrubland (CEGL001260, G5?)
- *Eriogonum fasciculatum* Shrubland (CEGL001258, G5)
- *Grayia spinosa* - *Ephedra viridis* Shrubland (CEGL001346, G5)
- *Grayia spinosa* - *Lycium andersonii* Shrubland (CEGL001347, G5)
- *Grayia spinosa* - *Lycium pallidum* Shrubland (CEGL001348, G5)
- *Grayia spinosa* - *Menodora spinescens* Shrubland (CEGL001349, G5)
- *Grayia spinosa* - *Prunus andersonii* Shrubland (CEGL001352, G4)
- *Grayia spinosa* / *Achnatherum thurberianum* Shrubland (CEGL002681, G2G3)
- *Grayia spinosa* / *Picrothamnus desertorum* Shrubland (CEGL001345, G5)
- *Larrea tridentata* - *Ambrosia dumosa* Shrubland [Placeholder] (CEGL002954, G3G4)
- *Larrea tridentata* - *Atriplex confertifolia* Shrubland (CEGL001263, G5)
- *Larrea tridentata* - *Atriplex hymenelytra* Shrubland (CEGL001264, G5)
- *Larrea tridentata* - *Coleogyne ramosissima* Shrubland (CEGL002717, G4?)
- *Larrea tridentata* - *Encelia farinosa* Shrubland [Placeholder] (CEGL002955, GNR)
- *Larrea tridentata* - *Ephedra nevadensis* Shrubland (CEGL001268, G5)
- *Larrea tridentata* - *Opuntia basilaris* - *Fouquieria splendens* Shrubland (CEGL001273, G4)
- *Larrea tridentata* / *Lycium andersonii* - *Grayia spinosa* Shrubland (CEGL001271, G5)
- *Larrea tridentata* / *Yucca* spp. Shrubland (CEGL001278, G5)
- *Larrea tridentata* Monotype Shrubland (CEGL001261, G5)

Alliances:

- *Ambrosia deltoidea* Shrubland Alliance (A.852)
- *Ambrosia dumosa* Dwarf-shrubland Alliance (A.1102)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)
- *Grayia spinosa* - *Ephedra viridis* Shrubland Alliance (A.1057)
- *Grayia spinosa* Intermittently Flooded Shrubland Alliance (A.1045)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Larrea tridentata* - *Ambrosia dumosa* Shrubland Alliance (A.2532)

- *Larrea tridentata* - *Encelia farinosa* Shrubland Alliance (A.2533)
- *Larrea tridentata* Shrubland Alliance (A.851)

DISTRIBUTION

Range: This system occupies broad valleys, lower bajadas, plains and low hills in the Mojave and lower Sonoran deserts.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXSO(MX), NV, UT

Map Zones: 12:C, 13:C, 14:C, 15:C, 16:?, 17:P, 23:C, 24:?, 25:C

USFS Ecomap Regions: 313A:CC, 313C:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, 341F:CC, M261E:PP, M341A:PP

TNC Ecoregions: 17:C, 23:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722916#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, West
ClassifResp: West

1088 SONORA-MOJAVE MIXED SALT DESERT SCRUB (CES302.749)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Temperate [Temperate Xeric]; Alkaline Soil; Basin floor; Atriplex spp.

Non-Diagnostic Classifiers: Tropical/Subtropical [Tropical Xeric]; Saline Substrate Chemistry; Aridic

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2088; ESLF 5265; ESP 1088

CONCEPT

Summary: This ecological system includes extensive open-canopied shrublands of typically saline basins in the Mojave and Sonoran deserts. Stands most often occur around playas and in valley bottoms or basins where evapotranspiration results in saline soils.

Substrates are generally fine-textured, saline soils. Vegetation is typically composed of one or more *Atriplex* species, such as *Atriplex canescens* or *Atriplex polycarpa*, along with other species of *Atriplex*. Species of *Allenrolfea*, *Salicornia*, *Suaeda*, *Krascheninnikovia lanata*, or other halophytic plants are often present to codominant. In some locations, scattered *Yucca brevifolia* may occur, but other Mojavean taxa are typically not present. Graminoid species may include *Sporobolus airoides* or *Distichlis spicata* at varying densities.

Related Concepts:

- Salt Desert Shrub (414) (Shiflet 1994) Broader
- Saltbush - Greasewood (501) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Atriplex (lentiformis, polycarpa)* Shrubland [Placeholder] (CEGL003016, G3)
- *Atriplex canescens - Artemisia tridentata* Shrubland (CEGL001282, G4)
- *Atriplex canescens - Ephedra viridis* Talus Shrubland (CEGL001287, G4)
- *Atriplex canescens - Krascheninnikovia lanata* Shrubland (CEGL001285, G5)
- *Atriplex canescens / Bouteloua gracilis* Shrubland (CEGL001283, G3)
- *Atriplex canescens / Calycoseris parryi* Shrubland (CEGL001284, G2)
- *Atriplex canescens / Pleuraphis jamesii* Shrubland (CEGL001288, G3G4)
- *Atriplex canescens* Shrubland (CEGL001281, G5)
- *Atriplex confertifolia - Atriplex polycarpa* Shrubland (CEGL001299, G5)
- *Atriplex confertifolia - Ephedra nevadensis* Shrubland (CEGL001303, G5)
- *Atriplex confertifolia - Lycium andersonii* Shrubland (CEGL001308, G3)
- *Atriplex confertifolia - Sarcobatus vermiculatus* Shrubland (CEGL001313, G5)
- *Atriplex hymenelytra* Shrubland (CEGL001317, G5)
- *Atriplex polycarpa* Shrubland (CEGL001318, G5)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)

Alliances:

- *Atriplex (lentiformis, polycarpa)* Shrubland Alliance (A.864)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Atriplex confertifolia* Shrubland Alliance (A.870)
- *Atriplex hymenelytra* Shrubland Alliance (A.872)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North American Warm Desert Playa (CES302.751)

DISTRIBUTION

Range: This system is found in saline basins of the Mojave and Sonoran deserts.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXSO(MX), NV, UT

Map Zones: 4:C, 5:P, 6:P, 12:C, 13:C, 14:C, 15:?, 17:P, 25:C

USFS Ecomap Regions: 261B:??, 262A:CC, 313A:PP, 313C:PP, 321A:PP, 322A:CC, 322B:CC, 322C:CC, 341D:C?, 341F:CC, M261E:CC, M341A:PP
TNC Ecoregions: 17:C, 22:C, 23:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722923#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1108 SONORA-MOJAVE SEMI-DESERT CHAPARRAL (CES302.757)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Intermediate Disturbance Interval; F-Patch/High Intensity; Evergreen Sclerophyllous Shrub

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Ridge/Summit/Upper Slope; Sideslope; Aridic; Broad-Leaved Deciduous Shrub; Broad-Leaved Evergreen Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2108; ESLF 5314; ESP 1108

CONCEPT

Summary: This ecological system is composed of evergreen shrublands or dwarf-woodlands on sideslopes transitioning from low-elevation desert landscapes up into woodlands of the western Mojave and Sonoran deserts. It extends from northeast Kern County, California, into Baja Norte, Mexico. Associated species include *Quercus john-tuckeri*, *Quercus cornelius-mulleri*, *Quercus berberidifolia*, *Arctostaphylos patula*, *Arctostaphylos pungens*, *Arctostaphylos glauca*, *Rhus ovata*, *Cercocarpus montanus* var. *glaber* (= *Cercocarpus betuloides*), *Ceanothus greggii*, *Garrya flavescens*, *Juniperus californica*, and *Nolina parryi*. Sometimes *Juniperus californica* forms an open, shrubby tree layer over the evergreen oaks and other shrubs.

Related Concepts:

- Snowbush (420) (Shiflet 1994) Undetermined. uncertain if these are related in concept.

DISTRIBUTION

Range: This system occurs in the western Mojave and Sonoran deserts, from northeast Kern County, California, into Baja Norte, Mexico.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXSO(MX), NV

Map Zones: 4:C, 6:P, 13:C, 14:C

USFS Ecomap Regions: 322A:CC, 322B:CC, 322C:CC, 341F:??, M261E:CC

TNC Ecoregions: 17:C, 23:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722915#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, West

ClassifResp: West

1089 SONORAN BRITTLEBUSH-IRONWOOD DESERT SCRUB (CES302.758)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]

Non-Diagnostic Classifiers: Lowland [Lowland]; Aridic

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2089; ESLF 5266; ESP 1089

CONCEPT

Summary: This Sonoran Desert scrub ecological system is common in plains of Sonora, Mexico, between 100-800 m elevation, but may not occur in the U.S. Vegetation is a sparse to moderately dense layer of short trees and xeromorphic microphyllous and broad-leaved evergreen shrubs that is dominated by *Olneya tesota* and *Encelia farinosa*. *Parkinsonia microphylla* and *Prosopis* spp. can also be common in the short-tree canopy. The understory is typically sparse but may also include desert grasses and ephemerals.

MEMBERSHIP

Associations:

- *Encelia farinosa* - *Ephedra nevadensis* - *Ephedra viridis* Shrubland (CEGL001252, G3)
- *Encelia farinosa* Shrubland (CEGL001251, G5)
- *Parkinsonia florida* - *Olneya tesota* Woodland [Placeholder] (CEGL003035, G3?)
- *Parkinsonia florida* / *Hilaria belangeri* Shrubland (CEGL001374, G3)

Alliances:

- *Encelia farinosa* Shrubland Alliance (A.867)
- *Parkinsonia florida* - *Olneya tesota* Woodland Alliance (A.588)
- *Parkinsonia florida* Shrubland Alliance (A.882)

DISTRIBUTION

Range: Plains of Sonora, Mexico, between 100-800 m elevation, but may not occur in the U.S.

Divisions: 302:C

Nations: MX, US?

Subnations: AZ?, MXSO(MX)

Map Zones: 14:P

USFS Ecomap Regions: 322B:PP

TNC Ecoregions: 17:C, 23:C

SOURCES

References: Brown 1982, Comer et al. 2003, MacMahon 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722914#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, West

ClassifResp: West

1090 SONORAN GRANITE OUTCROP DESERT SCRUB (CES302.760)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Granitic Rock; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Ridge; Woody-Herbaceous; Ridge/Summit/Upper Slope; Sideslope; Sand Soil Texture; Canyon; Cliff (Landform)

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2090; ESLF 5267; ESP 1090

CONCEPT

Summary: This ecological system occurs in foothills and mountains of Sonora, Mexico, and extends north across the border into southern Arizona. It is found on low- to mid-elevation granitic outcrops. Tropical genera of *Jatropha* and *Bursera* become codominants in dense to sparse vegetation transitioning upslope from Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761).

Diagnostic species are *Bursera microphylla*, *Jatropha cuneata*, *Nolina bigelovii*, *Parkinsonia microphylla*, or *Rhus kearneyi*.

Classification Comments: This ecological system is likely to be a northern expression of a more widely distributed desert scrub system of Sonora, Mexico, where it may not be restricted to rock outcrops or sites, such as in Arizona.

MEMBERSHIP

Associations:

- *Nolina bigelovii* Shrubland (CEGL003064, G3?)
- *Parkinsonia microphylla* - *Larrea tridentata* Shrubland (CEGL001375, G4)

Alliances:

- *Nolina bigelovii* Shrubland Alliance (A.2534)
- *Parkinsonia microphylla* Shrubland Alliance (A.883)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761)

Adjacent Ecological System Comments: This system transitions upslope from Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761).

DISTRIBUTION

Range: Occurs in foothills and mountains of Sonora, Mexico, and extends north across the border into southern Arizona.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXSO(MX), NV

Map Zones: 14:C

USFS Ecomap Regions: 322B:CC, 322C:CC

TNC Ecoregions: 23:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, MacMahon 1988, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722912#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, West
ClassifResp: West

1091 SONORAN MID-ELEVATION DESERT SCRUB (CES302.035)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Shrubland (Shrub-dominated); Alkaline Soil

Non-Diagnostic Classifiers: Alluvial fan; Sideslope; Temperate [Temperate Xeric]

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2091; ESLF 5268; ESP 1091

CONCEPT

Summary: This transitional desert scrub system occurs along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region between 750 and 1300 m. Stands occur in the Bradshaw, Hualapai, and Superstition mountains, among other desert ranges, and are found above Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761) and below Mogollon Chaparral (CES302.741). Sites range from a narrow strip on steep slopes to very broad areas such as the Verde Valley. Climate is too dry for chaparral species to be abundant, and freezing temperatures during winter are too frequent and prolonged for many of the frost-sensitive species that are characteristic of Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761), such as *Carnegia gigantea*, *Parkinsonia microphylla*, *Prosopis* spp., *Olneya tesota*, *Ferocactus* sp., and *Opuntia bigelovii*. Substrates are generally rocky soils derived from parent materials such as limestone, granitic rocks or rhyolite. The vegetation is typically composed of an open shrub layer of *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* with taller shrub such as *Canotia holacantha* (limestone or granite) or *Simmondsia chinensis* (rhyolite). The herbaceous layer is generally sparse.

Classification Comments: Includes Brown's (1982) Jojoba-Mixed Scrub and Creosotebush-Crucifixion-thorn Series.

MEMBERSHIP

Associations:

- *Ambrosia deltoidea* / *Simmondsia chinensis* Shrubland (CEGL000953, G4)

Alliances:

- *Ambrosia deltoidea* Shrubland Alliance (A.852)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mogollon Chaparral (CES302.741)
- Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761)

Adjacent Ecological System Comments: It is found above Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761) and below Mogollon Chaparral (CES302.741).

DISTRIBUTION

Range: This system occurs along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region between 750 and 1300 m.

Divisions: 302:C; 306:P

Nations: MX, US

Subnations: AZ, MXSO(MX)

Map Zones: 13:C, 14:C, 15:C, 25:C

USFS Ecomap Regions: 313C:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CP, M313A:CC

TNC Ecoregions: 22:P, 23:C

SOURCES

References: Brown 1982, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722672#references

Description Author: K. Pohns, K. Schulz, P. Comer

Version: 05 Oct 2004

Concept Author: K. Pohns, K. Schulz, P. Comer

Stakeholders: Latin America, West
ClassifResp: West

1109 SONORAN PALOVERDE-MIXED CACTI DESERT SCRUB (CES302.761)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic; Xeromorphic Shrub; Succulent Shrub; Cacti-dominated

Non-Diagnostic Classifiers: Sideslope; Toeslope/Valley Bottom; Alkaline Soil; Sand Soil Texture; Broad-Leaved Deciduous Shrub; Succulent Forb

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2109; ESLF 5315; ESP 1109

CONCEPT

Summary: This ecological system occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3-16 m tall) and/or a sparse to moderately dense canopy codominated by xeromorphic deciduous and evergreen tall shrubs *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis* sp., *Oleña tesota*, and *Fouquieria splendens* less prominent. Other common shrubs and dwarf-shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Simmondsia chinensis*, and many cacti, including *Ferocactus* spp., *Echinocereus* spp., and *Opuntia* spp. (both cholla and prickly-pear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present. Outliers of this succulent-dominated ecological system occur as "Cholla Gardens" in the western Mojave in California. In this area, the system is characterized by *Opuntia bigelovii*, *Fouquieria splendens*, *Senna armata*, and other succulents, but it lacks the *Carnegiea gigantea* and *Parkinsonia microphylla* which are typical farther east.

Related Concepts:

- Palo Verde - Cactus (507) (Shiflet 1994) Equivalent

MEMBERSHIP

Associations:

- *Acacia greggii* - *Parkinsonia microphylla* Shrubland (CEGL001340, G4G5)
- *Ambrosia deltoidea* / *Simmondsia chinensis* Shrubland (CEGL000953, G4)
- *Carnegiea gigantea* / *Prosopis velutina* Wooded Shrubland (CEGL001389, GNR)
- *Fouquieria splendens* / *Bouteloua curtipendula* Shrubland (CEGL001376, GNR)
- *Fouquieria splendens* / *Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Opuntia bigelovii* Shrubland [Placeholder] (CEGL003065, G4?)
- *Parkinsonia florida* - *Oleña tesota* Woodland [Placeholder] (CEGL003035, G3?)
- *Parkinsonia florida* / *Hilaria belangeri* Shrubland (CEGL001374, G3)
- *Parkinsonia microphylla* - *Larrea tridentata* Shrubland (CEGL001375, G4)
- *Simmondsia chinensis* - *Parkinsonia microphylla* Shrubland (CEGL000983, G4)

Alliances:

- *Acacia greggii* Shrubland Alliance (A.1036)
- *Ambrosia deltoidea* Shrubland Alliance (A.852)
- *Carnegiea gigantea* Wooded Shrubland Alliance (A.885)
- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Opuntia bigelovii* Shrubland Alliance (A.877)
- *Parkinsonia florida* - *Oleña tesota* Woodland Alliance (A.588)
- *Parkinsonia florida* Shrubland Alliance (A.882)
- *Parkinsonia microphylla* Shrubland Alliance (A.883)
- *Simmondsia chinensis* Shrubland Alliance (A.853)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Sonoran Granite Outcrop Desert Scrub (CES302.760)
- Sonoran Mid-Elevation Desert Scrub (CES302.035)

DISTRIBUTION

Range: This system is found in southern Arizona and southeastern California.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXSO(MX), NV?

Map Zones: 13:C, 14:C, 15:C, 25:C

USFS Ecomap Regions: 313C:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, M313A:??

TNC Ecoregions: 23:C

SOURCES

References: Bowers and McLaughlin 1987, Brown 1982, Comer et al. 2003, MacMahon 1988, McAuliffe 1993, Niering and Lowe 1984, Robichaux 1999, Shreve and Wiggins 1964

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722911#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, West

ClassifResp: West

1092 SOUTHERN CALIFORNIA COASTAL SCRUB (CES206.933)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Sideslope; Mediterranean [Mediterranean Xeric-Oceanic]; Xeric; Intermediate Disturbance Interval; F-Landscape/High Intensity; Evergreen Sclerophyllous Shrub; Semi-Shrub; *Artemisia californica*, *Salvia mellifera*

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2092; ESLF 5269; ESP 1092

CONCEPT

Summary: This ecological system includes mixed coastal shrublands from Monterey, California, south into Baja Norte, Mexico. It is dominated by drought-deciduous shrubs but at times can have characteristic (constant but not dominant) resprouting, deep-rooted sclerophyllous shrubs. It occurs below 1000 m (3000 feet) elevation and may extend inland from the maritime zone in hotter, drier conditions than northern (less fog-drenched) shrublands (e.g., areas with 10-60 cm of annual precipitation). Soils vary from coarse gravels to clays but typically only support plant-available moisture with winter and spring rain. Most predominant shrubs include *Artemisia californica*, *Salvia mellifera*, *Salvia apiana*, *Salvia leucophylla*, *Encelia californica*, *Eriogonum fasciculatum*, *Eriogonum cinereum*, *Opuntia littoralis*, *Diplacus aurantiacus* (= *Mimulus aurantiacus*), *Lotus scoparius* (early seral after fire), and *Baccharis pilularis* (in moister, disturbed sites). Characteristic (constant but not dominant) resprouting, deep-rooted sclerophyllous shrubs include *Malosma laurina*, *Rhus integrifolia*, and *Rhamnus crocea*. Fire frequency was historically low, but in recent years with adjacency to urban and suburban areas, the fire frequency has increased (a result of arson or cigarette ignition) resulting in type conversion to non-native and ruderal annual grasslands. *Malosma laurina* and *Rhus integrifolia* are also increasing in abundance because they can continually resprout after repeated fires. In places, *Opuntia littoralis* may proliferate and cover entire slopes in dry rocky areas with repeated fires that have killed the scrub taxa, while *Opuntia littoralis* can resprout and spread to cover large patches.

Similar Ecological Systems:

- Northern California Coastal Scrub (CES206.932)

Related Concepts:

- Coastal Sage Shrub (205) (Shiflet 1994) Equivalent

MEMBERSHIP

Associations:

- *Eriogonum fasciculatum* - *Salvia apiana* Shrubland [Placeholder] (CEGL003048, G3?)
- *Opuntia littoralis* Shrubland (CEGL003066, G3G4)
- *Salvia (apiana, leucophylla, mellifera)* Shrubland [Placeholder] (CEGL003106, G3?)
- *Salvia apiana* Shrubland [Placeholder] (CEGL003103, G3?)
- *Salvia mellifera* - *Artemisia californica* Shrubland (CEGL003012, G4)

Alliances:

- *Artemisia californica* - *Salvia mellifera* Shrubland Alliance (A.814)
- *Eriogonum fasciculatum* - *Salvia apiana* Shrubland Alliance (A.773)
- *Opuntia littoralis* Shrubland Alliance (A.879)
- *Salvia (apiana, leucophylla, mellifera)* Shrubland Alliance (A.746)
- *Salvia apiana* Shrubland Alliance (A.747)

DISTRIBUTION

Range: This system is found from Monterey, California, south into Baja Norte, Mexico. It occurs below 1000 m (3000 feet) elevation and may extend inland from the maritime zone.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C, 5:?, 6:?

USFS Ecomap Regions: 261B:CC, 262A:CC

TNC Ecoregions: 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722748#references

Description Author: P. Comer, T. Keeler-Wolf
Version: 07 Oct 2005
Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West
ClassifResp: West

1110 SOUTHERN CALIFORNIA DRY-MESIC CHAPARRAL (CES206.930)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Sideslope; Mediterranean [Mediterranean Desertic-Oceanic]; Ustic; F-Landscape/High Intensity; Broad-Leaved Shrub

Non-Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Deep Soil; Intermediate Disturbance Interval; Evergreen Sclerophyllous Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2110; ESLF 5316; ESP 1110

CONCEPT

Summary: This ecological system includes chaparral from sea level up to 1500 m (4550 feet) elevation throughout central and southern California and inland portions of Baja Norte, Mexico. It is found in dry-mesic to mesic site conditions analogous to mesic chaparral. Santa Ana winds drive late-summer, stand-replacing fires in these systems. Characteristic species include *Ceanothus megacarpus*, *Ceanothus crassifolius*, *Ceanothus leucodermis*, *Ceanothus greggii*, *Adenostoma fasciculatum*, *Adenostoma sparsifolium*, *Arctostaphylos glauca*, *Cercocarpus montanus* var. *glaber* (= *Cercocarpus betuloides*), *Cercocarpus montanus* var. *minutiflorus* (= *Cercocarpus minutiflorus*), *Rhus ovata*, and *Xylococcus bicolor*.

Related Concepts:

- Ceanothus Mixed Chaparral (208) (Shiflet 1994) Broader
- Chamise Chaparral (206) (Shiflet 1994) Broader. SRM groups all Adenostoma-dominated communities into one range type; several ecological systems can have Adenostoma fasciculatum as a dominant.

MEMBERSHIP

Associations:

- *Ceanothus megacarpus* - *Cercocarpus montanus* var. *glaber* Shrubland (CEGL003029, G3?)
- *Ceanothus megacarpus* - *Rhamnus ilicifolia* Shrubland [Provisional] (CEGL003030, G3?)

Alliances:

- *Ceanothus megacarpus* Shrubland Alliance (A.770)

DISTRIBUTION

Range: This system includes chaparral from sea level up to 1500 m (4550 feet) elevation throughout central and southern California and inland portions of Baja Norte, Mexico.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C, 5:C

USFS Ecomap Regions: 261B:CC, 262A:CC, 322A:PP, 322C:PP

TNC Ecoregions: 13:C, 15:P, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722751#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West
ClassifResp: West

1093 SOUTHERN COLORADO PLATEAU SAND SHRUBLAND (CES304.793)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Woody-Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Very Short Disturbance Interval; G-Landscape/High Intensity

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Mechanical Disturbance; Xeromorphic Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2093; ESLF 5270; ESP 1093

CONCEPT

Summary: This large-patch ecological system is found on the south-central Colorado Plateau in northeastern Arizona extending into southern and central Utah. It occurs on windswept mesas, broad basins and plains at low to moderate elevations (1300-1800 m). Substrates are stabilized sandsheets or shallow to moderately deep sandy soils that may form small hummocks or small coppice dunes. This semi-arid, open shrubland is typically dominated by short shrubs (10-30 % cover) with a sparse graminoid layer. The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include *Ephedra cutleri*, *Ephedra torreyana*, *Ephedra viridis*, and *Artemisia filifolia*. *Coleogyne ramosissima* is typically not present. *Poliomintha incana*, *Parryella filifolia*, *Quercus havardii* var. *tuckeri*, or *Ericameria nauseosa* may be present to dominant locally. *Ephedra cutleri* and *Ephedra viridis* often assume a distinctive matty growth form. Characteristic grasses include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, and *Pleuraphis jamesii*. The general aspect of occurrences is an open low shrubland but may include small blowouts and dunes. Occasionally grasses may be moderately abundant locally and form a distinct layer. Disturbance may be important in maintaining the woody component. Eolian processes are evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this system from Inter-Mountain Basins Active and Stabilized Dune (CES304.775).

Similar Ecological Systems:

- Inter-Mountain Basins Active and Stabilized Dune (CES304.775)

MEMBERSHIP

Associations:

- *Artemisia filifolia* - *Ephedra* (*torreyana*, *viridis*) Shrubland (CEGL002786, GNR)
- *Ephedra cutleri* Shrubland [Provisional] (CEGL005804, GNR)
- *Ephedra torreyana* - *Achnatherum hymenoides* Hummock Shrubland (CEGL005802, GNR)
- *Ephedra torreyana* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001731, G2)
- *Ephedra viridis* / *Achnatherum hymenoides* - *Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL001648, G2G4)
- *Ephedra viridis* / *Achnatherum hymenoides* - *Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001649, G2G4)
- *Ephedra viridis* / *Bromus tectorum* Semi-natural Shrubland (CEGL002355, GNA)
- *Ephedra viridis* / *Pleuraphis rigida* Shrubland (CEGL001257, G3)
- *Ericameria nauseosa* Sand Deposit Sparse Shrubland (CEGL002980, GNR)
- *Poliomintha incana* / (*Pleuraphis jamesii*) Shrubland (CEGL002930, GNR)

Alliances:

- *Achnatherum hymenoides* Shrub Herbaceous Alliance (A.1543)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Ephedra cutleri* Shrubland Alliance [Provisional] (A.2644)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Poliomintha incana* Shrubland Alliance (A.862)

DISTRIBUTION

Range: This system occurs in sandy plains and mesas on the south-central Colorado Plateau in northeastern Arizona extending into southern and central Utah.

Divisions: 304:C

Nations: US

Subnations: AZ, CO?, NM?, UT

Map Zones: 15:?, 16:?, 23:C, 24:C, 28:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 341B:CC, M313A:CC, M341B:PP

TNC Ecoregions: 19:C

SOURCES

References: AZGAP unpubl. data 2004, UTGAP unpubl. data 2004, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.740063#references

Description Author: K.A. Schulz

Version: 08 Sep 2004

Concept Author: K. Pohs, K. Schulz, J. Kirby

Stakeholders: West

ClassifResp: West

1392 TAMAULIPAN CALCAREOUS THORNSCRUB (CES301.986)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Caliche Layer; Lowland [Lowland]; Ridge; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Tropical/Subtropical [Tropical Xeric]; Calcareous; Very Shallow Soil

Non-Diagnostic Classifiers: Oligotrophic Soil; Alkaline Soil

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2392; ESLF 5323; ESP 1392

CONCEPT

Summary: This xeric thornscrub ecological system is restricted to limestone and calcareous sandstone hills and caliche substrates such as along the Bordas Scarp in southern Texas and northeastern Mexico. Soils are shallow, alkaline, strongly calcareous and underlain by bedrock or a caliche layer. It has a shorter, more open shrub canopy (usually less than 2 m) when compared to more typical thornscrub growing on more favorable sites. However, shrub cover is generally greater than 70% and often greater than 85%. Dominant species include *Leucophyllum frutescens*, *Acacia berlandieri*, and *Acacia farnesiana* with many other shrub species that may be locally dominant such as *Acacia rigidula*, *Amyris madrensis*, *Amyris texana*, *Castela erecta ssp. texana*, *Celtis pallida*, *Eysenhardtia texana*, *Helietta parvifolia*, *Koeberlinia spinosa*, *Parkinsonia texana var. macra*, *Sophora secundiflora*, or *Yucca* spp. The sparse to moderately dense herbaceous layer is dominated by perennial graminoids.

Similar Ecological Systems:

- Edwards Plateau Limestone Shrubland (CES303.041)

MEMBERSHIP

Associations:

- *Acacia rigidula* - *Leucophyllum frutescens* - *Hechtia glomerata* Shrubland (CEGL007760, G2G3Q)
- *Helietta parvifolia* - *Acacia rigidula* - *Ebenopsis ebano* - *Leucophyllum frutescens* Shrubland (CEGL004923, G3)
- *Leucophyllum frutescens* - *Salvia ballotiflora* - *Lippia graveolens* Shrubland (CEGL007789, G2?)
- *Leucophyllum frutescens* Shrubland (CEGL002168, G4)

Alliances:

- *Acacia rigidula* - *Leucophyllum frutescens* - *Acacia berlandieri* Shrubland Alliance (A.1909)

DISTRIBUTION

Range: Restricted to limestone and calcareous sandstone hills and caliche substrates such as along the Bordas Scarp in southern Texas and northeastern Mexico.

Divisions: 301:C; 303:P

Nations: MX, US

Subnations: MXCO(MX), MXNU(MX), MXTM(MX), TX

Map Zones: 26:C, 35:C, 36:C

TNC Ecoregions: 24:C, 29:C, 30:C, 31:P

SOURCES

References: Comer et al. 2003, CONABIO 2003b, Jahrsdoerfer and Leslie 1988, McLendon 1991

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722719#references

Description Author: Western Ecology Group, mod. J. Teague and L. Elliott

Version: 17 Apr 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1391 TAMAULIPAN MESQUITE UPLAND SCRUB (CES301.984)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; *Prosopis* spp.-dominated

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2391; ESLF 5322; ESP 1391

CONCEPT

Summary: This ecological system occurs throughout much of the lower Rio Grande plains and plateaus of northeastern Mexico and southern Texas. It is dominated by thorn scrub that was limited to rocky, broken uplands and drainages, but has become widespread in the last 100-150 years as the result of disturbance to adjacent mesquite savanna grasslands. Severe overgrazing in the mid-1800s, with subsequent shifts in fire processes and changes in edaphic conditions, has allowed this thornscrub ecological system to be the new steady-state. The vegetation is characterized by an open to dense tall-shrub layer dominated or codominated by *Prosopis glandulosa* with many other species present to codominate such as *Acacia berlandieri*, *Acacia farnesiana*, *Acacia rigidula*, *Amyris madrensis*, *Amyris texana*, *Celtis pallida*, *Leucophyllum frutescens*, *Opuntia* spp., *Parkinsonia texana*, *Yucca* spp. and *Zanthoxylum fagara*. The herbaceous layer is generally sparse, but dense graminoids may dominate the herbaceous layer of stands with open shrub canopies or remnant patches of savanna.

Classification Comments: More review is needed to determine the naturalness of this system and its relationship to Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733).

Similar Ecological Systems:

- Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733)

DESCRIPTION

Vegetation: The vegetation is characterized by an open to dense tall-shrub layer dominated or codominated by *Prosopis glandulosa* with many other species present to codominate such as *Acacia berlandieri*, *Acacia farnesiana*, *Acacia rigidula*, *Amyris madrensis*, *Amyris texana*, *Celtis pallida*, *Leucophyllum frutescens*, *Opuntia* spp., *Parkinsonia texana*, *Yucca* spp. and *Zanthoxylum fagara*. The herbaceous layer is generally sparse, but dense graminoids may dominate the herbaceous layer of stands with open shrub canopies or remnant patches of savanna.

MEMBERSHIP

Associations:

- *Prosopis glandulosa* - *Atriplex* spp. Shrubland (CEGL002193, GNR)
- *Prosopis glandulosa* var. *glandulosa* / *Celtis pallida* - *Opuntia* spp. Woodland (CEGL007756, GNA)
- *Prosopis glandulosa* var. *glandulosa* / *Spartina spartinae* Shrubland (CEGL007761, G3?)

Alliances:

- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis glandulosa* Woodland Alliance (A.611)

DISTRIBUTION

Range: This system occurs throughout much of the lower Rio Grande plains and plateaus of northeastern Mexico and south Texas, ranging north into the southwestern portion of the Edwards Plateau of Texas.

Divisions: 301:C; 303:C

Nations: MX, US

Subnations: MXCO(MX), MXNU(MX), MXTM(MX), TX

Map Zones: 26:P, 35:C, 36:C

TNC Ecoregions: 29:C, 30:C, 31:C

SOURCES

References: Brown 1982, Brown et al. 1998, Comer et al. 2003, CONABIO 2003a, Webster 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722721#references

Description Author: NatureServe Western Ecology Team

Version: 04 Feb 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1390 TAMAULIPAN MIXED DECIDUOUS THORNSCRUB (CES301.983)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2390; ESLF 5321; ESP 1390

CONCEPT

Summary: This thornscrub ecological system occurs throughout much of northeastern Mexico and southern Texas. It occurs on a variety of substrates and landforms. Dominant species include *Acacia roemeriana*, *Leucophyllum frutescens*, and *Prosopis glandulosa*. Other species present to codominant include *Acacia berlandieri*, *Acacia farnesiana*, *Amyris madrensis*, *Amyris texana*, *Celtis pallida*, *Parkinsonia texana*, and cacti such as *Opuntia engelmannii* var. *lindheimeri*.

MEMBERSHIP

Associations:

- *Acacia berlandieri* South Texas Plains Shrubland (CEGL002181, G3G5)
- *Acacia farnesiana* - *Celtis laevigata* - *Celtis pallida* Woodland (CEGL007793, GNA)
- *Acacia rigidula* - *Leucophyllum frutescens* - *Acacia berlandieri* Shrubland (CEGL007759, G5)
- *Acacia rigidula* Shrubland (CEGL003874, G4G5)
- *Prosopis glandulosa* / *Acanthocereus tetragonus* Woodland (CEGL007832, G2?)
- *Prosopis glandulosa* var. *glandulosa* - *Acacia greggii* - *Celtis pallida* / *Paspalum setaceum* - *Urochloa ciliatissima* Woodland (CEGL007786, G3?)
- *Prosopis glandulosa* var. *glandulosa* - *Celtis pallida* / *Opuntia* spp. - *Xylothamia palmeri* Woodland (CEGL007787, G4G5)
- *Prosopis glandulosa* var. *glandulosa* - *Opuntia engelmannii* var. *lindheimeri* - *Borrchia frutescens* Shrubland (CEGL007790, G3G4)
- *Prosopis glandulosa* var. *glandulosa* - *Parkinsonia texana* var. *macra* - (*Cordia boissieri*, *Koeberlinia spinosa*) Shrubland (CEGL007762, G4)
- *Prosopis glandulosa* var. *glandulosa* / (*Celtis pallida*, *Phaulothamnus spinescens*, *Ziziphus obtusifolia* var. *obtusifolia*) Woodland (CEGL002132, G2?)
- *Varilla texana* - *Castela erecta* ssp. *texana* - *Isocoma coronopifolia* / *Hilaria belangeri* Shrubland (CEGL007763, G1?)

Alliances:

- *Acacia farnesiana* Woodland Alliance (A.660)
- *Acacia rigidula* - *Leucophyllum frutescens* - *Acacia berlandieri* Shrubland Alliance (A.1909)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis glandulosa* Woodland Alliance (A.611)
- *Varilla texana* - *Castela erecta* Shrubland Alliance (A.1910)

DISTRIBUTION

Range: Occurs throughout much of northeastern Mexico and southern Texas.

Divisions: 301:C

Nations: MX, US

Subnations: MXCO(MX), MXNU(MX), MXTM(MX), TX

Map Zones: 36:C

TNC Ecoregions: 30:C, 31:C

SOURCES

References: Brown 1982, Brown et al. 1998, Comer et al. 2003, CONABIO 2003a, Webster 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722722#references

Description Author: NatureServe Western Ecology Team

Version: 21 Mar 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1111 WESTERN GREAT PLAINS MESQUITE WOODLAND AND SHRUBLAND (CES303.668)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); F-Patch/Medium Intensity; G-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2111; ESLF 5317; ESP 1111

CONCEPT

Summary: This system is found primarily in the southern portion of the Western Great Plains Division, primarily in Texas, Oklahoma and eastern New Mexico. It is dominated by *Prosopis glandulosa* with shortgrass species in the understory. *Ziziphus obtusifolia* and *Atriplex canescens* can codominate in some examples, as can *Opuntia* species in heavily grazed areas. Shortgrass species *Bouteloua gracilis* or *Buchloe dactyloides* are typically present. Other grasses may include *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua hirsuta*, *Muhlenbergia torreyi*, *Pleuraphis jamesii*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Historically this system probably occurred as a natural component on more fertile soils and along drainages, but it has expanded its range into prairie uplands in recent decades.

Classification Comments: With fire suppression and grazing, *Prosopis glandulosa* has been able to extend its range and become dense in examples of Western Great Plains Shortgrass Prairie (CES303.672) or Central Mixedgrass Prairie (CES303.659). Those areas should still be considered part of the prairie system. In Landfire mapzone 26 BpS modeling workshops, this was modeled in its limited extent along drainages rather than as the pervasive EVT.

Similar Ecological Systems:

- Central Mixedgrass Prairie (CES303.659)
- Western Great Plains Shortgrass Prairie (CES303.672)

Related Concepts:

- Mesquite (729) (Shiflet 1994) Broader
- Mesquite - Buffalograss (727) (Shiflet 1994) Finer
- Mesquite - Grama (718) (Shiflet 1994) Equivalent
- Mesquite: 242 (Eyre 1980) Broader

DESCRIPTION

Environment: This system occurs naturally on deeper or more fertile soils and along drainages.

Vegetation: This system is dominated by *Prosopis glandulosa* with *Ziziphus obtusifolia*, and *Atriplex canescens* can codominate. *Opuntia* spp. can be prevalent in areas in heavily grazed examples of this system. The understory of this system is often dominated by shortgrass species.

Dynamics: Historically, fire controlled this system and limited the development of woody cover. Likewise, edaphic conditions and topographic factors limited this system to deep alluvial soils in relatively low topographic positions along broad valley floors.

MEMBERSHIP

Associations:

- *Acacia farnesiana* - (*Prosopis glandulosa*) Woodland (CEGL002131, G5)
- *Buchloe dactyloides* Modified Herbaceous Vegetation (CEGL004948, GNA)
- *Prosopis glandulosa* - *Ziziphus obtusifolia* Shrubland (CEGL004939, G2G3)
- *Prosopis glandulosa* / *Bouteloua curtipendula* - *Nassella leucotricha* Woodland (CEGL002133, G3?)
- *Prosopis glandulosa* / *Bouteloua curtipendula* Shrubland (CEGL002194, GNR)
- *Prosopis glandulosa* var. *glandulosa* / *Bouteloua gracilis* - *Buchloe dactyloides* Shrubland (CEGL003877, GNR)
- *Schizachyrium scoparium* - (*Sorghastrum nutans*) - *Sporobolus compositus* var. *compositus* - *Liatris mucronata* Herbaceous Vegetation (CEGL004211, GNR)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Nassella leucotricha* Herbaceous Vegetation (CEGL004070, GNR)

Alliances:

- *Acacia farnesiana* Woodland Alliance (A.660)
- *Buchloe dactyloides* Herbaceous Alliance (A.1276)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis glandulosa* Woodland Alliance (A.611)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is primarily found in the southern portion of the Western Great Plains division, particularly in Texas, Oklahoma

and eastern New Mexico.

Divisions: 303:C

Nations: US

Subnations: NM, OK, TX

Map Zones: 26:C, 27:C, 34:C, 35:C, 38:P

USFS Ecomap Regions: 315A:CC, 315B:CC, 331B:CC, 331I:C?, M313B:??

TNC Ecoregions: 27:?, 28:C, 29:C, 33:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722990#references

Description Author: S. Menard and K. Kindscher, mod. K.A. Schulz

Version: 29 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

1094 WESTERN GREAT PLAINS SANDHILL STEPPE (CES303.671)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Sand Soil Texture; Ustic; F-Landscape/Medium Intensity; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2094; ESLF 5271; ESP 1094

CONCEPT

Summary: This system is found mostly in south-central areas of the Western Great Plains Division ranging from southwestern Wyoming and southwestern Nebraska up into the Nebraska Sandhill region, south through eastern Colorado, and New Mexico to central Texas, although some examples may reach as far north as the Badlands of South Dakota. The climate is semi-arid to arid for much of the region in which this system occurs. This system is found on somewhat excessively to excessively well-drained, deep sandy soils that are often associated with dune systems and ancient floodplains. In some areas, this system may actually occur as a result of overgrazing in Western Great Plains Tallgrass Prairie (CES303.673) or Western Great Plains Sand Prairie (CES303.670). Typically, this system is characterized by a sparse to moderately dense woody layer dominated by *Artemisia filifolia*, but other characteristic species may be present, including *Amorpha canescens*, *Prosopis glandulosa* (southern stands), *Prunus angustifolia*, *Prunus pumila* var. *besseyi* (northern stands), *Rhus trilobata*, and *Yucca glauca*. Associated herbaceous species can vary with geography, amount and season of precipitation, disturbance, and soil texture. The herbaceous layer typically has a moderate to dense canopy but may include stands with sparse understory. Several mid- to tallgrass species characteristic of sand substrates are usually present to dominant, such as *Andropogon hallii*, *Calamovilfa gigantea*, *Calamovilfa longifolia*, *Schizachyrium scoparium*, *Sporobolus cryptandrus*, *Sporobolus giganteus*, or *Hesperostipa comata*.

In the southern range of this system, *Quercus havardii* may also be present to dominant and represents one succession pathway that develops over time following a disturbance. *Quercus havardii* is able to resprout following a fire and thus may persist for long periods of time once established forming extensive clones. Edaphic and climatic factors are the most important dynamic processes for this type, with drought and extreme winds impacting this system significantly in some areas. Because *Quercus havardii* is able to resprout rapidly following fire, fire tends to cause structural changes in the vegetation, and compositional shifts are less significant in most cases. Overgrazing can lead to decreasing dominance of some of the grass species such as *Andropogon hallii*, *Calamovilfa gigantea*, and *Schizachyrium scoparium*. In the western extent of this system in the shortgrass prairie, more xeric mid- and shortgrass species such as *Hesperostipa comata*, *Sporobolus cryptandrus* and *Bouteloua gracilis* often dominate the herbaceous layer.

Classification Comments: This system is minor in the sandhills region of western Nebraska which is dominated by sand prairie. It may overlap in concept with East-Central Texas Plains Xeric Sandyland (CES205.897). This system was modeled Monahans and Mescalero Sands of Texas and New Mexico during Landfire workshops, but probably needs significant review because of the complexity of the relationship among tallgrass, shin oak, and sandsage types. This type is probably best represented in mapzone 34.

Similar Ecological Systems:

- East-Central Texas Plains Xeric Sandyland (CES205.897)
- Western Great Plains Sand Prairie (CES303.670)
- Western Great Plains Tallgrass Prairie (CES303.673)

Related Concepts:

- Blue Grama - Sideoats Grama - Black Grama (707) (Shiflet 1994) Intersecting
- Bluestem -Dropseed (708) (Shiflet 1994) Broader
- Sand Bluestem - Little Bluestem Dunes (720) (Shiflet 1994) Finer
- Sand Sagebrush - Mixed Prairie (722) (Shiflet 1994) Equivalent
- Sand Shinnery Oak (730) (Shiflet 1994) Finer
- Sandsage Prairie (605) (Shiflet 1994) Broader

DESCRIPTION

Environment: This system is found primarily in semi-arid to arid areas of the Western Great Plains Division. It occurs on somewhat excessively to excessively well-drained and deep sandy soils. This system is often found associated with dune systems and/or ancient floodplains but may occur in soils derived from sandstone residuum.

Vegetation: This system is distinguished by a sparse to moderately dense shrub layer dominated by *Artemisia filifolia*. Graminoid species, such as *Andropogon hallii*, *Schizachyrium scoparium*, *Sporobolus cryptandrus*, *Calamovilfa gigantea*, *Hesperostipa comata*, and *Bouteloua* spp., can also be found within this system. Other shrub species, such as *Yucca glauca*, *Rhus trilobata*, and *Prunus angustifolia*, may be present. *Quercus havardii* and *Prosopis glandulosa* may also be present in the southern extent of this system.

Dynamics: Fire and grazing constitute the most important processes impacting this system. Burning shrublands reduces cover of *Artemisia filifolia* for several years resulting in grassland patches that form a mosaic pattern with shrublands. Composition of

grasslands depends on precipitation and management. Drought stress can also influence this system in some areas.

MEMBERSHIP

Associations:

- *Artemisia filifolia* / *Andropogon hallii* Shrubland (CEGL001459, G3?)
- *Artemisia filifolia* / *Bouteloua (curtipendula, gracilis)* Shrubland (CEGL002176, GNR)
- *Artemisia filifolia* / *Calamovilfa longifolia* Shrubland (CEGL002177, G2G3)
- *Artemisia filifolia* / *Schizachyrium scoparium* - *Andropogon hallii* Shrubland (CEGL002178, GNR)
- *Artemisia filifolia* / *Sporobolus cryptandrus* Shrubland (CEGL002179, GNR)
- *Quercus havardii* / *Sporobolus cryptandrus* - *Schizachyrium scoparium* Shrubland (CEGL002171, G3)

Alliances:

- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Quercus havardii* Shrubland Alliance (A.780)

DISTRIBUTION

Range: This system is found primarily within the south-central areas of the Western Great Plains Division ranging from the Nebraska Sandhills south into central Texas. However, examples of this system can be found as far north as the Badlands in South Dakota.

Divisions: 303:C

Nations: US

Subnations: CO, KS, NE, NM, OK, SD?, TX

Map Zones: 25:?, 26:C, 27:C, 28:?, 31:C, 33:C, 34:C, 38:C

USFS Ecomap Regions: 315A:CC, 315B:CC, 315F:CC, 321A:CC, 331B:CC, 331C:CC, 331H:CC, 331I:CC, 332E:CC, 332F:CC, M313B:PP

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C

SOURCES

References: Comer et al. 2003, Ramaley 1939b, Sims et al. 1976, Tolstead 1942

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722987#references

Description Author: S. Menard and K. Kindscher, mod. K.A. Schulz and L. Elliott

Version: 10 Apr 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

1072 WYOMING BASINS DWARF SAGEBRUSH SHRUBLAND AND STEPPE (CES304.794)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Hill(s); Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Sideslope; Shallow Soil; Silt Soil Texture; Clay Soil Texture; Aridic; W-Landscape/High Intensity; Low *Artemisia* spp.

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Alkaline Soil; Dwarf-Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Dwarf-shrubland, Evergreen dwarf-shrubland

National Mapping Codes: EVT 2072; ESLF 5209; ESP 1072

CONCEPT

Summary: This windswept ecological system is composed of dwarf sagebrush shrubland and shrub-steppe that forms matrix vegetation and large patches on the margins of high-elevation basins in central and southern Wyoming. Typical sites are gently rolling hills and long, gently sloping pediments and fans. These sites are very windy and have shallow, often rocky soils. The distinguishing feature of this system is a short-shrub stratum in which dwarf-shrubs (≤ 30 cm tall) contribute at least two-thirds of the woody canopy. Four sagebrush taxa may dominate the shrub stratum: *Artemisia tripartita* ssp. *rupicola*, *Artemisia nova*, *Artemisia arbuscula* ssp. *longiloba*, and wind-dwarfed *Artemisia tridentata* ssp. *wyomingensis*. Two or more of these sagebrushes often codominate, but any of them may occur alone. Where graminoids are common and tall, the vegetation often has the appearance of grassland without shrubs; the shrubs are obvious only when the vegetation is viewed from up close. Where graminoids contribute less cover, the vegetation is a compact shrubland. The herbaceous component of the vegetation includes both rhizomatous and bunch-form graminoids, cushion plants, and other low-growing forbs. *Bouteloua gracilis*, a common species of Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) in Wyoming, is absent.

Related Concepts:

- Black Sagebrush (405) (Shiflet 1994) Intersecting
- Black Sagebrush - Bluebunch Wheatgrass (320) (Shiflet 1994) Intersecting. Black sage communities in Montana need review for the best system placement.
- Black Sagebrush - Idaho Fescue (321) (Shiflet 1994) Intersecting. Black sage communities in Montana need review for the best system placement.
- Threetip Sagebrush (404) (Shiflet 1994) Intersecting. *Artemisia tripartita* ssp. *rupicola* shrublands are included in this ecological system in the Wyoming Basins.

MEMBERSHIP

Associations:

- *Artemisia arbuscula* ssp. *longiloba* / Cushion Plants Shrubland (CEGL005996, GNR)
- *Artemisia arbuscula* ssp. *longiloba* / *Elymus lanceolatus* Shrubland (CEGL002585, GNR)
- *Artemisia arbuscula* ssp. *longiloba* / *Poa fendleriana* Shrubland (CEGL005997, GNR)
- *Artemisia arbuscula* ssp. *longiloba* / *Poa secunda* Shrub Herbaceous Vegetation (CEGL001523, G3Q)
- *Artemisia arbuscula* ssp. *longiloba* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001416, GNR)
- *Artemisia nova* / *Pseudoroegneria spicata* Shrubland (CEGL001424, G4G5)
- *Artemisia tridentata* ssp. *wyomingensis* / *Carex filifolia* Shrubland (CEGL001042, G1Q)
- *Artemisia tridentata* ssp. *wyomingensis* / *Poa secunda* Shrubland (CEGL001049, G4)
- *Artemisia tripartita* ssp. *rupicola* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001540, G3)

Alliances:

- *Artemisia arbuscula* ssp. *longiloba* Shrub Herbaceous Alliance (A.2552)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance (A.2549)
- *Artemisia nova* Shrubland Alliance (A.1105)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Artemisia tripartita* ssp. *rupicola* Shrub Herbaceous Alliance (A.2556)

DISTRIBUTION

Range: This system occurs throughout the basins of central and southern Wyoming, extending south into adjacent portions of Colorado. It also occurs on the eastern side of the Continental Divide in Montana, where *Artemisia nova* shrublands are found on calcareous substrates.

Divisions: 304:C

Nations: US

Subnations: CO, MT, WY

Map Zones: 16:?, 21:C, 22:C, 23:C, 29:C

USFS Ecomap Regions: 331F:CC, 331G:CC, 331K:CP, 331L:C?, 331N:CP, 341C:??, 342F:CC, 342G:CC, M331A:C?, M331B:CC,

M331D:C?, M331E:CC, M331H:CC, M331I:CC, M332D:CC, M341B:PP

TNC Ecoregions: 10:C, 26:C

SOURCES

References: Comer et al. 2003, Jones 1992b, Knight 1994, Knight et al. 1987

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722879#references

Description Author: Western Ecology Group, mod. M.S. Reid and G.P. Jones

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

SAVANNA AND SHRUB-STEPPE

1408 ALABAMA KETONA GLADE AND WOODLAND (CES202.338)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2408; ESLF 5424; ESP 1408

CONCEPT

Summary: This system consists of open glades and related vegetation on Ketona dolomite slopes found in Bibb County, Alabama, in the vicinity of the Little Cahaba River. The vegetation includes herbaceous, shrubland, and open woodlands, which occur on thin soils or outcrops of Ketona dolomite. *Juniperus virginiana*, *Quercus muehlenbergii*, *Pinus palustris*, *Croton alabamensis*, *Sabal minor*, and *Leptopus phyllanthoides* are the dominant woody plants of the woodlands. The system supports eight endemic and numerous disjunct plant taxa and has very high conservation value based on rare plants.

Classification Comments: As TNC ecoregions are officially defined, examples of this system are found in the Cumberland and Southern Ridge and Valley (Ecoregion 50), as well as in the Upper East Gulf Coastal Plain (Ecoregion 43). However, the occurrence in the latter ecoregion may be due to inaccurate boundaries; the system is fundamentally associated with the Cumberland and Southern Ridge and Valley due to its fidelity to ancient dolomites not more recent sediments. It appears to be restricted to EPA level III Ecoregion 67 (Ridge and Valley) not 65 ("Southeastern Plains") (EPA 2004) and the corresponding MRLC mapzones (i.e., 48 not 46), and the attributions reflect this determination.

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)

DESCRIPTION

Environment: This system consists of open glades and related vegetation on Ketona dolomite slopes found in Bibb County, Alabama, in the vicinity of the Little Cahaba River.

Vegetation: The vegetation of the system includes a mixture of herbaceous, shrubland, and open woodlands, which occur on thin soils surrounding outcrops of Ketona dolomite. *Juniperus virginiana*, *Quercus muehlenbergii*, *Pinus palustris*, *Croton alabamensis*, *Sabal minor*, and *Leptopus phyllanthoides* are the dominant woody plants of the woodlands. *Schizachyrium scoparium* is a frequent grass in this system and is commonly associated with *Andropogon gerardii* and other calcium-loving, drought-tolerant plant species. Stunted woodlands are primarily dominated by *Quercus muehlenbergii* interspersed with *Juniperus virginiana* and occur on variable-depth-to-bedrock soils. The trees may occur as islands in a wider herbaceous or rocky area. The islands are found in microenvironments where the soil depth and available water are sufficient to support trees (e.g., depressions or fissures in the bedrock). Small-scale stands of annual *Sporobolus* spp. may be prominent in some examples. More than 60 plant taxa of conservation concern occur on or near these glades, marking them as one of the most significant reservoirs of botanical diversity in the eastern United States. Eight endemic taxa were recently found and newly described: *Castilleja kraliana*, *Coreopsis grandiflora* var. *inclinata*, *Dalea cahaba*, *Erigeron strigosus* var. *dolomiticola*, *Liatris oligocephala*, *Onosmodium decipiens*, *Silphium glutinosum*, and *Spigelia gentianoides* var. *alabamensis*. Seven Alabama state records were discovered: *Solanum carolinense* var. *hirsutum* (= *Solanum pumilum*), last collected in 1837 and presumed extinct; *Astrolepis integerrima*, disjunct from Texas; *Paronychia virginica*, bridging a gap between Arkansas and Virginia; *Baptisia australis* var. *australis*, *Rhynchospora capillacea*, *Rhynchospora thornei*, and *Spiranthes lucida*.

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - *Croton alabamensis* - *Leptopus phyllanthoides* / *Carex eburnea* Shrubland (CEGL003937, G1)
- *Quercus muehlenbergii* - *Carya carolinae-septentrionalis* / *Acer (barbatum, leucoderme)* - *Juniperus virginiana* var. *virginiana* / *Croton alabamensis* Woodland (CEGL003758, G1)
- *Schizachyrium scoparium* - *Sporobolus junceus* - *Rudbeckia triloba* var. *pinnatifida* - *Onosmodium decipiens* Wooded Herbaceous Vegetation (CEGL004080, G1)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Quercus muehlenbergii* Woodland Alliance (A.621)

DISTRIBUTION

Range: This small-patch system is restricted to Ketona dolomite slopes found in Bibb County, Alabama, in the vicinity of the Little Cahaba River.

Divisions: 202:C

Nations: US

Subnations: AL

Map Zones: 48:C

USFS Ecomap Regions: 231D:CC

TNC Ecoregions: 43:C, 50:C

SOURCES

References: Allison and Stevens 2001, Comer et al. 2003, EPA 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723167#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 22 May 2008

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1121 APACHERIAN-CHIHUAHUAN SEMI-DESERT GRASSLAND AND STEPPE (CES302.735)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Herbaceous; Temperate [Temperate Xeric]; Short Disturbance Interval; F-Patch/High Intensity [Seasonality/Winter Fire]; Xeromorphic Tree; Thorn Shrub; Graminoid

Non-Diagnostic Classifiers: Tropical/Subtropical [Tropical Xeric]; Aridic; Broad-Leaved Evergreen Tree; Xeromorphic Shrub; Succulent Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2121; ESLF 5450; ESP 1121

CONCEPT

Summary: This ecological system is a broadly defined desert grassland, mixed shrub-succulent or xeromorphic oak savanna that is typical of the Borderlands of Arizona, New Mexico and northern Mexico (Apacherian region) but extends west to the Sonoran Desert, north into the Mogollon Rim and throughout much of the Chihuahuan Desert. It is found on gently sloping bajadas that support frequent fire throughout the Sky Islands and on mesas and steeper piedmont, foothill and desert mountain slopes up to 1670 m elevation in the Chihuahuan Desert. It is characterized by typically diverse perennial grasses. Common species include grasses *Bouteloua eriopoda*, *Bouteloua hirsuta*, *Bouteloua ramosa*, *Bouteloua rothrockii*, *Bouteloua curtipendula*, *Bouteloua gracilis*, *Eragrostis intermedia*, *Muhlenbergia emersleyi*, *Muhlenbergia porteri*, *Muhlenbergia setifolia*, and *Pleuraphis jamesii*, succulent species of *Agave*, *Dasyllirion*, and *Yucca*, short-shrub species of *Calliandra*, *Mimosa*, and *Parthenium*, and tall-shrub/short-tree species of *Acacia*, *Prosopis*, and various oaks (e.g., *Quercus grisea*, *Quercus emoryi*, *Quercus arizonica*, *Quercus oblongifolia*). *Pleuraphis mutica*-dominated semi-desert grasslands often with *Bouteloua eriopoda* or *Bouteloua gracilis* occurring on lowlands and loamy plains in the Chihuahuan Desert are classified as Chihuahuan Loamy Plains Desert Grassland (CES302.061). Many of the historical desert grassland and savanna areas have been converted through intensive grazing and other land uses, some to Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733) (*Prosopis* spp.-dominated).

Classification Comments: *Dasyllirion leiophyllum*, *Dasyllirion wheeleri*, and *Fouquieria splendens* foothill shrublands and oak savannas/open woodlands are included in the concept of the this grassland and steppe ecological system. Chihuahuan grassland types that are currently included in this system are: (1) Chino grasslands of mountain slopes on acidic igneous, limestone, or deeper gravelly soils at elevations less than 1070 m (3500 feet). These sites are dominated by *Bouteloua ramosa* with *Euphorbia antisyphilitica*, *Hechtia texensis* (= *Hechtia scariosa*), *Fouquieria splendens*, *Jatropha dioica*, and *Agave lechuguilla*. (2) Desert mountain grasslands on mountain slopes between 1070 and 1370 m (3500-4500 feet) elevation on acidic igneous substrates, but also sometimes on limestone. *Bouteloua eriopoda* and *Bouteloua curtipendula* are constituents of this system. (3) Gravelly piedmont slope grasslands between 1370 and 1670 m (4500-5500 feet) elevation on Perdiz conglomerate or Tascotal tuff. These grasslands have *Bouteloua eriopoda*, *Bouteloua gracilis*, and *Dasyllirion* as common components. Input from fire ecologist at a Landfire modeling workshop in 2006 suggests a fire-return interval that is generally long (about 10 years), with pluvial periods providing conditions leading to more rapid fuel development.

Similar Ecological Systems:

- Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733)
- Madrean Encinal (CES305.795)
- Madrean Juniper Savanna (CES301.730)

Related Concepts:

- Alkali Sacaton - Tobosagrass (701) (Shiflet 1994) Intersecting
- Blue Grama - Sideoats Grama (706) (Shiflet 1994) Intersecting
- Grama - Tobosa Shrub (505) (Shiflet 1994) Finer
- Grama -Muhly - Threeawn (713) (Shiflet 1994) Finer
- MLRA 42 - Southern Desertic Basin (SD-1) R042XA058NM Hills (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-1) R042XA059NM Limestone Hills (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Limy (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) R042XB021NM Limestone Hills (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) R042XB027NM Hills (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-4) Limy and Shallow Sandy (NRCS 2006) Broader
- Oak - Juniper Woodland and Mahogany - Oak (509) (Shiflet 1994) Intersecting
- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Intersecting
- Western Live Oak: 241 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Artemisia bigelovii* / *Bouteloua eriopoda* Dwarf-shrub Herbaceous Vegetation (CEGL001741, GNRQ)
- *Artemisia bigelovii* / *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001742, GNR)
- *Artemisia bigelovii* / *Muhlenbergia setifolia* Shrub Herbaceous Vegetation (CEGL001544, GNR)
- *Ayenia microphylla* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001729, G1G2)
- *Bothriochloa barbinodis* Herbaceous Vegetation (CEGL005323, GNR)
- *Bouteloua aristidoides* - (*Chloris virgata*, *Eriochloa lemmonii*) Annual Herbaceous Vegetation [Provisional] (CEGL005329, GNR)
- *Bouteloua curtipendula* - *Bothriochloa barbinodis* Herbaceous Vegetation (CEGL001590, G4)
- *Bouteloua curtipendula* - *Hilaria belangeri* - *Bouteloua eriopoda* Herbaceous Vegetation (CEGL001591, G3)
- *Bouteloua curtipendula* - *Schizachyrium cirratum* Herbaceous Vegetation (CEGL001592, G4)
- *Bouteloua eriopoda* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001747, G2)
- *Bouteloua eriopoda* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001748, G2)
- *Bouteloua eriopoda* - *Bouteloua hirsuta* Herbaceous Vegetation (CEGL001749, G2)
- *Bouteloua eriopoda* - *Bouteloua trifida* Herbaceous Vegetation (CEGL001750, GNRQ)
- *Bouteloua eriopoda* - *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001753, GNRQ)
- *Bouteloua eriopoda* - *Pleuraphis jamesii* Herbaceous Vegetation (CEGL001751, G3)
- *Bouteloua eriopoda* Semi-desert Herbaceous Vegetation (CEGL001752, G2Q)
- *Bouteloua gracilis* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis* - *Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis* - *Eragrostis intermedia* Herbaceous Vegetation (CEGL001758, G3)
- *Bouteloua gracilis* - *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001763, GNRQ)
- *Bouteloua gracilis* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001761, GNRQ)
- *Bouteloua gracilis* - *Sporobolus flexuosus* Herbaceous Vegetation (CEGL001762, GNRQ)
- *Bouteloua hirsuta* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001764, G4)
- *Bouteloua hirsuta* - *Bouteloua radicata* Herbaceous Vegetation (CEGL001765, G2)
- *Bouteloua hirsuta* - *Digitaria californica* Herbaceous Vegetation (CEGL001767, GNRQ)
- *Bouteloua hirsuta* - *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001766, GNRQ)
- *Bouteloua ramosa* Herbaceous Vegetation (CEGL004522, GNR)
- *Bouteloua rothrockii* Herbaceous Vegetation [Provisional] (CEGL005330, GNR)
- *Calliandra eriophylla* / *Eragrostis lehmanniana* Semi-natural Shrubland [Provisional] (CEGL005331, GNR)
- *Dasyllirion leiophyllum* - *Agave lechuguilla* / *Bouteloua hirsuta* - *Bouteloua gracilis* - *Bouteloua eriopoda* Shrubland (CEGL004245, GNR)
- *Dasyllirion leiophyllum* - *Viguiera stenoloba* - *Agave lechuguilla* / *Bouteloua ramosa* Shrubland (CEGL004604, G3G4)
- *Dasyllirion wheeleri* / *Bouteloua curtipendula* Shrub Herbaceous Vegetation (CEGL001593, GNR)
- *Dasyllirion wheeleri* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001730, GNRQ)
- *Dasyllirion wheeleri* / *Muhlenbergia setifolia* Shrub Herbaceous Vegetation (CEGL001512, GNRQ)
- *Eragrostis lehmanniana* Semi-natural Herbaceous Vegetation [Provisional] (CEGL005332, GNA)
- *Eragrostis lehmanniana* Semi-natural Shrub Herbaceous Vegetation [Provisional] (CEGL005333, GNA)
- *Fouquieria splendens* / *Bouteloua curtipendula* Shrubland (CEGL001376, GNR)
- *Fouquieria splendens* / *Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Fouquieria splendens* / *Muhlenbergia setifolia* Shrub Herbaceous Vegetation (CEGL001513, GNRQ)
- *Hesperostipa neomexicana* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001709, G3?)
- *Hesperostipa neomexicana* - *Dasyllirion wheeleri* Herbaceous Vegetation (CEGL001710, GNR)
- *Larrea tridentata* / *Pleuraphis mutica* Shrub Herbaceous Vegetation (CEGL001542, G2)
- *Mimosa dysocarpa* / *Bouteloua curtipendula* Shrubland [Provisional] (CEGL005336, GNR)
- *Muhlenbergia emersleyi* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001644, GNR)
- *Muhlenbergia emersleyi* - *Bouteloua hirsuta* Herbaceous Vegetation (CEGL001645, G2?)
- *Panicum antidotale* Semi-natural Herbaceous Vegetation [Provisional] (CEGL005337, GNA)
- *Parthenium incanum* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001734, G3)
- *Pleuraphis jamesii* - *Sporobolus airoides* Herbaceous Vegetation (CEGL001778, G2G3)
- *Prosopis glandulosa* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001510, G3G4)
- *Prosopis glandulosa* / *Pleuraphis mutica* Shrub Herbaceous Vegetation (CEGL001641, G5)
- *Quercus arizonica* / *Bouteloua curtipendula* Woodland (CEGL000680, G3)
- *Quercus arizonica* / *Muhlenbergia emersleyi* Woodland (CEGL000681, G4)
- *Quercus emoryi* / *Bouteloua curtipendula* Woodland (CEGL000683, G3)
- *Quercus emoryi* / *Muhlenbergia emersleyi* Woodland (CEGL000685, G4)
- *Quercus emoryi* / *Schizachyrium cirratum* Woodland (CEGL000687, GNR)
- *Quercus grisea* / *Bouteloua curtipendula* Woodland (CEGL000689, G5)
- *Schizachyrium scoparium* var. *scoparium* - *Muhlenbergia pungens* Herbaceous Vegetation (CEGL001684, G2)
- *Yucca faxoniana* / *Bouteloua hirsuta* - *Bouteloua gracilis* - *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL004248, GNR)

Alliances:

- *Bothriochloa barbinodis* Herbaceous Alliance (A.1209)

- *Bouteloua aristidoides* Herbaceous Alliance (A.2683)
- *Bouteloua curtipendula* Herbaceous Alliance (A.1244)
- *Bouteloua curtipendula* Shrub Herbaceous Alliance (A.1552)
- *Bouteloua eriopoda* Dwarf-shrub Herbaceous Alliance (A.1570)
- *Bouteloua eriopoda* Herbaceous Alliance (A.1284)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Alliance (A.1571)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* - *Bouteloua gracilis* - *Bouteloua eriopoda* Shrub Herbaceous Alliance (A.1548)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Bouteloua ramosa* Herbaceous Alliance (A.1275)
- *Calliandra eriophylla* Shrubland Alliance (A.2684)
- *Dasyllirion leiophyllum* - (*Agave lechuguilla*, *Viguiera stenoloba*) Shrubland Alliance (A.850)
- *Eragrostis lehmanniana* Semi-natural Herbaceous Alliance (A.2687)
- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Mimosa dysocarpa* Shrubland Alliance (A.2685)
- *Muhlenbergia emersleyi* Herbaceous Alliance (A.1259)
- *Muhlenbergia setifolia* / *Artemisia bigelovii* Shrub Herbaceous Alliance (A.1530)
- *Muhlenbergia setifolia* Shrub Herbaceous Alliance (A.1541)
- *Panicum antidotale* Semi-natural Herbaceous Alliance (A.2686)
- *Pleuraphis jamesii* Herbaceous Alliance (A.1287)
- *Pleuraphis mutica* Shrub Herbaceous Alliance (A.1551)
- *Prosopis glandulosa* Shrub Herbaceous Alliance (A.1550)
- *Quercus arizonica* Woodland Alliance (A.482)
- *Quercus emoryi* Woodland Alliance (A.483)
- *Quercus grisea* Woodland Alliance (A.478)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)

DISTRIBUTION

Range: This system is found in the Borderlands of Arizona, New Mexico and northern Mexico (Apacherian region), extending to the Sonoran Desert and throughout much of the northern Chihuahuan Desert.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), NM, TX

Map Zones: 13:C, 14:C, 15:C, 24:C, 25:C, 26:C, 27:C, 28:?, 34:?

USFS Ecomap Regions: 313B:CC, 313C:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 24:C, 28:C

SOURCES

References: Brown 1982, Burgess 1995, Comer et al. 2003, Dick-Peddie 1993, McAuliffe 1995, McPherson 1995, Muldavin et al. 2000b, Muldavin et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722937#references

Description Author: NatureServe Western Ecology Team

Version: 05 Oct 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1112 CALIFORNIA CENTRAL VALLEY MIXED OAK SAVANNA (CES206.935)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Woody-Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Deep Soil; Xeric; F-Landscape/Low Intensity; *Quercus lobata*, *Quercus douglasii*

Non-Diagnostic Classifiers: Herbaceous; Sideslope; Toeslope/Valley Bottom; Alluvial plain; Alluvial terrace; Eutrophic Soil; Mineral: W/ A-Horizon >10 cm

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Deciduous sparse tree canopy

National Mapping Codes: EVT 2112; ESLF 5401; ESP 1112

CONCEPT

Summary: Historically, these savannas occurred on alluvial terraces and flat plains, often with deep, fertile soils, throughout the California Central Valley from Lake Shasta south to Los Angeles County. This system is found from 10-1200 m (30-3600 feet) elevation; receiving on average 50 cm (range 25-100 cm) of precipitation per year, mainly as winter rain. Variable canopy densities in existing occurrences are likely due to variation in soil moisture regime, natural patch dynamics of fire, and land use (fire suppression, livestock grazing, herbivory, etc.). *Quercus lobata* was the characteristic oak species of these savannas, though other species were present, including *Quercus wislizeni*, *Quercus agrifolia*, *Quercus douglasii*, *Aesculus californica*, *Cercis canadensis* var. *texensis* (= *Cercis occidentalis*), *Juniperus californica*, and *Nassella pulchra*. There is some evidence that much of the understory prior to the invasion by non-native annual grasses and forbs was composed of native annual herbs such as *Hemizonia*, *Eriogonum*, *Trifolium*, *Gilia*, *Navarretia*, *Lupinus*, *Calycadenia*, *Lessingia*, *Lotus*, *Daucus*, and *Holocarpa* spp. There is considerable seasonal and annual variation in cover of understory species due to phenology and intra-annual precipitation and temperature variation.

Related Concepts:

- Blue Oak Woodland (201) (Shiflet 1994) Broader. Some *Q. lobata*-*Q. douglasii* Savannas are included in this SRM type.
- Coast Live Oak Woodland (202) (Shiflet 1994) Broader. Where *Q. agrifolia* mixes with *Q. lobata*.

MEMBERSHIP

Associations:

- *Aesculus californica* Woodland [Placeholder] (CEGL003004, G4?)
- *Quercus douglasii* - *Quercus wislizeni* / *Bromus* sp. - *Daucus pusillus* Woodland (CEGL008648, G4?)
- *Quercus douglasii* / *Bromus* sp. - *Daucus pusillus* Woodland (CEGL008645, G4?)
- *Quercus douglasii* / *Ceanothus cuneatus* / Poaceae Woodland (CEGL008646, G3G4)
- *Quercus lobata* Woodland (CEGL003096, G2?)

Alliances:

- *Aesculus californica* Woodland Alliance (A.602)
- *Quercus douglasii* Woodland Alliance (A.614)
- *Quercus lobata* Woodland Alliance (A.618)

DISTRIBUTION

Range: Historically, this system was found throughout the California Central Valley from Lake Shasta south to Los Angeles County.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 3:C, 4:C, 5:C, 6:C

USFS Ecomap Regions: 262A:CC, 263A:??, 322A:??, M261A:CP, M261B:CC, M261C:CC, M261E:CC, M261F:CC

TNC Ecoregions: 13:C, 15:P, 16:P

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722746#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1113 CALIFORNIA COASTAL LIVE OAK WOODLAND AND SAVANNA (CES206.937)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Sideslope; Mediterranean [Mediterranean Xeric-Oceanic]; Xeric; F-Patch/Medium Intensity; Broad-Leaved Evergreen Tree; *Quercus agrifolia*

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Forest and Woodland (Treed); Ustic; Intermediate Disturbance Interval; Graminoid

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2113; ESLF 5402; ESP 1113

CONCEPT

Summary: These *Quercus agrifolia*-dominated woodlands occur throughout the Pacific coastal areas from Sonoma County, California, south to Baja California. Occurrences vary in canopy cover from dense conditions that support sparse understory vegetation of *Rubus ursinus*, *Symphoricarpos mollis*, *Heteromeles arbutifolia*, and *Toxicodendron diversilobum*, to more open conditions with perennial bunchgrass understory. The latter typically occur on south-facing slopes with soils of variable depth. Variable canopy densities in existing occurrences are likely due to variation in soil moisture regime, natural patch dynamics of fire, and land use (fire suppression, livestock grazing, herbivory, etc.).

Related Concepts:

- California Coast Live Oak: 255 (Eyre 1980) Broader
- Coast Live Oak Woodland (202) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Quercus (agrifolia, douglasii, kelloggii, lobata, wislizeni)* Forest [Placeholder] (CEGL003097, G4?)
- *Quercus agrifolia / Toxicodendron diversilobum - (Corylus cornuta)* Woodland (CEGL003169, G4)

Alliances:

- *Quercus (agrifolia, douglasii, kelloggii, lobata, wislizeni)* Forest Alliance (A.371)
- *Quercus agrifolia* Woodland Alliance (A.589)

DISTRIBUTION

Range: Pacific coastal areas from Sonoma County, California, south to Baja California.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 3:C, 4:C, 5:?

USFS Ecomap Regions: 261B:CC, 262A:CC, 263A:CC, M261A:CC, M261B:CC

TNC Ecoregions: 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722744#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West
ClassifResp: West

1114 CALIFORNIA LOWER MONTANE BLUE OAK-FOOTHILL PINE WOODLAND AND SAVANNA (CES206.936)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Savanna-Woodland Mosaic; Woody-Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Ustic; F-Patch/Low Intensity; Needle-Leaved Tree; Graminoid; *Pinus sabiniana*, *Quercus douglasii*

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Sideslope; Toeslope/Valley Bottom; Alluvial plain; Alluvial terrace; Sand Soil Texture; Short Disturbance Interval; Broad-Leaved Deciduous Tree; Broad-Leaved Evergreen Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2114; ESLF 5403; ESP 1114

CONCEPT

Summary: This ecological system is primarily found in the valley margins and foothills of the Sierra Nevada and Coast Ranges of California from approximately 120-1200 m (360-3600 feet) in elevation on rolling plains or dry slopes. Over a century of anthropogenic changes (especially cutting of oak) have altered the density and distribution of woody vegetation. A high-quality occurrence often consists of open park-like stands of *Pinus sabiniana*, with oaks and other various broadleaf tree and shrub species, including *Quercus douglasii*, *Quercus wislizeni*, *Quercus agrifolia* (primarily central and southern Coast Ranges), *Quercus lobata*, *Aesculus californica*, *Arctostaphylos* spp., *Cercis canadensis* var. *texensis* (= *Cercis occidentalis*), *Ceanothus cuneatus*, *Frangula californica* (= *Rhamnus californica*), *Ribes quercetorum*, *Juniperus californica*, and *Pinus coulteri* (central and southern Coast Ranges). *Pinus sabiniana* tends to drop out all together in the driest and more southerly sites, which are often dominated by *Quercus douglasii*. The California central coast region may have open stands of just *Juniperus californica*, with a grassy understory. These stands belong here due to proximity to other blue oak and gray pine stands or chaparral, and due to the heavy native or non-native grass cover. This is distinguished from Great Basin pinyon-juniper stands, which have little herbaceous understory, and *Pinus monophylla* rather than *Pinus sabiniana*. These stands of only juniper are caused by repeated removal of the oaks by humans and feral pig populations. Northern extensions of this system include *Quercus garryana* as the dominant oak, where it becomes successional to Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923). *Pinus sabiniana* density also varies based on intensity or frequency of fire, being less abundant in areas of higher intensity or frequency, hence it is often more abundant on steep, rocky or more mesic north-facing slope exposures. Historically, understory vegetation included mixed chaparral to perennial bunchgrass. Currently, most occurrences have understories dominated by dense cover of annual species, both native and non-native. Variable canopy densities in existing occurrences are likely due to variation in soil moisture regime, natural patch dynamics of fire, and land use (fire suppression, livestock grazing, herbivory, etc.).

Similar Ecological Systems:

- Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923)

Related Concepts:

- Blue Oak - Digger Pine: 250 (Eyre 1980) Intersecting
- Blue Oak Woodland (201) (Shiflet 1994) Broader. This SRM type is close in concept to this system

MEMBERSHIP

Associations:

- *Pinus sabiniana* - *Quercus wislizeni* / *Arctostaphylos viscida* Woodland (CEGL008636, G3?)
- *Pinus sabiniana* - *Quercus wislizeni* / *Ceanothus cuneatus* Woodland (CEGL008635, G3?)
- *Pinus sabiniana* Woodland [Placeholder] (CEGL003077, G4?)
- *Quercus douglasii* - *Pinus sabiniana* / Grass Woodland (CEGL008647, G4?)
- *Quercus wislizeni* - *Quercus douglasii* - *Pinus sabiniana* Woodland (CEGL008642, G4?)

Alliances:

- *Pinus sabiniana* Woodland Alliance (A.525)
- *Quercus douglasii* Woodland Alliance (A.614)
- *Quercus wislizeni* Woodland Alliance (A.591)

DISTRIBUTION

Range: This system occurs primarily in the valley margins and foothills of the Sierra Nevada and Coast Ranges from approximately 120-1200 m (360-3600 feet) elevation, from Shasta County to Kern and northern Los Angeles counties, California. It is unlikely to occur in the southern portion of zone 7 (Modoc Plateau), but this needs to be confirmed with California ecologists.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 2:P, 3:C, 4:C, 5:C, 6:C, 7:P

USFS Ecomap Regions: 261B:CC, 262A:CC, 263A:CC, 322A:PP, M242A:??, M242B:??, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC
TNC Ecoregions: 5:C, 12:C, 13:C, 14:C, 15:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722745#references

Description Author: P. Comer, T. Keeler-Wolf, mod. G. Kittel

Version: 16 Jan 2009

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West
ClassifResp: West

1400 CENTRAL APPALACHIAN ALKALINE GLADE AND WOODLAND (CES202.602)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Ridge/Summit/Upper Slope; Unglaciated; Alkaline Soil; Shallow Soil

Non-Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Temperate; Mesotrophic Soil; Circumneutral Soil; Ustic; Intermediate Disturbance Interval; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2400; ESLF 5416; ESP 1400

CONCEPT

Summary: This system occurs at low to moderate elevations from the Central Appalachians (with a few northward incursions into southernmost New York and New England possible) down into the Ridge and Valley. It consists of woodlands and open glades on thin soils over limestone, dolostone or similar calcareous rock. In some cases, the woodlands grade into closed-canopy forests.

Juniperus virginiana is a common tree, filling in the absence of fire, and *Quercus muehlenbergii* is indicative of the limestone substrate. *Rhus aromatica*, *Cercis canadensis*, and *Ostrya virginiana* may occur. Prairie grasses are the dominant herbs (*Andropogon gerardii*, *Schizachyrium scoparium*, *Bouteloua* spp.); forb richness is often high. Characteristic forbs include *Asclepias verticillata*, *Monarda fistulosa*, *Salvia lyrata*, *Symphotrichum oblongifolium*, and *Brickellia eupatorioides* (Braun 1950). Fire is sometimes an important natural disturbance vector, but open physiognomies may also be maintained by drought and landslides.

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is a related system to the south and west of CES202.602; ranges do not overlap.
- Laurentian-Acadian Calcareous Rocky Outcrop (CES201.572)--characterized by *Thuja occidentalis* rather than *Juniperus virginiana*.
- North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--has a more closed canopy.
- Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)--occurs in the southern Ridge and Valley south of this system; they meet in southwestern Virginia.

DESCRIPTION

Environment: This system occupies mid-elevation rocky ridges, slopes, and outcrops with thin soils and calcareous bedrock. Large amounts of exposed mineral soils and/or gravel are characteristic. Soils are high in pH and rich in calcium and magnesium. Although these areas are subject to prolonged droughts, local areas of ephemeral vernal seepage occur in microtopographic concavities, and they may have distinctive vegetation (e.g., colonies of *Dodecatheon meadia*). A series of glades in western Virginia is somewhat distinctive because of the dolostone, which contains a high magnesium content. These glades are located on low dolomite knobs and foothills of Elbrook dolomite that occupy middle to upper slopes and crests of south- or southwest-facing spur ridges at relatively low elevations.

Vegetation: In some cases, the woodlands grade into closed-canopy forests. *Juniperus virginiana* is a common tree, filling in in the absence of fire, and *Quercus muehlenbergii* is indicative of the limestone substrate. *Rhus aromatica*, *Cercis canadensis*, and *Ostrya virginiana* may occur. Prairie grasses are the dominant herbs (*Andropogon gerardii*, *Schizachyrium scoparium*, *Bouteloua* spp.); forb richness is often high. Characteristic forbs include *Asclepias verticillata*, *Monarda fistulosa*, *Salvia lyrata*, *Symphotrichum oblongifolium*, and *Brickellia eupatorioides* (Braun 1950).

Dynamics: Fire is an important natural disturbance vector.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL006017, G4?)
- *Juniperus virginiana* / *Bouteloua curtipendula* - *Carex eburnea* Wooded Herbaceous Vegetation (CEGL006047, G1G2)
- *Quercus muehlenbergii* - *Cercis canadensis* / *Packera obovata* - *Lithospermum canescens* Woodland (CEGL006231, G3G4)
- *Quercus muehlenbergii* - *Quercus (alba, rubra)* - *Carya cordiformis* / *Viburnum prunifolium* Forest (CEGL004793, G3G4)
- *Quercus muehlenbergii* / *Packera plattensis* - *Parthenium auriculatum* - *Schizachyrium scoparium* Woodland (CEGL006030, G2)
- *Quercus muehlenbergii* / *Salix humilis* / *Eryngium yuccifolium* Woodland (CEGL006239, G1Q)
- *Quercus rubra* - *Carya (glabra, ovata)* / *Ostrya virginiana* / *Carex lucorum* Forest (CEGL006301, G4?)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus (alba, rubra)* Forest Alliance (A.258)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus muehlenbergii* Woodland Alliance (A.621)

DISTRIBUTION

Range: This system is known from Pennsylvania and northwestern New Jersey south through the Ridge and Valley to western Virginia, possibly extending to southeasternmost New York and the marble valleys of northwestern Connecticut.

Divisions: 202:C

Nations: US

Subnations: CT?, MD, NJ, NY?, OH, PA, VA, WV

Map Zones: 57:C, 60:C, 61:C, 64:C, 65:P

USFS Ecomap Regions: 221B:CC, 221D:CC, M221A:CC, M221B:CC

TNC Ecoregions: 49:P, 51:C, 59:C, 61:C

SOURCES

References: Braun 1950, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723007#references

Description Author: S.C. Gawler, G. Fleming, R. Evans, mod. M. Pyne

Version: 05 May 2008

Concept Author: S.C. Gawler, G. Fleming, R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: East

1401 CENTRAL INTERIOR HIGHLANDS CALCAREOUS GLADE AND BARRENS (CES202.691)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Alkaline Soil

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Sedimentary Rock; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2401; ESLF 5417; ESP 1401

CONCEPT

Summary: This system is found primarily in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions with scattered occurrences in northern Missouri. It occurs along moderate to steep slopes and steep valleys on primarily southerly to westerly facing slopes. Limestone and/or dolomite bedrock typify this system with shallow, moderately to well-drained soils interspersed with rocks. These soils often dry out during the summer and autumn, and then become saturated during the winter and spring. *Schizachyrium scoparium* dominates this system and is commonly associated with *Andropogon gerardii*, *Bouteloua curtipendula*, and calcium-loving plant species. Stunted woodlands primarily dominated by *Quercus muehlenbergii* interspersed with *Juniperus virginiana* occur on variable-depth-to-bedrock soils. Fire is the primary natural dynamic, and prescribed fires help manage this system by restricting woody growth and maintaining the more open glade structure.

Classification Comments: In Alabama, this system is found in the Moulton Valley region, which is technically part of TNC Ecoregion 50, but ambiguously placed there. This region is included in the Interior Plateau (71) of EPA (2004). The system is also found in the Western Valley of the Tennessee River (a very limited part of EPA 71f) in Decatur County, Tennessee. Also included here, somewhat uncomfortably, is an unusual series of flatrock glades on Silurian dolomite in Bullitt County, Kentucky (71d of Woods et al. (2002)).

Similar Ecological Systems:

- Alabama Ketona Glade and Woodland (CES202.338)--a similar concept on a very specialized substrate.
- Bluegrass Savanna and Woodland (CES202.888)
- Central Appalachian Alkaline Glade and Woodland (CES202.602)--of central Appalachians, mainly Virginia and north; need to clarify ranges.
- Nashville Basin Limestone Glade and Woodland (CES202.334)--restricted to the Nashville Basin of Tennessee, found on flat terrain instead of slopes.
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--has a more closed canopy.
- Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)--has a possible overlapping range.

Related Concepts:

- Dolomite Glade (Evans 1991) Finer
- Limestone Glade (Evans 1991) Finer
- Xeric Calcareous Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system is found primarily along moderate to steep slopes and steep valleys on primarily southerly to westerly facing slopes. Limestone and/or dolomite bedrock typify this system with shallow, moderately to well-drained soils interspersed with rocks. Soils are affected by the bedrock chemistry and tend to have high levels of calcium and potassium and a relatively high pH. Due to seasonal rainfall patterns and the extremely thin soils, these soils dry out during the summer and autumn and become saturated during the winter and spring. In northern Alabama (Moulton Valley), the stratum on which the system is found is a type of "marl." Seeps may occur where impervious rock strata meet relatively permeable limestone.

Vegetation: *Schizachyrium scoparium* dominates this system and is commonly associated with *Andropogon gerardii*, *Bouteloua curtipendula*, and calcium-loving plant species. Stunted woodlands primarily dominated by *Quercus muehlenbergii* interspersed with *Juniperus virginiana* occur on variable-depth-to-bedrock soils. The trees typically occur as islands in a wider herbaceous or rocky area. The islands are found in microenvironments where the soil depth and available water are sufficient to support trees (e.g., depressions in the bedrock). Other woody plants associated with this system (within their ranges) include *Quercus shumardii*, *Cercis canadensis*, *Ulmus alata*, *Fraxinus quadrangulata*, *Juniperus ashei*, *Acer saccharum*, and *Frangula caroliniana*. Other herbaceous taxa include *Silphium trifoliatum*, *Silphium terebinthinaceum*, *Liatris* spp., *Symphotrichum oblongifolium*, *Castilleja coccinea*, *Hedyotis nigricans*, *Talinum* spp., and *Panicum flexile*. Small-scale stands of annual *Sporobolus* spp. may be prominent in some examples. In some examples, small-scale seepage areas may contain *Eleocharis compressa*, *Nothoscordum bivalve*, *Isoetes butleri*, and *Hypoxis hirsuta*.

Dynamics: Fire is the primary natural dynamic, and prescribed fires help manage this system by restricting woody growth and maintaining the more open glade structure.

MEMBERSHIP

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

Associations:

- (*Quercus stellata*, *Ulmus alata*) / *Schizachyrium scoparium* - *Symphyotrichum patens* var. *patentissimum* Wooded Herbaceous Vegetation (CEGL007824, G2?)
- *Eleocharis compressa* - *Nothoscordum bivalve* Herbaceous Vegetation (CEGL004669, GNR)
- *Fraxinus quadrangulata* - *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Lithospermum canescens* Woodland (CEGL007994, G2)
- *Juniperus ashei* / *Cotinus obovatus* / *Carex eburnea* - *Rudbeckia missouriensis* Woodland (CEGL007833, G2?)
- *Juniperus ashei* Dry Chalk Outcrop Woodland (CEGL007967, G1)
- *Juniperus ashei* Ozark Clifftop Woodland (CEGL004672, G2?)
- *Juniperus virginiana* / *Schizachyrium scoparium* - (*Andropogon gerardii*, *Sorghastrum nutans*) - *Silphium (trifoliatum, terebinthinaceum)* Wooded Herbaceous Vegetation (CEGL004738, G2)
- *Juniperus virginiana* / *Schizachyrium scoparium* - *Silphium terebinthinaceum* var. *luciae-brauniae* - *Carex juniperorum* - *Castilleja coccinea* Wooded Herbaceous Vegetation (CEGL004464, G1Q)
- *Juniperus virginiana* Alkaline Bluff Woodland (CEGL002426, G3)
- *Juniperus virginiana* var. *virginiana* - *Fraxinus quadrangulata* / *Symphyotrichum oblongifolium* - *Panicum flexile* - *Sedum pulchellum* Woodland (CEGL004271, G2)
- *Quercus marilandica* - (*Juniperus virginiana*) / *Schizachyrium scoparium* - *Danthonia spicata* Wooded Herbaceous Vegetation (CEGL002428, G2)
- *Quercus muehlenbergii* - *Fraxinus (quadrangulata, americana)* / *Schizachyrium scoparium* Woodland (CEGL002143, G3G4)
- *Quercus muehlenbergii* - *Juniperus virginiana* / *Schizachyrium scoparium* - *Manfreda virginica* Wooded Herbaceous Vegetation (CEGL005131, G2G3)
- *Quercus muehlenbergii* - *Quercus shumardii* Forest (CEGL004602, G2G4)
- *Quercus muehlenbergii* / *Schizachyrium scoparium* - *Bouteloua curtipendula* Wooded Herbaceous Vegetation (CEGL005284, G2G3)
- *Quercus stellata* - *Quercus alba* - (*Quercus falcata*) / *Schizachyrium scoparium* Woodland (CEGL004217, G1)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Rudbeckia missouriensis* - *Mentzelia oligosperma* Wooded Herbaceous Vegetation (CEGL002251, G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Bouteloua curtipendula* - *Rudbeckia missouriensis* - *Hedyotis nigricans* Wooded Herbaceous Vegetation (CEGL002398, G3G4)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Tradescantia bracteata* Alkaline Bedrock Herbaceous Vegetation (CEGL005280, G1G2)
- *Schizachyrium scoparium* - *Sporobolus compositus* var. *compositus* - *Rudbeckia fulgida* var. *fulgida* Wooded Herbaceous Vegetation (CEGL004078, G2)
- *Sedum pulchellum* - *Talinum calcaricum* - *Leavenworthia* spp. / *Nostoc commune* Herbaceous Vegetation (CEGL004346, G3)
- *Sedum pulchellum* - *Talinum calycinum* - *Oenothera linifolia* Shale Herbaceous Vegetation (CEGL004347, G2G3)
- *Sporobolus (neglectus, vaginiflorus)* - *Leavenworthia exigua* var. *laciniata* - *Viola egglestonii* Herbaceous Vegetation (CEGL007772, G1Q)
- *Sporobolus vaginiflorus* var. *ozarkanus* Ozark Herbaceous Vegetation (CEGL008563, G3?)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Eleocharis (bifida, compressa)* - *Nothoscordum bivalve* Saturated Herbaceous Alliance (A.1458)
- *Fraxinus quadrangulata* - (*Juniperus virginiana*) Woodland Alliance (A.1913)
- *Juniperus ashei* Woodland Alliance (A.501)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus muehlenbergii* Woodland Alliance (A.621)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Sedum pulchellum* Saturated Herbaceous Alliance (A.1820)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

DISTRIBUTION

Range: This system is found primarily in the Interior Highlands of the Ozark, Ouachita, and the Interior Low Plateau regions ranging east to southern Ohio and including the Knobs region and Cliff section of Kentucky, the Cumberland Plateau escarpment of Tennessee, the Western Valley of the Tennessee River, and the Moulton Valley of northern Alabama.

Divisions: 202:C; 203:C

Nations: US

Subnations: AL, AR, IL, IN, KY, MO, OH, OK, TN

Map Zones: 43:P, 44:C, 47:C, 48:C, 49:C, 53:C

USFS Ecomap Regions: 221E:CC, 221H:CC, 223B:CC, 223D:CC, 223E:CC, 223F:CC

TNC Ecoregions: 36:C, 38:C, 39:C, 43:C, 44:C, 50:C

SOURCES

References: Comer et al. 2003, Delcourt and Delcourt 1997, DeSelm and Murdock 1993, EPA 2004, Erickson et al. 1942, Evans 1991, Nelson 1985, USFWS 1974, Webb et al. 1997, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722968#references

Description Author: S. Menard, T. Nigh, M. Pyne, mod. J. Drake

Version: 22 May 2008

Concept Author: S. Menard, T. Nigh, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1122 CHIHUAHUAN GYPSOPHILOUS GRASSLAND AND STEPPE (CES302.732)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Alkaline Soil; Gypsiferous; Dwarf-Shrub; Graminoid

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Oligotrophic Soil; Aridic

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2122; ESLF 5451; ESP 1122

CONCEPT

Summary: This ecological system is restricted to gypsum outcrops or sandy gypsiferous and/or often alkaline soils that occur in basins and slopes in the Chihuahuan Desert. Elevation range is from 1100-2000 m. These typically sparse grasslands, steppes or dwarf-shrublands are dominated by a variety of gypsophilous plants, many of which are endemic to these habitats. Characteristic species include *Tiquilia hispidissima*, *Atriplex canescens*, *Calylophus hartwegii*, *Ephedra torreyana*, *Frankenia jamesii*, *Bouteloua breviseta*, *Mentzelia perennis*, *Nama carnosum*, *Calylophus hartwegii* (= *Oenothera hartwegii*), *Selinocarpus lanceolatus*, *Sporobolus nealleyi*, *Sporobolus airoides*, and *Sartwellia flaveriae*. This system does not include the sparsely vegetated gypsum dunes that are included in North American Warm Desert Active and Stabilized Dune (CES302.744).

Similar Ecological Systems:

- North American Warm Desert Active and Stabilized Dune (CES302.744)

Related Concepts:

- MLRA 42 - Southern Desertic Basin (SD-1) Gyp Uplands (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Gyp Uplands (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-3) Gyp Uplands (NRCS 2006) Broader

MEMBERSHIP

Associations:

- *Atriplex obovata* / *Tidestromia carnososa* Dwarf-shrubland (CEGL004575, G2?)
- *Fouquieria splendens* / *Sporobolus nealleyi* Shrub Herbaceous Vegetation (CEGL001517, GNRQ)
- *Schizachyrium scoparium* var. *scoparium* - *Muhlenbergia pungens* Herbaceous Vegetation (CEGL001684, G2)
- *Sporobolus airoides* - *Scleropogon brevifolius* Herbaceous Vegetation (CEGL001692, G5)
- *Sporobolus nealleyi* - *Bouteloua eriopoda* Herbaceous Vegetation (CEGL001697, GU)
- *Sporobolus nealleyi* - *Calylophus hartwegii* Herbaceous Vegetation (CEGL001698, G3)
- *Tidestromia carnososa* - *Kallstroemia grandiflora* Sparse Vegetation (CEGL004580, G2G3)
- *Tiquilia hispidissima* - *Yucca torreyi* / *Sporobolus nealleyi* Dwarf-shrubland (CEGL003959, G2G3)
- *Tiquilia hispidissima* / *Bouteloua breviseta* - *Mentzelia humilis* Dwarf-shrubland (CEGL004573, G2)
- *Tiquilia hispidissima* / *Sporobolus airoides* Dwarf-shrubland (CEGL004574, G2G3)
- *Tiquilia hispidissima* / *Sporobolus nealleyi* Dwarf-shrubland (CEGL001546, G2)
- *Tiquilia hispidissima* Dwarf-shrubland [Provisional] (CEGL008425, GNR)

Alliances:

- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus nealleyi* Herbaceous Alliance (A.1269)
- *Sporobolus nealleyi* Shrub Herbaceous Alliance (A.1542)
- *Tidestromia carnososa* Sparsely Vegetated Alliance (A.1873)
- *Tiquilia hispidissima* Dwarf-shrubland Alliance (A.1101)

DISTRIBUTION

Range: This system is found on basins and slopes in the Chihuahuan Desert at elevations ranging from 1100-2000 m.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), NM, TX

Map Zones: 25:C, 26:C, 27:P, 28:?

USFS Ecomap Regions: 315A:CC, 315B:CC, 315H:CP, 321A:CC, M313B:CC

TNC Ecoregions: 22:P, 24:C

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, Henrickson et al. 1985, MacMahon 1988, Muldavin et al. 2000b, Muldavin et al. 2002, Powell and Turner 1974

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722940#references

Description Author: NatureServe Western Ecology Team

Version: 29 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1124 COLUMBIA PLATEAU LOW SAGEBRUSH STEPPE (CES304.080)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Sideslope; Shallow Soil; Silt Soil Texture; Clay Soil Texture; Aridic; W-Landscape/High Intensity; Low *Artemisia* spp.

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Alkaline Soil; Dwarf-Shrub

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2124; ESLF 5453; ESP 1124

CONCEPT

Summary: This matrix ecological system is composed of sagebrush dwarf-shrub-steppe that occurs in a variety of shallow-soil habitats throughout eastern Oregon, northern Nevada and southern Idaho. *Artemisia arbuscula* ssp. *arbuscula* and close relatives (*Artemisia arbuscula* ssp. *longiloba* and occasionally *Artemisia nova*) form stands that typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation. Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt. Other shrubs and dwarf-shrubs present may include *Purshia tridentata*, *Eriogonum* spp., and other species of *Artemisia*. Common graminoids include *Festuca idahoensis*, *Koeleria macrantha*, *Pseudoroegneria spicata*, and *Poa secunda*. Many forbs also occur and may dominate the herbaceous vegetation, especially at the higher elevations. Isolated individuals of *Juniperus occidentalis* (western juniper) and *Cercocarpus ledifolius* (mountain-mahogany) can often be found in this system.

Related Concepts:

- Antelope Bitterbrush - Bluebunch Wheatgrass (104) (Shiflet 1994) Intersecting. This system may have small inclusions of *Purshia tridentata* shrublands.
- Antelope Bitterbrush - Idaho Fescue (105) (Shiflet 1994) Intersecting. This system may have small inclusions of *Purshia tridentata* shrublands.
- Low Sagebrush (406) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Artemisia arbuscula* ssp. *arbuscula* - *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrubland [Provisional] (CEGL002982, GNR)
- *Artemisia arbuscula* ssp. *arbuscula* - *Purshia tridentata* / *Pseudoroegneria spicata* - *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001518, G2G3)
- *Artemisia arbuscula* ssp. *arbuscula* / *Achnatherum thurberianum* Shrub Herbaceous Vegetation (CEGL001413, G4G5)
- *Artemisia arbuscula* ssp. *arbuscula* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001409, G5)
- *Artemisia arbuscula* ssp. *arbuscula* / *Leymus salinus* ssp. *salmonis* Shrub Herbaceous Vegetation (CEGL001410, G1G2Q)
- *Artemisia arbuscula* ssp. *arbuscula* / *Poa secunda* Shrub Herbaceous Vegetation (CEGL001411, G5)
- *Artemisia arbuscula* ssp. *arbuscula* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001412, G5)
- *Artemisia arbuscula* ssp. *longiloba* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001522, G2)
- *Artemisia arbuscula* ssp. *longiloba* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001415, GU)
- *Artemisia arbuscula* ssp. *longiloba* / *Poa secunda* Shrub Herbaceous Vegetation (CEGL001523, G3Q)
- *Artemisia arbuscula* ssp. *longiloba* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001416, GNR)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland (CEGL001414, G4G5)

Alliances:

- *Artemisia arbuscula* ssp. *arbuscula* Shrub Herbaceous Alliance (A.1566)
- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)
- *Artemisia arbuscula* ssp. *longiloba* Shrub Herbaceous Alliance (A.2552)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance (A.2549)

DISTRIBUTION

Range: This system is found throughout the basins of eastern Oregon and southern Idaho, south into northern Nevada and northeastern California.

Divisions: 304:C

Nations: US

Subnations: CA, ID, MT?, NV, OR, WY?

Map Zones: 1:?, 7:C, 8:C, 9:C, 10:C, 17:?, 18:C, 19:C, 21:C

USFS Ecomap Regions: 331A:CC, 341E:CP, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:CC, M261G:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC, M332G:CC, M333A:??,

M341A:CC

TNC Ecoregions: 6:C, 11:C

SOURCES

References: West 1983a, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.740108#references

Description Author: J. Kagan

Version: 08 Sep 2004

Concept Author: J. Kagan

Stakeholders: West

ClassifResp: West

1123 COLUMBIA PLATEAU STEPPE AND GRASSLAND (CES304.083)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Sideslope; Very Shallow Soil; Landslide; Xeromorphic Shrub; Graminoid

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2123; ESLF 5452; ESP 1123

CONCEPT

Summary: These grasslands are similar floristically to Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) but are defined by a more frequent fire regime and the absence or low cover of shrubs over large areas, occasionally entire landforms. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub-steppe ecological system. This system occurs throughout much of the Columbia Plateau and is found at slightly higher elevations farther south. Soils are variable, ranging from relatively deep, fine-textured often with coarse fragments, and non-saline often with a microphytic crust, to stony volcanic-derived clays to alluvial sands. This grassland is dominated by perennial bunch grasses and forbs (>25% cover), sometimes with a sparse (<10% cover) shrub layer; *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Tetradymia* spp., or *Artemisia* spp. may be present in disturbed stands. Associated graminoids include *Achnatherum hymenoides*, *Elymus elymoides*, *Elymus lanceolatus* ssp. *lanceolatus*, *Hesperostipa comata*, *Festuca idahoensis*, *Koeleria macrantha*, *Poa secunda*, and *Pseudoroegneria spicata*. Common forbs are *Phlox hoodii*, *Arenaria* spp., and *Astragalus* spp. Areas with deeper soils are rare because of conversion to other land uses. The rapid fire-return regime of this ecological system maintains a grassland by retarding shrub invasion, and landscape isolation and fragmentation limit seed dispersal of native shrub species. Fire frequency is presumed to be less than 20 years. Through isolation from a seed source, combined with repeated burning, these are "permanently" (more than 50 years) converted to grassland.

Classification Comments: How this differs from Columbia Basin Palouse Prairie (CES304.792) is unclear.

Similar Ecological Systems:

- Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)
- Inter-Mountain Basins Semi-Desert Grassland (CES304.787)

Related Concepts:

- Bluegrass Scabland (106) (Shiflet 1994) Intersecting
- Threetip Sagebrush (404) (Shiflet 1994) Intersecting

DESCRIPTION

Dynamics: The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions in the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Microphytic crust is very important in this ecological system.

DISTRIBUTION

Range: This system occurs throughout the Columbia Plateau region, from north-central Idaho, south and west into Washington, Oregon, southern Idaho, and northern Nevada. Whether it also occurs in northeastern California, in the western ranges of Wyoming, or the central Wyoming Basins is unclear.

Divisions: 304:C; 306:C

Nations: US

Subnations: CA?, ID, MT?, NV, OR, UT?, WA

Map Zones: 7:?, 8:C, 9:C, 10:C, 12:P, 17:?, 18:C

USFS Ecomap Regions: 331A:CC, 341E:CP, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CP, M261G:CC, M331A:??, M332A:CC, M332E:C?, M332F:C?, M332G:CC, M333A:PP

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:P, 11:C

SOURCES

References: Daubenmire 1970, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemId=ELEMENT_GLOBAL.2.740175#references

Description Author: R. Crawford, mod. M.S. Reid

Version: 23 Jan 2006

Concept Author: R. Crawford

Stakeholders: West

ClassifResp: West

1398 CUMBERLAND SANDSTONE GLADE AND BARRENS (CES202.337)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Acidic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2398; ESLF 5414; ESP 1398

CONCEPT

Summary: This system encompasses a complex of sparsely vegetated rock outcrops, perennial grasslands, and woodlands on shallow soils on the Cumberland Plateau of Kentucky, Tennessee, Alabama, and Georgia. Herbaceous plants, including *Diamorpha smallii* and *Minuartia glabra*, are typical of the outcrops in Tennessee. In Alabama, *Bigelovia nuttallii* and *Schizachyrium scoparium* are important. *Pinus virginiana* and *Acer rubrum* are typical of the woodlands surrounding these outcrops on the Cumberland Plateau. *Pinus rigida*, *Pinus echinata*, and/or *Quercus prinus* may also occur. Scattered shrubs, such as *Gaylussacia* spp., *Vaccinium arboreum*, and *Chionanthus virginicus*, occur on the margins in patches of deeper soil. Fruticose lichens such as *Cladonia* spp. and *Cladina* spp. may be prominent in some examples. To the west, in the Interior Highlands (Ozark, Ouachita, and Interior Low Plateau regions), this system is replaced by Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692) (both are found in Kentucky, with the latter in the Shawnee Hills of the Interior Low Plateau).

Similar Ecological Systems:

- Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692)

Related Concepts:

- Cumberland Mountains xeric pine woodland (Evans 1991) Finer

DESCRIPTION

Environment: Some examples of this system may occur adjacent to sandstone cliff faces.

Vegetation: Herbaceous plants, including *Diamorpha smallii* and *Minuartia glabra*, are typical of the outcrops in Tennessee. In Alabama, *Bigelovia nuttallii* and *Schizachyrium scoparium* are important (A. Schotz pers. comm.). *Pinus virginiana* and *Acer rubrum* are typical of the woodlands surrounding these outcrops on the Cumberland Plateau (Perkins 1981). Other trees may include *Pinus rigida*, *Pinus echinata*, and/or *Quercus prinus*. Other herbaceous plants which may be found include *Schizachyrium scoparium*, *Danthonia sericea*, *Liatris microcephala*, *Eurybia surculosa* (= *Aster surculosus*), *Hypericum gentianoides*, *Talinum mengesii*, *Nuttallanthus canadensis* (= *Linaria canadensis*), *Opuntia humifusa* var. *humifusa*, *Sporobolus vaginiflorus*, *Erigeron strigosus*, *Grimmia* spp., and fruticose lichens such as *Cladonia* spp. and *Cladina* spp. Scattered shrubs, such as *Gaylussacia* spp., *Vaccinium arboreum*, and *Chionanthus virginicus*, occur on the margins of more open areas, in patches of deeper soil.

MEMBERSHIP

Associations:

- *Bigelovia nuttallii* - *Coreopsis pulchra* - *Liatris microcephala* Herbaceous Vegetation (CEGL004622, G2)
- *Diamorpha smallii* - *Minuartia glabra* Sandstone Herbaceous Vegetation (CEGL004343, G2G3)
- *Kalmia latifolia* - *Gaylussacia (baccata, brachycera)* Cumberland Shrubland (CEGL008470, G3)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Schizachyrium scoparium* - *Andropogon (gyrans, ternarius, virginicus)* Herbaceous Vegetation (CEGL007707, G3?)
- *Schizachyrium scoparium* - *Danthonia sericea* - *Liatris microcephala* - (*Eurybia surculosa*) Wooded Herbaceous Vegetation (CEGL004061, G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Bigelovia nuttallii* Herbaceous Alliance (A.1617)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- *Minuartia glabra* - *Talinum* spp. - *Diamorpha smallii* Saturated Herbaceous Alliance (A.1819)
- *Pinus virginiana* Forest Alliance (A.131)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the Cumberland Plateau of Kentucky, Tennessee, Virginia, Alabama, and Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, TN, VA

Map Zones: 48:C, 53:C

USFS Ecomap Regions: 221H:CC

TNC Ecoregions: 50:C

SOURCES

References: Comer et al. 2003, Perkins 1981, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723168#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 23 Jan 2008

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

EASTERN GREAT PLAINS QUARTZITE ROCKY OUTCROP (CES205.697)

CLASSIFIERS

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

National Mapping Codes: ESLF 3194

CONCEPT

Summary: This system is found along outcrops of Sioux quartzite in Minnesota and South Dakota. It is found on rocky, level or hilly areas within the Northern Tallgrass Prairie (TNC Ecoregion 35) of Minnesota and South Dakota. It is characterized by a mosaic of rocky outcrops that are sparsely vegetated with scattered succulents and other vegetation such as *Opuntia fragilis*, *Opuntia macrorhiza*, *Escobaria vivipara* (= *Coryphantha vivipara*), and *Lomatium orientale*, as well as *Selaginella rupestris*, *Talinum parviflorum*, *Woodsia ilvensis*, and a variety of spring- and summer-blooming annuals. Soil development is minimal and restricted to patches.

Classification Comments: This system may not hold together as a system separate from a larger, surrounding system. These rocky outcrops were split from quartzite glades found in the Baraboo Hills region of Wisconsin (CES202.699). Distribution into Manitoba needs further review.

DESCRIPTION

Environment: Soil development is minimal. Most vegetation present grows in shallow, dry soil that collects in small depressions on sloping rock faces. The outcrops are composed primarily of Sioux quartzite, granite and gneiss. Extreme drought and great fluctuations in the temperature of the ground surface occur within this system (MNNHP 1993).

Vegetation: This system contains a sparse vegetation layer, with scattered succulents and many annuals, including *Opuntia fragilis*, *Opuntia macrorhiza*, *Escobaria vivipara* (= *Coryphantha vivipara*), and *Lomatium orientale*, as well as *Selaginella rupestris*, *Talinum parviflorum*, *Woodsia ilvensis*, and a variety of spring- and summer-blooming annuals (MNNHP 1993).

Dynamics: Fire appears to be important in maintaining this system. Trees and shrubs invade in the absence of fire. *Juniperus virginiana* is an invader throughout the range of this type, displacing the herbs, lichens, and mosses that characterize the system (MNNHP 1993).

MEMBERSHIP

Associations:

- Quartzite - Granite Rock Outcrop Sparse Vegetation (CEGL002298, G3?)

Alliances:

- Rock Outcrop Sparsely Vegetated Alliance (A.1838)

DISTRIBUTION

Range: This system is found in a very restricted area within Minnesota and South Dakota along outcrops of Sioux quartzite.

Divisions: 205:C

Nations: CA?, US

Subnations: MB?, MN, ND, SD

Map Zones: 39:C, 40:?

USFS Ecomap Regions: 251Ba:CCC

TNC Ecoregions: 35:C

SOURCES

References: Midwestern Ecology Working Group n.d., MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.800696#references

Description Author: S.E. Menard

Version: 11 Apr 2007

Concept Author: S.E. Menard

Stakeholders: Canada, Midwest

ClassifResp: Midwest

1409 GREAT LAKES ALVAR (CES201.721)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Intermittent Flooding; Flat; Glaciated uplands; Rock Outcrops/Barrens/Glades; Limestone; Extensive Wet Flat [Lakeshore]; Isolated Wetland [Partially Isolated]; Very Shallow Soil

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2409; ESLF 5458; ESP 1409

CONCEPT

Summary: Alvars are natural systems of humid and subhumid climates, centered around areas of glaciated horizontal limestone/dolomite (dolostone) bedrock pavement with a discontinuous thin soil mantle. These communities are characterized by distinctive flora and fauna with less than 60% tree cover that is maintained by associated geologic, hydrologic, and other landscape processes. In particular, all forms of alvar tend to flood each spring, then experience moderate to severe drought in summer months. They include open pavement, grassland, and shrubland/woodland types. Alvar communities occur in an ecological matrix with similar bedrock and hydrologically influenced communities. Almost all of North America's alvars occur within the Great Lakes basin, primarily in an arc along the Niagaran Escarpment from northern Lake Michigan across northern Lake Huron and eastern Ontario and northwestern New York state.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Ostrya virginiana* - *Carya ovata* - *Quercus rubra* Limestone Woodland (CEGL005059, G3G4)
- *Carya ovata* / *Zanthoxylum americanum* / *Panicum philadelphicum* - *Carex pensylvanica* Wooded Herbaceous Vegetation (CEGL005230, GNR)
- *Danthonia spicata* - *Poa compressa* - (*Schizachyrium scoparium*) Herbaceous Vegetation (CEGL005100, G2?)
- *Deschampsia caespitosa* - (*Sporobolus heterolepis*, *Schizachyrium scoparium*) - *Carex crawei* - *Packera paupercula* Herbaceous Vegetation (CEGL005110, G2)
- *Juniperus communis* - (*Juniperus virginiana*) - *Rhus aromatica* - *Viburnum rafinesquianum* / *Oligoneuron album* Shrubland (CEGL005212, G3)
- *Juniperus horizontalis* - *Dasiphora fruticosa* ssp. *floribunda* / *Schizachyrium scoparium* - *Carex richardsonii* Dwarf-shrubland (CEGL005236, G2)
- *Juniperus virginiana* / *Ranunculus fascicularis* Woodland (CEGL005122, G3?)
- *Picea glauca* - *Thuja occidentalis* - *Juniperus communis* / *Iris lacustris* - *Carex eburnea* Shrubland (CEGL005211, G1G2)
- *Pinus banksiana* - *Thuja occidentalis* - *Picea glauca* / *Juniperus communis* Woodland (CEGL005126, G2?)
- *Sporobolus heterolepis* - *Schizachyrium scoparium* - (*Carex scirpoidea*) / (*Juniperus horizontalis*) Herbaceous Vegetation (CEGL005234, G2)
- *Sporobolus neglectus* - *Sporobolus vaginiflorus* - *Isanthus brachiatus* - *Panicum philadelphicum* - (*Poa compressa*) Alvar Herbaceous Vegetation (CEGL005235, G2)
- *Thuja occidentalis* - *Pinus banksiana* / *Dasiphora fruticosa* ssp. *floribunda* / *Clinopodium arkansanum* Wooded Herbaceous Vegetation (CEGL005132, G1G2)
- *Tortella tortuosa* - *Cladonia pocillum* - *Placynthium* spp. Sparse Vegetation (CEGL005192, G2)

Alliances:

- *Danthonia spicata* Herbaceous Alliance (A.1281)
- *Juniperus communis* Shrubland Alliance (A.808)
- *Juniperus horizontalis* Dwarf-shrubland Alliance (A.1080)
- *Juniperus virginiana* Woodland Alliance (A.545)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Quercus muehlenbergii* Wooded Herbaceous Alliance (A.3534)
- *Sporobolus heterolepis* - (*Deschampsia caespitosa*, *Schizachyrium scoparium*) Herbaceous Alliance (A.1402)
- *Sporobolus neglectus* - *Sporobolus vaginiflorus* Alvar Herbaceous Alliance (A.3502)
- *Thuja occidentalis* Wooded Herbaceous Alliance (A.3533)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

DISTRIBUTION

Divisions: 201:C

Nations: CA, US

Subnations: MI, NY, OH, ON, WI

Map Zones: 41:C, 50:C, 51:C, 52:C, 63:P, 64:C

USFS Ecomap Regions: 211Ee:CCC, 212Hl:CCC, 212Rc:CCC, 212Re:CCC, 212Tb:CCC, 212Te:CCC, 222Ie:CCC, 222U:CC

TNC Ecoregions: 48:C, 64:C

SOURCES

References: Albert 1990, Comer et al. 2003, Reschke et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722949#references

Description Author: C. Reschke, mod. S. Gawler

Version: 20 Aug 2007

Concept Author: C. Reschke

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

1125 INTER-MOUNTAIN BASINS BIG SAGEBRUSH STEPPE (CES304.778)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Deep Soil; Aridic; Xeromorphic Shrub; Bunch grasses; *Artemisia tridentata* ssp. *tridentata*

Non-Diagnostic Classifiers: Lowland [Foothill]; Plain; Plateau; Woody-Herbaceous; Sideslope; Temperate [Temperate Continental]; Alkaline Soil; Forb; Graminoid

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2125; ESLF 5454; ESP 1125

CONCEPT

Summary: This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin, east into the Wyoming Basins, central Montana, and north and east onto the western fringe of the Great Plains in Montana and South Dakota. It is found at slightly higher elevations farther south. In central Montana, this system differs slightly, with more summer rain than winter precipitation, more precipitation annually, and it occurs on glaciated landscapes. Soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with *Artemisia tridentata* ssp. *tridentata* (this is not at all important in Wyoming occurrences), *Artemisia tridentata* ssp. *xericensis*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tripartita* ssp. *tripartita* (Snake River valley in Wyoming), *Artemisia cana* ssp. *cana*, and/or *Purshia tridentata* dominating or codominating the open to moderately dense (10-40% cover) shrub layer. *Atriplex confertifolia*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Sarcobatus vermiculatus*, *Tetradymia* spp., or *Artemisia frigida* may be common especially in disturbed stands. In Montana and Wyoming, stands are more mesic, with more biomass of grass, have less shrub diversity than stands farther west, and 50 to 90% of the occurrences are dominated by *Artemisia tridentata* ssp. *wyomingensis* with *Pascopyrum smithii*. In addition, *Bromus japonicus* and *Bromus tectorum* are indicators of disturbance, and *Bromus tectorum* is typically not as abundant as in the Intermountain West, possibly due to a colder climate. Associated graminoids can include *Achnatherum hymenoides*, *Calamagrostis montanensis*, *Elymus lanceolatus* ssp. *lanceolatus*, *Koeleria macrantha*, *Poa secunda*, *Pascopyrum smithii*, *Hesperostipa comata*, *Nassella viridula*, *Bouteloua gracilis*, and *Pseudoroegneria spicata*. Important rhizomatous species include *Carex filifolia* and *Carex duriuscula*, which are very common and important in the eastern distribution of this system in both Wyoming and Montana. *Festuca idahoensis* is uncommon in this system, although it does occur in areas of higher elevations/precipitation; *Festuca campestris* is also uncommon. In Wyoming, both *Nassella viridula* and *Pseudoroegneria spicata* rarely occur, with the latter typically found in eastern Wyoming on ridgetops and rocky slopes outside of this system. In Montana, there is an absence of *Festuca* spp., except *Vulpia octoflora*. Common forbs are *Phlox hoodii*, *Arenaria* spp., *Opuntia* spp., *Sphaeralcea coccinea*, *Dalea purpurea*, *Liatris punctata*, and *Astragalus* spp. Areas with deeper soils more commonly support *Artemisia tridentata* ssp. *tridentata* but have largely been converted for other land uses. The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Where fire frequency has allowed for shifts to a native grassland condition, maintained without significant shrub invasion over a 50- to 70-year interval, the area would be considered Columbia Basin Foothill and Canyon Dry Grassland (CES304.993).

Classification Comments: *Artemisia cana* ssp. *cana* is listed as a component shrub of this system, but this statement needs a bit of review as to whether it is accurate. In addition, in Wyoming and Montana, *Artemisia tripartita* ssp. *tripartita* associations are not part of this system but occur at higher elevations as components of Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)%. Farther west, they are included in this system (CES304.778), but perhaps this should be reviewed by ecologists familiar with the Columbia Basin region.

Similar Ecological Systems:

- Columbia Basin Foothill and Canyon Dry Grassland (CES304.993)
- Columbia Plateau Steppe and Grassland (CES304.083)
- Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

Related Concepts:

- AB Antelope-brush Shrub/Grassland (Ecosystems Working Group 1998) Broader
- Antelope Bitterbrush - Bluebunch Wheatgrass (104) (Shiflet 1994) Intersecting. *Purshia tridentata* shrublands are included in this ecological system.
- Antelope Bitterbrush - Idaho Fescue (105) (Shiflet 1994) Intersecting. *Purshia tridentata* shrublands are included in this ecological system.
- Basin Big Sagebrush (401) (Shiflet 1994) Broader. This is the primary ecological system crosswalking to this SRM type.
- Big Sagebrush - Bluebunch Wheatgrass (314) (Shiflet 1994) Intersecting
- Big Sagebrush - Idaho Fescue (315) (Shiflet 1994) Intersecting

- Bitterbrush (210) (Shiflet 1994) Intersecting. *Purshia tridentata* steppe is included in this ecological system.
- Bitterbrush - Bluebunch Wheatgrass (317) (Shiflet 1994) Finer. Bitterbrush-dominated communities are included in the big sage steppe and shrubland systems.
- Bitterbrush - Idaho Fescue (318) (Shiflet 1994) Finer. Bitterbrush-dominated communities are included in the big sage steppe and shrubland systems.
- Bitterbrush - Rough Fescue (319) (Shiflet 1994) Finer. Bitterbrush-dominated communities are included in the big sage steppe and shrubland systems.
- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. *Artemisia tridentata ssp. tridentata* steppe communities are included in this ecological system.
- SS Big Sagebrush Shrub/Grassland (Ecosystems Working Group 1998) Broader. low-elevation sites; high elevation
- Threetip Sagebrush (404) (Shiflet 1994) Intersecting. *Artemisia tripartita ssp. tripartita* shrublands are included in this ecological system in the northern Great Basin, Columbia Plateau and northern Rockies regions.
- Threetip Sagebrush - Idaho Fescue (324) (Shiflet 1994) Broader. *Artemisia tripartita ssp. tripartita* communities are included in this ecological system.

DESCRIPTION

Dynamics: The natural fire regime of this ecological system likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Response to grazing can be variable depending on the type of grazer and the season in which grazing occurs. *Hesperostipa comata* can increase in abundance in response to either grazing or fire. In central and eastern Montana (and possibly elsewhere), complexes of prairie dog towns are common in this ecological system. Microphytic crust is very important in this ecological system.

MEMBERSHIP

Associations:

- *Artemisia cana ssp. cana* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001556, G4)
- *Artemisia tridentata (ssp. tridentata, ssp. xericensis)* / *Pseudoroegneria spicata* - *Poa secunda* Shrub Herbaceous Vegetation (CEGL001019, G1)
- *Artemisia tridentata (ssp. tridentata, ssp. xericensis)* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001018, G1)
- *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata* / *Leymus cinereus* Shrub Herbaceous Vegetation (CEGL001458, G2G4)
- *Artemisia tridentata* / *Sporobolus cryptandrus* - *Achnatherum hymenoides* Shrub Herbaceous Vegetation (CEGL001545, G2?)
- *Artemisia tridentata ssp. tridentata* - *Grayia spinosa* Shrubland (CEGL001004, G5)
- *Artemisia tridentata ssp. tridentata* / *Distichlis spicata* Shrubland (CEGL001000, G5)
- *Artemisia tridentata ssp. tridentata* / *Festuca idahoensis* Shrubland (CEGL001014, G4?)
- *Artemisia tridentata ssp. tridentata* / *Hesperostipa comata* Shrubland (CEGL002966, G4?)
- *Artemisia tridentata ssp. tridentata* / *Leymus cinereus* Shrubland (CEGL001016, G2)
- *Artemisia tridentata ssp. tridentata* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrubland (CEGL001017, G3?)
- *Artemisia tridentata ssp. tridentata* / *Pleuraphis jamesii* Shrubland (CEGL001015, G2G4)
- *Artemisia tridentata ssp. tridentata* / *Poa secunda* Shrubland (CEGL001008, G3G5)
- *Artemisia tridentata ssp. wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Artemisia tridentata ssp. wyomingensis* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001047, G4)
- *Artemisia tridentata ssp. wyomingensis* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535, G4)
- *Artemisia tripartita ssp. tripartita* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001537, G2?)
- *Artemisia tripartita ssp. tripartita* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001536, G3)
- *Artemisia tripartita ssp. tripartita* / *Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001539, G1)
- *Artemisia tripartita ssp. tripartita* / *Leymus cinereus* Shrub Herbaceous Vegetation (CEGL002994, GU)
- *Artemisia tripartita ssp. tripartita* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001538, G2G3)
- *Purshia tridentata* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001494, G2?)
- *Purshia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL002674, G3G5)
- *Purshia tridentata* / *Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001498, G2)
- *Purshia tridentata* / *Poa secunda* Shrubland (CEGL001059, G1?Q)
- *Purshia tridentata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001495, G3)

Alliances:

- *Artemisia cana ssp. cana* Shrub Herbaceous Alliance (A.2554)
- *Artemisia tridentata (ssp. tridentata, ssp. xericensis)* Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata (ssp. tridentata, ssp. xericensis)* Shrubland Alliance (A.830)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata ssp. wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tripartita ssp. tripartita* Shrub Herbaceous Alliance (A.1528)
- *Purshia tridentata* Shrub Herbaceous Alliance (A.1523)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Sporobolus cryptandrus* Shrub Herbaceous Alliance (A.1525)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Columbia Plateau Vernal Pool (CES304.057)
- Columbia Plateau Western Juniper Woodland and Savanna (CES304.082)

DISTRIBUTION

Range: This system occurs throughout much of the Columbia Plateau, the northern Great Basin, central and southeastern Montana, and Wyoming, and is found at slightly higher elevations farther south.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: BC, CA, CO, ID, MT, NV, OR, UT, WA, WY

Map Zones: 1:C, 6:?, 7:C, 8:C, 9:C, 10:C, 12:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 28:P, 29:C, 30:?, 33:P

USFS Ecomap Regions: 331A:CC, 331D:CC, 331E:CP, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CP, 341A:CP, 341D:CP, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261A:C?, M261D:CC, M261E:CP, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333C:CP, M333D:CP, M334A:CC, M341A:CC, M341B:CP, M341C:CP, M341D:CC

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 20:C, 26:C

SOURCES

References: Barbour and Major 1977, Barbour and Major 1988, Comer et al. 2003, Daubenmire 1970, Ecosystems Working Group 1998, Knight 1994, Mueggler and Stewart 1980, West 1983c

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722894#references

Description Author: G. Kittel and M.S. Reid

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

1115 INTER-MOUNTAIN BASINS JUNIPER SAVANNA (CES304.782)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Temperate [Temperate Continental]; Intermediate Disturbance Interval; F-Landscape/Medium Intensity; Evergreen Sclerophyllous Tree; Graminoid

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Woody-Herbaceous; Ridge/Summit/Upper Slope; Sideslope; Toeslope/Valley Bottom; Calcareous

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Evergreen sparse tree canopy

National Mapping Codes: EVT 2115; ESLF 5404; ESP 1115

CONCEPT

Summary: This widespread ecological system occupies dry foothills and sandsheets of western Colorado, northwestern New Mexico, northern Arizona, Utah, and west into the Great Basin of Nevada and southern Idaho. It is typically found at lower elevations ranging from 1500-2300 m. This system is generally found at lower elevations and more xeric sites than Great Basin Pinyon-Juniper Woodland (CES304.773) or Colorado Plateau Pinyon-Juniper Woodland (CES304.767). These occurrences are found on lower mountain slopes, hills, plateaus, basins and flats often where juniper is expanding into semi-desert grasslands and steppe. The vegetation is typically open savanna, although there may be inclusions of more dense juniper woodlands. This savanna is typically dominated by *Juniperus osteosperma* trees with high cover of perennial bunch grasses and forbs, with *Bouteloua gracilis*, *Hesperostipa comata*, and *Pleuraphis jamesii* being most common. In the southern Colorado Plateau, *Juniperus monosperma* or juniper hybrids may dominate the tree layer. Pinyon trees are typically not present because sites are outside the ecological or geographic range of *Pinus edulis* and *Pinus monophylla*. It has been suggested that all *Juniperus osteosperma* stands in Wyoming be placed in Colorado Plateau Pinyon-Juniper Woodland (CES304.767). This savanna system does not occur in Wyoming.

Classification Comments: *Juniperus californica* savannas in the Central Valley of California and around the fringes of the Mojave Desert are not part of this ecological system. In many cases, they are the result of some disturbance removing an oak component from one of the several oak woodland and savanna systems of California.

Similar Ecological Systems:

- Colorado Plateau Pinyon-Juniper Woodland (CES304.767)
- Great Basin Pinyon-Juniper Woodland (CES304.773)

Related Concepts:

- Juniper - Pinyon Woodland (412) (Shiflet 1994) Intersecting
- Rocky Mountain Juniper: 220 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Juniperus monosperma* / *Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma* / *Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma* / *Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma* / *Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma* / *Cercocarpus montanus* - *Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma* / *Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma* / *Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Juniperus osteosperma* / *Hesperostipa comata* Wooded Herbaceous Vegetation (CEGL001489, G1Q)
- *Juniperus osteosperma* / *Hesperostipa comata* Woodland (CEGL002815, GNR)
- *Juniperus osteosperma* / *Hesperostipa neomexicana* Woodland (CEGL000740, GUQ)
- *Juniperus osteosperma* / *Leymus salinus* ssp. *salmonis* Wooded Herbaceous Vegetation (CEGL001488, G1Q)
- *Juniperus osteosperma* / *Pleuraphis mutica* Woodland (CEGL000736, G2)
- *Juniperus osteosperma* / *Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus osteosperma* / *Symphoricarpos oreophilus* Woodland (CEGL000741, GU)
- *Juniperus scopulorum* / *Pseudoroegneria spicata* Woodland (CEGL000748, G4)
- *Juniperus scopulorum* / *Schizachyrium scoparium* Woodland (CEGL000750, G2)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)
- *Juniperus osteosperma* Wooded Herbaceous Alliance (A.1502)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Juniperus scopulorum* Woodland Alliance (A.506)

DISTRIBUTION

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

Range: This juniper savanna occurs from northwestern New Mexico, northern Arizona, western Colorado, Utah, west into the Great Basin of Nevada and southern Idaho. Where it occurs in California, it is found only in the far eastern edges of the state adjacent to other Great Basin systems.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CA, CO, ID, NM, NV, OR, UT

Map Zones: 7:?, 9:C, 12:P, 13:P, 14:P, 15:C, 16:P, 17:P, 18:C, 19:P, 21:?, 22:?, 23:C, 24:C, 25:C, 28:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315H:CC, 321A:CC, 322A:CC, 341A:C?, 341D:C?, 341E:C?, 341F:C?, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342G:CC, 342J:CC, M313A:CC, M331D:CC, M331E:C?, M331G:CP, M331H:CC, M331I:CP, M331J:CP, M332E:CC, M341A:CC, M341D:CP

TNC Ecoregions: 6:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

SOURCES

References: Bassett et al. 1987, Blackburn and Tueller 1970, Comer et al. 2003, Fitzhugh et al. 1987, Francis 1986, Knight 1994, Larson and Moir 1986, Larson and Moir 1987, Tuhy et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722890#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1126 INTER-MOUNTAIN BASINS MONTANE SAGEBRUSH STEPPE (CES304.785)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Woody-Herbaceous

Non-Diagnostic Classifiers: Mountainside; Mountain valley; Plateau; Sideslope; Toeslope/Valley Bottom; Temperate [Temperate Continental]; Long Disturbance Interval; F-Patch/Medium Intensity; Broad-Leaved Evergreen Shrub; Graminoid; Bunch grasses; *Artemisia tridentata* ssp. *vaseyana*

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2126; ESLF 5455; ESP 1126

CONCEPT

Summary: This ecological system includes sagebrush communities occurring at foothills (in Wyoming) to montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In Montana, it occurs on mountain "islands" in the north-central portion of the state and possibly along the Boulder River south of Absarokee and at higher elevations. In British Columbia, it occurs between 450 and 1650 m in the southern Fraser Plateau and the Thompson and Okanagan basins. Climate is cool, semi-arid to subhumid. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system shows an affinity for mild topography, fine soils, some source of subsurface moisture or more mesic sites, zones of higher precipitation and areas of snow accumulation. Across its range of distribution, this is a compositionally diverse system. It is composed primarily of *Artemisia tridentata* ssp. *vaseyana*, *Artemisia cana* ssp. *viscidula*, and related taxa such as *Artemisia tridentata* ssp. *spiciformis* (= *Artemisia spiciformis*). *Purshia tridentata* may codominate or even dominate some stands. *Artemisia arbuscula* ssp. *arbuscula*-dominated shrublands commonly occur within this system on rocky or windblown sites. Other common shrubs include *Symphoricarpos* spp., *Amelanchier* spp., *Ericameria nauseosa*, *Peraphyllum ramosissimum*, *Ribes cereum*, and *Chrysothamnus viscidiflorus*. *Artemisia tridentata* ssp. *wyomingensis* may be present to codominant if the stand is clearly montane as indicated by montane indicator species such as *Festuca idahoensis*, *Leucopoa kingii*, or *Danthonia intermedia*. Most stands have an abundant perennial herbaceous layer (over 25% cover, in many cases over 50% cover), but this system also includes *Artemisia tridentata* ssp. *vaseyana* shrublands. Common graminoids include *Danthonia intermedia*, *Festuca arizonica*, *Festuca idahoensis*, *Hesperostipa comata*, *Poa fendleriana*, *Elymus trachycaulus*, *Bromus carinatus*, *Poa secunda*, *Leucopoa kingii*, *Deschampsia caespitosa*, *Calamagrostis rubescens*, and *Pseudoroegneria spicata*. Species of *Achnatherum* are common, including *Achnatherum nelsonii* ssp. *dorei*, *Achnatherum nelsonii* ssp. *nelsonii*, *Achnatherum hymenoides*, and others. In many areas, wildfires can maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (>40%), with the moisture providing equally high grass and forb cover.

Classification Comments: In Wyoming and Montana, *Artemisia tripartita* ssp. *tripartita* associations are part of this system, occurring at higher elevations than Inter-Mountain Basins Big Sagebrush Steppe (CES304.778). Farther west, they are included in that system, but perhaps this should be reviewed by ecologists familiar with the Columbia Basin region.

Related Concepts:

- Big Sagebrush - Bluebunch Wheatgrass (314) (Shiflet 1994) Intersecting
- Big Sagebrush - Idaho Fescue (315) (Shiflet 1994) Intersecting
- Big Sagebrush - Rough Fescue (316) (Shiflet 1994) Finer
- Chokecherry - Serviceberry - Rose (421) (Shiflet 1994) Intersecting. Montane sagebrush has inclusions of choke cherry-, serviceberry- and rose-dominated shrublands.
- Low Sagebrush (406) (Shiflet 1994) Intersecting. This system includes *Artemisia arbuscula* ssp. *arbuscula* shrublands.
- Mountain Big Sagebrush (402) (Shiflet 1994) Equivalent
- Other Sagebrush Types (408) (Shiflet 1994) Intersecting. *Artemisia tridentata* ssp. *spiciformis* shrublands are included in this ecological system.
- SS Big Sagebrush Shrub/Grassland, high elevation (Ecosystems Working Group 1998) Broader

DESCRIPTION

Environment: This ecological system occurs in many of the western United States, usually at middle elevations (1000-2500 m). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year. Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.

Vegetation: Vegetation types within this ecological system are usually less than 1.5 m tall and dominated by *Artemisia tridentata* ssp. *vaseyana*, *Artemisia cana* ssp. *viscidula*, or *Artemisia tridentata* ssp. *spiciformis*. A variety of other shrubs can be found in some

occurrences, but these are seldom dominant. They include *Artemisia rigida*, *Artemisia arbuscula*, *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Symphoricarpos oreophilus*, *Purshia tridentata*, *Peraphyllum ramosissimum*, *Ribes cereum*, *Rosa woodsii*, *Ceanothus velutinus*, and *Amelanchier alnifolia*. *Artemisia tridentata* ssp. *wyomingensis* may be present to codominant if the stand is clearly montane to subalpine as indicated by montane indicator species such as *Festuca idahoensis*, *Leucopoa kingii*, or *Danthonia intermedia*. The canopy cover is usually between 20-80%. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include *Festuca idahoensis*, *Festuca thurberi*, *Festuca ovina*, *Elymus elymoides*, *Deschampsia caespitosa*, *Danthonia intermedia*, *Danthonia parryi*, *Stipa* spp., *Pascopyrum smithii*, *Bromus carinatus*, *Elymus trachycaulus*, *Koeleria macrantha*, *Pseudoroegneria spicata*, *Poa fendleriana*, or *Poa secunda*, and *Carex* spp. Forbs are often numerous and an important indicator of health. Forb species may include *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, and *Eriogonum*, *Balsamorhiza sagittata*, *Achillea millefolium*, *Antennaria rosea*, and *Eriogonum umbellatum*, *Fragaria virginiana*, *Artemisia ludoviciana*, *Hymenoxys hoopesii* (= *Helenium hoopesii*), etc.

Dynamics: Healthy sagebrush shrublands are very productive, are often grazed by domestic livestock, and are strongly preferred during the growing season (Padgett et al. 1989). Prolonged livestock use can cause a decrease in the abundance of native bunch grasses and increase in the cover of shrubs and non-native grass species, such as *Poa pratensis*. *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). *Artemisia tridentata* is generally killed by fires and may take over ten years to form occurrences of some 20% cover or more. The condition of most sagebrush steppe has been degraded due to fire suppression and heavy livestock grazing. It is unclear how long restoration will take to restore degraded occurrences.

MEMBERSHIP

Associations:

- *Arctostaphylos patula* - *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) Shrubland (CEGL002694, GNR)
- *Artemisia arbuscula* ssp. *arbuscula* - *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrubland [Provisional] (CEGL002982, GNR)
- *Artemisia arbuscula* ssp. *arbuscula* - *Purshia tridentata* / *Pseudoroegneria spicata* - *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001518, G2G3)
- *Artemisia arbuscula* ssp. *arbuscula* / *Achnatherum thurberianum* Shrub Herbaceous Vegetation (CEGL001413, G4G5)
- *Artemisia arbuscula* ssp. *arbuscula* / *Eriogonum microthecum* Shrubland (CEGL003483, G2G3)
- *Artemisia arbuscula* ssp. *arbuscula* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001409, G5)
- *Artemisia arbuscula* ssp. *arbuscula* / *Leptodactylon pungens* Shrubland (CEGL003482, G4?)
- *Artemisia arbuscula* ssp. *arbuscula* / *Leymus salinus* ssp. *salmonis* Shrub Herbaceous Vegetation (CEGL001410, G1G2Q)
- *Artemisia arbuscula* ssp. *arbuscula* / *Poa secunda* Shrub Herbaceous Vegetation (CEGL001411, G5)
- *Artemisia arbuscula* ssp. *arbuscula* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001412, G5)
- *Artemisia arbuscula* ssp. *thermopola* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001519, G2)
- *Artemisia nova* / *Pseudoroegneria spicata* Shrubland (CEGL001424, G4G5)
- *Artemisia rothrockii* / *Monardella odoratissima* Shrubland (CEGL008652, G3?)
- *Artemisia rothrockii* Shrubland [Provisional] (CEGL003014, G3?)
- *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) - *Amelanchier utahensis* Shrubland (CEGL002820, GNR)
- *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata* ssp. *spiciformis* / *Bromus carinatus* Shrubland (CEGL002989, GNR)
- *Artemisia tridentata* ssp. *spiciformis* / *Carex geyeri* Shrubland (CEGL002990, GNR)
- *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Vegetation [Provisional] (CEGL002993, GNR)
- *Artemisia tridentata* ssp. *vaseyana* - *Holodiscus dumosus* Shrubland [Provisional] (CEGL002807, GNR)
- *Artemisia tridentata* ssp. *vaseyana* - *Purshia tridentata* / *Pseudoroegneria spicata* Shrubland (CEGL001032, G5?)
- *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Bromus carinatus* Shrubland (CEGL001035, G4Q)
- *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Elymus trachycaulus* ssp. *trachycaulus* Shrubland (CEGL001034, G3G4)
- *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Festuca idahoensis* Shrubland (CEGL001036, G4)
- *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Hesperostipa comata* Shrubland (CEGL001039, G3?)
- *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Poa secunda* Shrubland (CEGL001037, G5?)
- *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Pseudoroegneria spicata* Shrubland (CEGL001038, G5?)
- *Artemisia tridentata* ssp. *vaseyana* / *Achnatherum lettermanii* Shrubland (CEGL002811, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Achnatherum occidentale* Shrubland (CEGL001033, G2)
- *Artemisia tridentata* ssp. *vaseyana* / *Achnatherum pinetorum* Shrubland (CEGL002806, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Balsamorhiza sagittata* Shrubland (CEGL001020, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Bromus carinatus* Shrubland (CEGL001021, G4?)
- *Artemisia tridentata* ssp. *vaseyana* / *Carex exserta* Shrubland (CEGL008651, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Carex geyeri* Shrub Herbaceous Vegetation (CEGL001532, G3)
- *Artemisia tridentata* ssp. *vaseyana* / *Elymus lanceolatus* Shrubland [Provisional] (CEGL005318, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001531, G3Q)
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* - *Bromus carinatus* Shrubland (CEGL001023, G4Q)
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001533, G5)
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca thurberi* Shrubland (CEGL001024, G3G4)

- *Artemisia tridentata* ssp. *vaseyana* / *Hesperostipa comata* Shrubland (CEGL002931, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Leucopoa kingii* - *Koeleria macrantha* Shrubland (CEGL001026, G4)
- *Artemisia tridentata* ssp. *vaseyana* / *Leucopoa kingii* Shrubland (CEGL001025, G3)
- *Artemisia tridentata* ssp. *vaseyana* / *Leymus cinereus* Shrubland (CEGL001027, G4?)
- *Artemisia tridentata* ssp. *vaseyana* / *Monardella odoratissima* Shrubland (CEGL003476, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Pascopyrum smithii* Shrubland (CEGL001028, G3?)
- *Artemisia tridentata* ssp. *vaseyana* / *Phlox condensata* Shrubland (CEGL002770, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Poa (pratensis, compressa)* Semi-natural Shrub Herbaceous Vegetation (CEGL002339, GNA)
- *Artemisia tridentata* ssp. *vaseyana* / *Poa fendleriana* Shrubland (CEGL002812, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Poa pratensis* Sagebrush Shrubland (CEGL002528, GNR)
- *Artemisia tridentata* ssp. *vaseyana* / *Poa secunda* Shrubland (CEGL001029, G3)
- *Artemisia tridentata* ssp. *vaseyana* / *Pseudoroegneria spicata* - *Poa fendleriana* Shrubland (CEGL001031, G5)
- *Artemisia tridentata* ssp. *vaseyana* / *Pseudoroegneria spicata* Shrubland (CEGL001030, G5)
- *Artemisia tridentata* ssp. *wyomingensis* - *Peraphyllum ramosissimum* / *Festuca idahoensis* Shrubland (CEGL001048, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001047, G4)
- *Artemisia tridentata* Upperzone Community Shrubland (CEGL001013, G5?)

Alliances:

- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Artemisia arbuscula* ssp. *arbuscula* Shrub Herbaceous Alliance (A.1566)
- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)
- *Artemisia arbuscula* ssp. *thermopola* Shrub Herbaceous Alliance (A.2553)
- *Artemisia nova* Shrubland Alliance (A.1105)
- *Artemisia rothrockii* Shrubland Alliance (A.1098)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Alliance (A.2555)
- *Artemisia tridentata* ssp. *spiciformis* Shrubland Alliance (A.2550)
- *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance (A.1526)
- *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (A.831)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)

DISTRIBUTION

Range: This system is found at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In British Columbia, it occurs in the southern Fraser Plateau and the Thompson and Okanagan basins. This system occurs in mapzone 20 on the Rocky Mountain island ranges and on the western edge with mapzone 19.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AZ?, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 1:C, 3:?, 4:P, 6:C, 7:C, 8:C, 9:C, 10:C, 12:C, 13:P, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:?, 25:C, 27:?, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CP, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331B:C?, 331F:CC, 331G:CC, 331J:CC, 331M:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CC, M261E:CC, M261F:C?, M261G:CC, M313A:CP, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C, 26:C, 68:C

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Hansen et al. 1995, Hironaka et al. 1983, Johnston 2001, Mueggler and Stewart 1980, Neely et al. 2001, Padgett et al. 1989, West 1983c

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722887#references

Description Author: R. Crawford, mod. M.S. Reid and K.A. Schulz

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

1127 INTER-MOUNTAIN BASINS SEMI-DESERT SHRUB-STEPPE (CES304.788)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Woody-Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Very Short Disturbance Interval; G-Landscape/High Intensity; Graminoid

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Mechanical Disturbance; Broad-Leaved Evergreen Shrub; Xeromorphic Shrub; Thorn Shrub; Evergreen Sclerophyllous Shrub; Succulent Shrub; Dwarf-Shrub; Forb

FGDC Crosswalk: Vegetated, Shrub-dominated, Herbaceous - shrub-steppe, Perennial graminoid steppe

National Mapping Codes: EVT 2127; ESLF 5456; ESP 1127

CONCEPT

Summary: This ecological system occurs throughout the intermountain western U.S., typically at lower elevations on alluvial fans and flats with moderate to deep soils, and extends into south-central Montana between the Pryor and Beartooth ranges where a distinct rainshadow effect occurs. This semi-arid shrub-steppe is typically dominated by graminoids (>25% cover) with an open shrub to moderately dense woody layer with a typically strong graminoid layer. The most widespread (but not dominant) species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the northern Rockies. Characteristic grasses include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Distichlis spicata*, *Poa secunda*, *Poa fendleriana*, *Sporobolus airoides*, *Hesperostipa comata*, *Pleuraphis jamesii*, and *Leymus salinus*. The woody layer is often a mixture of shrubs and dwarf-shrubs, although it may be dominated by a single species. Characteristic species include *Atriplex canescens*, *Artemisia tridentata*, *Chrysothamnus Greenei*, *Chrysothamnus viscidiflorus*, *Ephedra* spp., *Ericameria nauseosa*, *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. *Artemisia tridentata* or *Atriplex canescens* may be present but does not dominate. Annual grasses, especially the exotics *Bromus japonicus* and *Bromus tectorum*, may be present to abundant. Forbs are generally of low importance and are highly variable across the range but may be diverse in some occurrences. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layers. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some stands.

Related Concepts:

- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. In southwestern Montana.

DESCRIPTION

Environment: This ecological system occurs throughout the Intermountain West from the western Great Basin to the northern Rocky Mountains and Colorado Plateau at elevations ranging from 300 m up to 2500 m. The climate where this system occurs is generally hot in summers and cold in winters with low annual precipitation, ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variations. Sites are generally alluvial fans and flats with moderate to deep soils. Some sites can be flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983). Substrates are generally shallow, calcareous, fine-textured soils (clays to silt-loams), derived from alluvium; or deep, fine to medium-textured alluvial soils with some source of subirrigation during the summer season. Soils may be alkaline and typically moderately saline (West 1983). Some occurrences occur on deep, sandy loam soils, or soils that are highly calcareous, but not deep sand with active dune fields (Hironaka et al. 1983).

Vegetation: The plant associations in this broadly defined system are characterized by a somewhat sparse to moderately dense (10-70% cover) shrub layer usually with a strong graminoid layer. The typically open woody layer is often a mixture of shrubs and dwarf-shrubs, although it may be dominated by a single species. Characteristic woody species include *Artemisia filifolia*, *Artemisia tridentata*, *Atriplex canescens*, *Ephedra cutleri*, *Ephedra nevadensis*, *Ephedra torreyana*, *Ephedra viridis*, *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, and *Sarcobatus vermiculatus*. Other shrubs occasionally present include *Purshia tridentata* and *Tetradymia canescens*. *Artemisia filifolia*, *Artemisia tridentata*, *Atriplex canescens*, or *Sarcobatus vermiculatus* may be present but does not dominate as it does in big sagebrush shrublands and steppes, or mixed salt-desert scrub systems. Trees are very rarely present in this system, but some individuals of *Pinus ponderosa*, *Juniperus scopulorum*, *Juniperus occidentalis*, or *Cercocarpus ledifolius* may occur. The herbaceous layer is dominated by bunch grasses which occupy patches in the shrub matrix. The most widespread species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the northern Rockies. Other locally dominant or important species include *Sporobolus airoides*, *Leymus cinereus*, *Festuca idahoensis*, *Pascopyrum smithii*, *Bouteloua gracilis*, *Distichlis spicata*, *Pleuraphis jamesii*, *Elymus lanceolatus*, *Elymus elymoides*, *Koeleria macrantha*, *Muhlenbergia richardsonis*, *Hesperostipa comata*, and *Poa secunda*. Annual grasses, especially the exotics *Bromus japonicus* and *Bromus tectorum*, may be present to abundant. Forbs are generally of low importance and are highly variable across the range, but may be diverse in some occurrences. Species that often occur are *Symphyotrichum ascendens* (= *Aster adscendens*), *Collinsia parviflora*, *Penstemon caespitosus*, *Achillea millefolium*, *Erigeron compositus*, *Senecio* spp, and *Taraxacum officinale*. Other important genera include *Astragalus*, *Oenothera*, *Eriogonum*, and *Balsamorhiza*. Mosses and lichens may be

important ground cover. Forbs are common on disturbed weedy sites. Weedy annual forbs may include the exotics *Descurainia* spp., *Helianthus annuus*, *Halogeton glomeratus*, *Lactuca serriola*, and *Lepidium perfoliatum*.

MEMBERSHIP

Associations:

- *Achnatherum speciosum* Shrub Herbaceous Vegetation (CEGL003113, G1Q)
- *Artemisia bigelovii* / *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001742, GNR)
- *Artemisia tridentata* - (*Ericameria nauseosa*) / *Bromus tectorum* Semi-natural Shrubland (CEGL002699, GNA)
- *Artemisia tridentata* - *Atriplex confertifolia* Shrubland (CEGL000993, G4)
- *Artemisia tridentata* ssp. *wyomingensis* / *Leymus salinus* Shrubland (CEGL002813, GNR)
- *Atriplex canescens* / *Pleuraphis jamesii* Shrubland (CEGL001288, G3G4)
- *Atriplex obovata* / *Sporobolus airoides* - *Pleuraphis jamesii* Shrub Herbaceous Vegetation (CEGL001775, GU)
- *Bouteloua eriopoda* Coconino Plateau Shrub Herbaceous Vegetation (CEGL002787, GNR)
- *Bouteloua gracilis* - *Hesperostipa comata* Herbaceous Vegetation [Provisional] (CEGL002932, GNR)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation [Placeholder] (CEGL005810, GNR)
- *Chrysothamnus viscidiflorus* - *Ericameria parryi* Shrub Herbaceous Vegetation [Provisional] (CEGL002781, GNR)
- *Chrysothamnus viscidiflorus* / *Hesperostipa comata* Shrubland (CEGL002799, GNR)
- *Chrysothamnus viscidiflorus* / *Leymus salinus* ssp. *salinus* Shrub Herbaceous Vegetation (CEGL001501, G2G4)
- *Chrysothamnus viscidiflorus* / *Poa pratensis* Semi-natural Shrub Herbaceous Vegetation (CEGL002933, GNA)
- *Chrysothamnus viscidiflorus* Shrub Herbaceous Vegetation [Provisional] (CEGL002530, GNR)
- *Ephedra nevadensis* Basalt Shrubland [Provisional] (CEGL002936, GNR)
- *Ephedra torreyana* - *Artemisia bigelovii* Sparse Vegetation (CEGL002350, GNR)
- *Ephedra torreyana* / *Achnatherum hymenoides* - *Pleuraphis jamesii* Shrubland (CEGL002352, GNR)
- *Ephedra viridis* / *Achnatherum hymenoides* - *Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL001648, G2G4)
- *Ephedra viridis* / *Achnatherum hymenoides* - *Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001649, G2G4)
- *Ephedra viridis* / *Bromus tectorum* Semi-natural Shrubland (CEGL002355, GNA)
- *Ericameria nauseosa* / *Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL003495, GNR)
- *Ericameria nauseosa* / *Bromus tectorum* Semi-natural Shrubland (CEGL002937, GNA)
- *Ericameria nauseosa* / *Muhlenbergia pungens* - *Achnatherum hymenoides* Shrub Herbaceous Vegetation (CEGL002921, GNR)
- *Ericameria nauseosa* / *Pleuraphis jamesii* - (*Hesperostipa comata*) Shrub Herbaceous Vegetation (CEGL002996, GNR)
- *Ericameria parryi* / *Achnatherum hymenoides* Shrubland (CEGL003751, GNR)
- *Ericameria parryi* / *Pleuraphis jamesii* - *Bouteloua gracilis* Shrubland (CEGL001331, GUQ)
- *Gutierrezia sarothrae* - (*Opuntia* spp.) / *Pleuraphis jamesii* Dwarf-shrubland (CEGL002690, GNR)
- *Gutierrezia sarothrae* - *Krascheninnikovia lanata* - *Atriplex canescens* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001733, G2)
- *Gutierrezia sarothrae* / *Pleuraphis rigida* Shrub Herbaceous Vegetation (CEGL001543, G2Q)
- *Gutierrezia sarothrae* / *Sporobolus airoides* - *Pleuraphis jamesii* Shrub Herbaceous Vegetation (CEGL001776, GU)
- *Krascheninnikovia lanata* / *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001321, G4)
- *Krascheninnikovia lanata* / *Pascopyrum smithii* - *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001324, G4)
- *Krascheninnikovia lanata* / *Pleuraphis jamesii* Dwarf-shrubland (CEGL001322, G3G4)
- *Krascheninnikovia lanata* / *Poa secunda* Dwarf-shrubland (CEGL001326, G3)
- *Krascheninnikovia lanata* Dwarf-shrubland (CEGL001320, G5?)
- *Opuntia polyacantha* / *Pleuraphis jamesii* Shrubland (CEGL002299, GNR)
- *Poliomintha incana* / (*Pleuraphis jamesii*) Shrubland (CEGL002930, GNR)

Alliances:

- *Achnatherum hymenoides* Shrub Herbaceous Alliance (A.1543)
- *Achnatherum speciosum* Shrub Herbaceous Alliance (A.1549)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Bouteloua eriopoda* Microphyllous Evergreen Shrub Herbaceous Alliance (A.1545)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Alliance (A.1571)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Chrysothamnus viscidiflorus* Shrub Herbaceous Alliance (A.1524)
- *Chrysothamnus viscidiflorus* Shrubland Alliance (A.2651)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Ephedra torreyana* Sparsely Vegetated Alliance (A.2571)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria nauseosa* Shrub Short Herbaceous Alliance (A.1546)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Ericameria parryi* Shrubland Alliance (A.818)

- *Gutierrezia sarothrae* Dwarf-shrubland Alliance (A.2528)
- *Krascheninnikovia lanata* Dwarf-shrub Herbaceous Alliance (A.1565)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Opuntia* spp. Shrubland Alliance (A.2650)
- *Pleuraphis rigida* / *Gutierrezia sarothrae* Shrub Herbaceous Alliance (A.1529)
- *Poliomintha incana* Shrubland Alliance (A.862)
- *Sporobolus airoides* - (*Pleuraphis jamesii*) Shrub Herbaceous Alliance (A.1532)

DISTRIBUTION

Range: This system occurs throughout the intermountain western U.S., typically at lower elevations, and extends into Wyoming and Montana across the Great Divide Basin. It barely gets as far north into north-central Montana (mapzone 20) but is unlikely to be mapped.

Divisions: 304:C

Nations: US

Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WY

Map Zones: 6:P, 7:P, 8:C, 9:C, 12:C, 13:C, 14:C, 15:C, 16:C, 17:C, 18:C, 19:?, 22:C, 23:C, 24:C, 25:C, 27:C, 28:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 331B:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242C:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332E:CP, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

SOURCES

References: Branson et al. 1976, Comer et al. 2003, Hanson 1929, Hironaka et al. 1983, Tuhy et al. 2002, West 1983e

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722884#references

Description Author: G. Kittel and M.S. Reid, mod. K.A. Schulz

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1170 KLAMATH-SISKIYOU XEROMORPHIC SERPENTINE SAVANNA AND CHAPARRAL (CES206.150)

CLASSIFIERS

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Serpentine; Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Ultramafic with low Ca:Mg ratio

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2170; ESLF 5425; ESP 1170

CONCEPT

Summary: Concept Summary: This ecological system occurs throughout the Klamath-Siskiyou region below 1500 m (4550 feet) on thin rocky soils below winter snow accumulations and typically experiences hot and dry summers. These savannas and shrublands are almost always found on ultramafic soils (gabbro, peridotite, serpentinite), especially on the Josephine Peridotite Formation in the western Klamaths, with very low Ca:Mg ratio. These systems are highly variable and spotty in distribution. This system represents the most xeromorphic of these environments, generally supporting savannas or shrublands in areas with high rainfall amounts (over 130 cm/year) that would usually support closed-canopy forests. Landforms can include rocky ridges and ridgetops, south-facing slopes and river terraces, or gravelly valley bottomlands. These contain mosaics or patches of open-canopy tree-savannas with chaparral understories or shrub-dominated chaparral. Shrubs will often have higher densities than the trees which are more limited due to the rocky/thin soils and are often stunted in growth-form. These can also be short-duration chaparrals in previously forested areas that have experienced crownfires. When present, trees tend to have a scattered, open canopy or can be clustered, over a usually continuous, dense shrub layer, but sometimes with a grassy understory. *Pinus jeffreyi* or occasionally *Pinus attenuata* can form a scattered tree layer over bunch grasses. Dense shrub layers can also be present in some stands, or form their own patches without trees, especially on ridges. *Quercus vaccinifolia*, *Quercus sadleriana* (coastal and wetter climate but found on xeric sties), *Lithocarpus densiflorus* var. *echinoides*, *Quercus garryana* var. *breweri* (drier, inland), *Ceanothus cuneatus*, *Ceanothus pumilus*, *Arctostaphylos viscida*, *Arctostaphylos X cinerea*, *Arctostaphylos canescens*, *Arctostaphylos nevadensis*, *Frangula californica* (= *Rhamnus californica*), and *Garrya buxifolia* represent some of the many chaparral shrubs that can be found in these habitats. Perennial grasses such as *Festuca roemerii*, *Achnatherum lemmonii*, *Melica*, and *Danthonia californica* may also be characteristic, although a diverse and often endemic forb component (including rare serpentine endemics) is usually present. This system tends to have lower diversity within stands than in the other serpentine woodland and shrubland systems. Locally occurring, stunted and open stands of *Pinus contorta* and *Pinus monticola* on serpentine at low elevation are included in this system. The grassy understory savannas tend to have understory burns, while shrub-dense stands will suffer intense, stand-replacing fires.

Classification Comments: While generally occurring on serpentine soils, these also can be found on rocky or shallow, non-serpentine soils. They are identified by their very dry, open appearance, and hence are distinguished from the similar Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland (CES206.917) which occurs on less xeric sties and has a woodland physiognomy.

Similar Ecological Systems:

- Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland (CES206.917)

Related Concepts:

- *Arctostaphylos canescens* - *Arctostaphylos viscida* - *Ceanothus cuneatus* chaparral (Kagan et al. 2004) Finer. in OR Classification, not in NVC.
- *Ceanothus cuneatus* - *Garrya fremontii* - *Toxicodendron diversilobum* chaparral (Kagan et al. 2004) Finer. in OR Classification, not in NVC.
- Knobcone Pine: 248 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Pinus attenuata* / *Arctostaphylos viscida* Woodland (CEGL008623, G3)
- *Pinus jeffreyi* / *Ceanothus pumilus* Wooded Herbaceous Vegetation (CEGL000816, G4)
- *Pinus jeffreyi* / *Festuca roemerii* Wooded Herbaceous Vegetation (CEGL000817, G3)

Alliances:

- *Pinus attenuata* Woodland Alliance (A.508)
- *Pinus jeffreyi* Wooded Herbaceous Alliance (A.1501)

DISTRIBUTION

Range: This system occurs throughout the Klamath - Siskiyou region below 1500 m (4550 feet), but mostly in the western Klamaths on the Josephine peridotite body.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 7:?

USFS Ecomap Regions: 263A:??, M242A:??, M242B:??, M261A:CC, M261D:C?

TNC Ecoregions: 5:P

SOURCES

References: Atzet et al. 1996, Barbour and Major 1988, Holland and Keil 1995, Jimerson 1993, Jimerson 1994, Jimerson and Daniel 1999, Jimerson et al. 1995, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791117#references

Description Author: M.S. Reid

Version: 23 Jan 2006

Concept Author: J. Kagan, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

LAURENTIAN ACIDIC ROCKY OUTCROP (CES201.019)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland; Ridge/Summit/Upper Slope; Rock Outcrops/Barrens/Glades; Glaciated; Acidic Soil

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 5463

CONCEPT

Summary: This Laurentian and near-boreal outcrop system is found across central southern Canada and the upper Midwest of the United States. It is found on ridges or summits of resistant acidic bedrock at low to mid elevations. The vegetation is patchy, often a mosaic of woodlands and open glades. The system is typically dominated by various conifers, including *Pinus banksiana* and *Picea mariana*, with occasional *Picea glauca* or *Populus tremuloides*. Hardwoods include *Quercus rubra*, *Quercus ellipsoidalis*, and *Populus tremuloides*. Structure can vary from treed to low heath shrubs to open lichen woodland. Exposure and occasional fire are the major factors in keeping the vegetation relatively open.

Classification Comments: See also Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571), which occurs to the east of this system's primary range and is characterized by granitic bedrock.

Similar Ecological Systems:

- Boreal Jack Pine-Black Spruce Forest (CES103.022)
- Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571)--is similar but occurs east of the Great Lakes. *Picea rubens* is often present and *Quercus ellipsoidalis* is absent; *Pinus banksiana* is only rarely present.

MEMBERSHIP

Associations:

- (*Pinus strobus*, *Quercus rubra*) / *Danthonia spicata* Acidic Bedrock Wooded Herbaceous Vegetation (CEGL005101, G3G4)
- *Corylus cornuta* - *Amelanchier* spp. - *Prunus virginiana* Rocky Shrubland (CEGL005197, GNR)
- *Danthonia spicata* - *Poa compressa* Granite Herbaceous Vegetation (CEGL005157, GNR)
- *Juniperus communis* - (*Quercus rubra*) / *Juniperus horizontalis* - *Arctostaphylos uva-ursi* Shrubland (CEGL005065, G3G4)
- *Picea glauca* - (*Betula papyrifera*) / *Danthonia spicata* Woodland (CEGL005196, GNR)
- *Pinus banksiana* - (*Picea mariana*, *Pinus strobus*) / *Vaccinium* spp. Rocky Woodland (CEGL002483, G4?)
- *Pinus banksiana* - *Pinus strobus* - (*Quercus rubra*) / *Cladina* spp. Nonvascular Vegetation (CEGL002491, G3G5)
- *Pinus banksiana* / (*Quercus rubra*, *Quercus ellipsoidalis*) Forest (CEGL002440, G4?)
- *Pinus banksiana* / *Photinia melanocarpa* / *Xanthoparmelia* spp. Woodland (CEGL005045, G4G5)
- *Populus tremuloides* - (*Populus grandidentata*) Rocky Woodland (CEGL002487, GNR)
- *Quercus ellipsoidalis* - *Quercus macrocarpa* - (*Pinus banksiana*) Rocky Woodland (CEGL005246, GNR)

Alliances:

- *Corylus cornuta* - *Amelanchier* spp. Shrubland Alliance (A.898)
- *Danthonia spicata* Herbaceous Alliance (A.1281)
- *Juniperus communis* Shrubland Alliance (A.808)
- *Picea glauca* Woodland Alliance (A.551)
- *Pinus (banksiana, resinosa)* Woodland Alliance (A.507)
- *Pinus banksiana* / *Cladina* spp. Nonvascular Alliance (A.1828)
- *Pinus banksiana* Forest Alliance (A.116)
- *Populus tremuloides* Woodland Alliance (A.610)
- *Quercus macrocarpa* - *Quercus (alba, ellipsoidalis, velutina)* Woodland Alliance (A.619)

DISTRIBUTION

Range: This system is found in central Canada south to the Great Lakes and northern Minnesota, eastward in Canada to Quebec and a small portion of extreme northeastern New York.

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: MB, MI, MN, NY, ON, QC, WI

Map Zones: 41:C, 50:C, 51:C, 64:C

USFS Ecomap Regions: 211E:CC, 212Jb:CCC, 212Jc:CCC, 212Jo:CCP, 212K:CC, 212Lb:CCP, 212M:CC, 212Q:CC, 212Sb:CCC, 212Sc:CCP, 212Sn:CCP, 212Sq:CCC, 212Tc:CCC, 212X:CC, 212Ya:CCC

TNC Ecoregions: 47:C, 48:C, 64:C

SOURCES

References: Comer et al. 2003, Edinger et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722686#references

Description Author: D. Faber-Langendoen, mod. S.C. Gawler

Version: 03 Oct 2007

Concept Author: D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

1407 LAURENTIAN PINE-OAK BARRENS (CES201.718)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2407; ESLF 5423; ESP 1407

CONCEPT

Summary: These pine-oak barrens occur in the northern and western Great Lakes region. They occur on sandplains/outwash habitats, with dry, frequent fires (every 10-50 years). *Pinus banksiana*, *Pinus resinosa*, *Quercus ellipsoidalis*, and *Pinus strobus* are common overstory dominants. Prairie species are common throughout much of the range of the type. Common shrub and field layer species include *Schizachyrium scoparium*, *Andropogon gerardii*, *Carex pensylvanica*, *Vaccinium angustifolium*, and *Corylus americana*. Oak grubs may be common under frequent burning. Catastrophic burns may create open bracken grasslands.

Classification Comments: This system covers the Great Lakes barrens. The eastern U.S. pine barrens fall into Northeastern Interior Pine Barrens (CES202.590) described under the Central Interior-Appalachian Division (202). The more southern North-Central Oak Barrens (CES202.727) overlaps this type along the "tension zone" of Minnesota and Wisconsin. Northward, this system is differentiated from more boreal systems with *Pinus banksiana* by absence of *Picea mariana* and the presence of many prairie species. Within the pine barrens landscape this system overlaps with Laurentian-Acadian Northern Pine-(Oak) Forest (CES201.719), which may occupy pine barrens sites that have not burned for more than 50 years.

Similar Ecological Systems:

- Boreal Jack Pine-Black Spruce Forest (CES103.022)
- Laurentian-Acadian Northern Pine-(Oak) Forest (CES201.719)
- North-Central Oak Barrens (CES202.727)
- Northeastern Interior Pine Barrens (CES202.590)

MEMBERSHIP

Associations:

- *Pinus banksiana* - (*Pinus resinosa*) - *Quercus ellipsoidalis* / *Carex pensylvanica* Forest (CEGL002478, G4G5)
- *Pinus banksiana* - (*Pinus resinosa*) / *Corylus cornuta* Forest (CEGL002442, G4?)
- *Pinus banksiana* - (*Quercus ellipsoidalis*) / *Schizachyrium scoparium* - Prairie Forbs Wooded Herbaceous Vegetation (CEGL002490, G2)
- *Pinus banksiana* - *Pinus resinosa* - (*Quercus ellipsoidalis*) / *Carex pensylvanica* Wooded Herbaceous Vegetation (CEGL005124, G3G4)
- *Pinus banksiana* / *Vaccinium* spp. / *Pleurozium schreberi* Forest (CEGL002441, G4G5)
- *Pinus strobus* - *Quercus alba* - (*Quercus velutina*) / *Andropogon gerardii* Wooded Herbaceous Vegetation (CEGL005127, G2?)
- *Populus tremuloides* - *Quercus* (*ellipsoidalis*, *macrocarpa*) / *Andropogon gerardii* Shrubland (CEGL002197, GNR)
- *Pteridium aquilinum* - *Bromus kalmii* Herbaceous Vegetation (CEGL005142, GNR)
- *Quercus ellipsoidalis* - (*Quercus macrocarpa*) Forest (CEGL002077, G4?)

Alliances:

- *Pinus banksiana* - (*Pinus resinosa*) Wooded Herbaceous Alliance (A.1499)
- *Pinus banksiana* - *Quercus* (*ellipsoidalis*, *velutina*) Forest Alliance (A.391)
- *Pinus banksiana* Forest Alliance (A.116)
- *Pinus strobus* - *Quercus* (*alba*, *rubra*) Wooded Herbaceous Alliance (A.1496)
- *Populus tremuloides* - *Quercus* spp. - *Salix* spp. Shrubland Alliance (A.903)
- *Pteridium aquilinum* - *Bromus kalmii* Herbaceous Alliance (A.1599)
- *Quercus ellipsoidalis* Forest Alliance (A.255)

DISTRIBUTION

Range: Occurs in the northern and western Great Lakes region.

Divisions: 201:C

Nations: CA, US

Subnations: MI, MN, ON, WI

Map Zones: 41:C, 50:C, 51:C

USFS Ecomap Regions: 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212He:CCC, 212Hg:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCP, 212J:CP, 212K:CC, 212L:CP, 212N:CC, 212Ra:CCC, 212Rb:CCP, 212Rc:CCP, 212Re:CCP, 212Sc:CCP, 212Sn:CCC, 212Sq:CCP, 212Tb:CCC, 212Tc:CCC, 212Te:CCC, 212X:CP, 222Ja:CCC, 222Jb:CCC, 222R:CC, 222Ud:CCC

TNC Ecoregions: 45:P, 47:C, 48:C

SOURCES

References: Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003, Curtis 1959

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722951#references

Description Author: D. Faber-Langendoen

Version: 05 Mar 2003

Concept Author: D. Faber-Langendoen

Stakeholders: Canada, Midwest

ClassifResp: Midwest

LAURENTIAN-ACADIAN CALCAREOUS ROCKY OUTCROP (CES201.572)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades; Glaciated; Alkaline Soil; Circumneutral Soil

Non-Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Mesotrophic Soil; Very Shallow Soil; Udic; Consolidated; Intermediate Disturbance Interval; F-Patch/Medium Intensity

National Mapping Codes: ESLF 5461

CONCEPT

Summary: This outcrop system occurs in scattered locations from New England west to the Great Lakes. It occurs on ridges or summits of circumneutral to calcareous bedrock. Sites are often exposed and dry; however, there may be local areas of more moist conditions. The vegetation is often a mosaic of woodlands and open glades. This system may also occur on rocks that are primarily acidic but with a local influence of calcium through weathering.

Similar Ecological Systems:

- Central Appalachian Alkaline Glade and Woodland (CES202.602)

MEMBERSHIP

Associations:

- *Acer saccharum* - *Ostrya virginiana* - *Carya ovata* - *Quercus rubra* Limestone Woodland (CEGL005059, G3G4)
- *Adiantum aleuticum* - *Asplenium* spp. - *Cerastium arvense* Sparse Vegetation (CEGL006104, G1G2)
- *Juniperus virginiana* - *Ostrya virginiana* / *Carex eburnea* Woodland (CEGL006180, G2G3)
- *Quercus macrocarpa* / *Danthonia spicata* - (*Geum triflorum*) Limestone Wooded Herbaceous Vegetation (CEGL005237, G1?)
- *Thuja occidentalis* - *Fraxinus pennsylvanica* / *Acer pensylvanicum* Woodland (CEGL006508, GNR)
- *Thuja occidentalis* / *Carex eburnea* Forest (CEGL006021, GNR)
- *Thuja occidentalis* / *Gaylussacia baccata* - *Vaccinium angustifolium* Woodland (CEGL006411, GNR)
- *Thuja occidentalis* / *Oligoneuron album* Woodland (CEGL006093, GNR)

Alliances:

- *Cerastium arvense* Sparsely Vegetated Alliance (A.1840)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Quercus macrocarpa* - (*Quercus alba*) Wooded Herbaceous Alliance (A.1491)
- *Thuja occidentalis* Forest Alliance (A.142)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

DISTRIBUTION

Range: Scattered locations from New England and adjacent Canada west to the eastern Great Lakes.

Divisions: 201:C

Nations: US

Subnations: ME, NH, NY, VT

Map Zones: 63:C, 64:C, 66:C

TNC Ecoregions: 48:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723033#references

Description Author: S.C. Gawler

Version: 09 Jan 2003

Concept Author: S.C. Gawler

Stakeholders: East, Midwest

ClassifResp: East

1116 MADREAN JUNIPER SAVANNA (CES301.730)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Woody-Herbaceous; Tropical/Subtropical [Tropical Xeric]; Evergreen Sclerophyllous Tree; Succulent Shrub; *Juniperus coahuilensis*, *J. deppeana*, *J. pinchotii*

Non-Diagnostic Classifiers: Alluvial flat; Sideslope; Toeslope/Valley Bottom; Alluvial plain; Alluvial terrace; Sand Soil Texture; F-Patch/Low Intensity; Graminoid

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Evergreen sparse tree canopy

National Mapping Codes: EVT 2116; ESLF 5405; ESP 1116

CONCEPT

Summary: This Madrean ecological system occurs in lower foothills and plains of southeastern Arizona, southern New Mexico extending into west Texas and Mexico. These savannas have widely spaced mature juniper trees and moderate to high cover of graminoids (>25% cover). The presence of Madrean *Juniperus* spp. such as *Juniperus coahuilensis*, *Juniperus pinchotii*, and/or *Juniperus deppeana* is diagnostic. *Juniperus monosperma* may be present in some stands; *Juniperus deppeana* has a broader range than this Madrean system and extends north into southern stands of Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834). Stands of *Juniperus pinchotii* may be short and resemble a shrubland. Graminoid species are a mix of those found in Western Great Plains Shortgrass Prairie (CES303.672) and Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735), with *Bouteloua gracilis* and *Pleuraphis jamesii* being most common. In addition, these areas include succulents such as species of *Yucca*, *Opuntia*, and *Agave*. Juniper savanna expansion into grasslands has been documented in the last century.

Similar Ecological Systems:

- Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735)
- Western Great Plains Shortgrass Prairie (CES303.672)

Related Concepts:

- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Juniperus deppeana* / *Bouteloua gracilis* Woodland (CEGL000693, G5)
- *Juniperus deppeana* / *Bouteloua hirsuta* Woodland (CEGL000694, G3)
- *Juniperus deppeana* / *Muhlenbergia emersleyi* Woodland (CEGL000697, G4)
- *Juniperus deppeana* / *Panicum obtusum* Woodland (CEGL000698, GNR)
- *Juniperus deppeana* / *Schizachyrium cirratum* Woodland (CEGL000699, G4)
- *Juniperus monosperma* / *Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Quercus mohriana* - *Juniperus pinchotii* / *Bouteloua curtipendula* Shrubland (CEGL002173, G4)

Alliances:

- *Juniperus deppeana* Woodland Alliance (A.534)
- *Juniperus monosperma* Woodland Alliance (A.504)
- *Quercus mohriana* Shrubland Alliance (A.782)

DISTRIBUTION

Range: This system is found in southeastern Arizona, southern New Mexico, and extending into west Texas and Mexico. It likely occurs on the west side of the Sacramento and Guadalupe mountains.

Divisions: 301:C

Nations: MX, US

Subnations: AZ, NM, TX

Map Zones: 14:P, 15:C, 24:C, 25:C, 26:C, 27:C, 28:?

USFS Ecomap Regions: 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, M313A:CC, M313B:CC, M331F:??

TNC Ecoregions: 22:C, 24:C, 30:P

SOURCES

References: Barbour and Billings 2000, Brown et al. 1979, Brown et al. 1998, Comer et al. 2003, Dick-Peddie 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722942#references

Description Author: NatureServe Western Ecology Team

Version: 10 Nov 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West
ClassifResp: West

1397 NASHVILLE BASIN LIMESTONE GLADE AND WOODLAND (CES202.334)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Alkaline Soil; Graminoid

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2397; ESLF 5413; ESP 1397

CONCEPT

Summary: This system encompasses a range of plant communities associated with thin soils on flat areas of Ordovician limestone in the Inner Nashville Basin of Tennessee (Ecoregion 71i of Griffith et al. (1998), EPA (2004); Subsection 222Ed of Keys et al. (1995)), with a few disjunct occurrences in Kentucky. The vegetation of this system includes sparsely vegetated rock outcrops, annual *Sporobolus* spp.-dominated grasslands, *Schizachyrium scoparium*-dominated perennial grasslands, seasonally wet herbaceous washes and seeps, shrublands, as well as woodlands dominated by *Juniperus virginiana* and oaks. *Echinacea tennesseensis* and *Astragalus bibullatus* are completely endemic to this system. There are numerous other disjunct and near-endemic plants.

Classification Comments: This system occupies a small portion of the landscape but many associations are only found in this system. The most closely related system is Central Interior Highlands Calcareous Glade and Barrens (CES202.691). Also included here are related disjunct examples in Kentucky on Mississippian limestones (EPA ecoregions 71a, 71e of Woods et al. (2002)).

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is typically found on sloping surfaces, not flatrocks, and has a broader distribution.

Related Concepts:

- Limestone Flat-Rock Glade (Evans 1991) Finer

DESCRIPTION

Environment: This system is associated with thin soils on flat areas of Ordovician limestone in the Inner Nashville Basin of Tennessee (Ecoregion 71i of Griffith et al. (1998), EPA (2004); Subsection 222Ed of Keys et al. (1995)), with a few disjunct occurrences in Kentucky.

Vegetation: The vegetation of this system includes sparsely vegetated rock outcrops, annual *Sporobolus* spp.-dominated grasslands, *Schizachyrium scoparium*-dominated perennial grasslands, seasonally wet herbaceous washes and seeps, shrublands, as well as woodlands dominated by *Juniperus virginiana* and oaks. Other woody plants associated with this system include *Quercus shumardii*, *Cercis canadensis*, *Ulmus alata*, *Fraxinus quadrangulata*, and *Acer saccharum*. Characteristic shrubs include *Forestiera ligustrina*, *Rhus aromatica*, *Hypericum frondosum*, and *Frangula caroliniana*. Other herbaceous taxa include *Andropogon gerardii*, *Bouteloua curtipendula*, *Silphium trifoliatum*, *Silphium terebinthinaceum*, *Helianthus mollis*, *Grindelia lanceolata*, *Liatris* spp., *Hedyotis nigricans*, *Croton capitatus*, *Heliotropium tenellum*, *Isanthus brachiatus*, *Manfreda virginica*, *Ruellia humilis*, *Talinum calcaricum*, *Sedum pulchellum*, and *Panicum flexile*. *Echinacea tennesseensis* and *Astragalus bibullatus* are completely endemic to this system. There are numerous other disjunct and near-endemic plants, including *Astragalus tennesseensis*, *Dalea gattingeri*, and *Pediomelum subacaule* (Somers et al. 1986). Small-scale seepage areas and washes may contain *Eleocharis compressa*, *Nothoscordum bivalve*, *Isoetes butleri*, and *Hypoxis hirsuta*.

MEMBERSHIP

Associations:

- *Dalea foliosa* - *Mecardonia acuminata* - *Mitreola petiolata* Herbaceous Vegetation (CEGL004292, G2?)
- *Eleocharis (bifida, compressa)* - *Schoenolirion croceum* - *Carex crawei* - *Allium cernuum* Herbaceous Vegetation (CEGL004169, G2?)
- *Juniperus virginiana* var. *virginiana* - *Forestiera ligustrina* - *Rhus aromatica* - *Hypericum frondosum* Shrubland (CEGL003938, G3G4)
- *Juniperus virginiana* var. *virginiana* - *Fraxinus quadrangulata* / *Polymnia canadensis* - (*Astranthium integrifolium*) Woodland (CEGL003754, G3)
- *Quercus muehlenbergii* - *Juniperus virginiana* / *Schizachyrium scoparium* - *Manfreda virginica* Wooded Herbaceous Vegetation (CEGL005131, G2G3)
- *Quercus stellata* / *Viburnum rufidulum* - *Forestiera ligustrina* / *Andropogon gerardii* Woodland (CEGL003712, G2?)
- *Sedum pulchellum* - *Talinum calcaricum* - *Leavenworthia* spp. / *Nostoc commune* Herbaceous Vegetation (CEGL004346, G3)
- *Sporobolus (neglectus, vaginiflorus)* - *Aristida longispica* - *Panicum flexile* - *Panicum capillare* Herbaceous Vegetation (CEGL004340, G3)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Dalea foliosa* - *Mecardonia acuminata* Saturated Herbaceous Alliance (A.1686)

- *Eleocharis (bifida, compressa) - Nothoscordum bivalve* Saturated Herbaceous Alliance (A.1458)
- *Fraxinus quadrangulata - (Juniperus virginiana)* Woodland Alliance (A.1913)
- *Juniperus virginiana - Rhus aromatica* Shrubland Alliance (A.1049)
- *Quercus stellata - Quercus marilandica* Woodland Alliance (A.625)
- *Sedum pulchellum* Saturated Herbaceous Alliance (A.1820)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DISTRIBUTION

Range: This system is restricted to flat areas of Ordovician limestone in the Inner Nashville Basin of Tennessee, as well as limited and disjunct examples on flat Mississippian limestones in Kentucky.

Divisions: 202:C

Nations: US

Subnations: KY, TN

Map Zones: 47:C, 48:C

USFS Ecomap Regions: 223D:CC, 223E:CC

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, EPA 2004, Griffith et al. 1998, Keys et al. 1995, Somers et al. 1986, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723170#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 22 May 2008

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1394 NORTH-CENTRAL INTERIOR OAK SAVANNA (CES202.698)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Woody-Herbaceous

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Deciduous sparse tree canopy

National Mapping Codes: EVT 2394; ESLF 5410; ESP 1394

CONCEPT

Summary: This system is found primarily in the northern glaciated regions of the Midwest with the largest concentration in the prairie-forest border ecoregion. It is typically found on rolling outwash plains, hills and ridges. Soils are typically moderately well- to well-drained deep loams. This system is typified by scattered trees over a continual tallgrass prairie. *Quercus macrocarpa* is the most common tree species and can range from 10-60% cover. The understory is dominated by tallgrass prairie species such as *Andropogon gerardii* and *Schizachyrium scoparium* associated with several forb species. Historically, frequent fires maintained this savanna system within its range and would have restricted tree canopies to 10-30%. Fire suppression in the region has allowed trees to establish more dense canopies. Periodic, strong wind disturbances and browsing also impact this system. Much of this system has also been converted to agriculture, and thus its range has decreased considerably.

DESCRIPTION

Environment: This system is typically found on rolling outwash plains, hills and ridges. Soils are typically moderately well- to well-drained deep loams. This system is typified by scattered trees over a continual tallgrass prairie.

Vegetation: *Quercus macrocarpa* is the most common tree species and can range from 10-60% cover. The understory is dominated by tallgrass prairie species such as *Andropogon gerardii*, *Calamagrostis canadensis*, and *Schizachyrium scoparium* associated with several forb species.

Dynamics: Historically, frequent fires maintained this savanna system within its range and would have restricted tree canopies to 10-30%. Fire suppression in the region has allowed trees to establish more dense canopies. Periodic, strong wind disturbances and browsing also impact this system. Much of this system has also been converted to agriculture, and thus its range has decreased considerably.

MEMBERSHIP

Associations:

- *Quercus alba* - *Quercus macrocarpa* - *Quercus rubra* / *Corylus americana* Woodland (CEGL002142, G3G4)
- *Quercus alba* - *Quercus macrocarpa* / *Andropogon gerardii* Wooded Herbaceous Vegetation (CEGL005121, G1)
- *Quercus macrocarpa* - (*Quercus alba*, *Quercus stellata*) / *Andropogon gerardii* Wooded Herbaceous Vegetation (CEGL002159, G1)
- *Quercus macrocarpa* - (*Quercus alba*, *Quercus velutina*) / *Andropogon gerardii* Wooded Herbaceous Vegetation (CEGL002020, G1)
- *Quercus macrocarpa* - *Quercus palustris* - *Quercus bicolor* / *Calamagrostis canadensis* Wooded Herbaceous Vegetation (CEGL005120, G1)
- *Quercus macrocarpa* Northern Tallgrass Wooded Herbaceous Vegetation (CEGL002158, G1G2)

Alliances:

- *Quercus macrocarpa* - (*Quercus alba*) Wooded Herbaceous Alliance (A.1491)
- *Quercus macrocarpa* - *Quercus (alba, ellipsoidalis, velutina)* Woodland Alliance (A.619)

DISTRIBUTION

Range: This system is found throughout the northern glaciated regions of the Midwest. Its main concentration, where it was likely the matrix type, is within the Prairie Forest Border of Minnesota, Wisconsin, Iowa, and Illinois. Conversion to agriculture and fire suppression have significantly impacted the range of this system.

Divisions: 201:?, 202:C; 205:C

Nations: US

Subnations: IA, IL, IN, MI?, MN, MO, WI

Map Zones: 39:P, 40:C, 41:C, 42:C, 43:P, 44:P, 49:C, 50:C, 51:P, 52:C

USFS Ecomap Regions: 212K:CP, 212Q:CP, 222Jb:CCP, 222Jc:CCC, 222Je:CCC, 222Jf:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222L:CC, 222M:CC, 222N:CC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC, 251A:CC, 251B:CC

TNC Ecoregions: 35:C, 36:C, 45:P, 46:C, 47:P

SOURCES

References: Albert 1995b, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003, MNNHP 1993

Full References:

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722962#references

Description Author: S. Menard

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

NORTH-CENTRAL INTERIOR QUARTZITE GLADE (CES202.699)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous; Ridge/Summit/Upper Slope; Metamorphic Rock [Quartzite]; Very Shallow Soil; Cliff (Landform)

National Mapping Codes: ESLF 5459

CONCEPT

Summary: This quartzite woodland is found on rocky, hilly regions in the upper midwestern United States in the Baraboo Hills of Wisconsin. Stands occur on the brow of steep slopes that overlay quartzite, rhyolite or sandstone bedrock that contains some fractures. Soils are thin (10-30 cm deep) silt loams, acidic (pH of 4.5-5.0), fertile, and rich in organic matter (10-15% organic matter). These glades represent forest openings dominated by relatively even-spaced, small-statured trees and a sparse shrub and sapling layer. The tree canopy is fairly closed, although historically it may have been more open. These glades are dominated by *Quercus alba* or *Carya ovata* with an understory of herbaceous species such as *Carex pensylvanica*, *Antennaria plantaginifolia*, *Solidago ulmifolia*, and others. Drought strongly influences this system, although deer browsing and fire, at least historically, may also play a role in keeping the glade structure.

Classification Comments: This system was originally included with the Minnesota/South Dakota quartzite glades, but further discussion determined that those examples found within the Driftless Area are distinct from those farther west.

DESCRIPTION

Environment: Stands occur on the brow of steep slopes that overlay quartzite, rhyolite or sandstone bedrock that contains some fractures. Exposed bedrock may average about 15%. The stands themselves have gentle slopes (2-11%), mostly with a southwestern aspect, but range from due east to due west. Glade soils are thin (10-30 cm deep) silt loams, acidic (pH of 4.5-5.0), fertile, and rich in organic matter (10-15% organic matter). The high organic matter content could be a function of low pH and droughtiness that inhibit decomposition of organic matter (West and Welsh 1998).

Vegetation: These glades represent forest openings dominated by relatively even-spaced, small-statured trees and a sparse shrub and sapling layer. The tree canopy is fairly closed, averaging about 75% (range of 57-82%). Either *Quercus alba* or *Carya ovata* dominate the canopy. *Quercus velutina* and *Quercus rubra* are much less common. Shrubs are nearly absent from all glades. Herbaceous species include *Carex pensylvanica*, *Antennaria plantaginifolia*, *Solidago ulmifolia*, and others. The flora is complicated by the fact that the glades likely served as refugia for prairie plants historically and now serve as refugia for woodland and savanna plants (P. West pers. comm. 2000).

Dynamics: Droughts and deer browse may currently interact to keep these glades open. Historically, the surrounding matrix of dry oak forests may have been more likely to burn, and those fires and the more open canopy could have spread into the glades (West and Welsh 1998). These glades are thought to be more environmentally controlled, by shallow soils, which suggest that soil depth and the historic extent of the glade community may be positively correlated (P. West pers. comm. 2000). *Juniperus virginiana* was present on some of the glades but in small numbers (P. West pers. comm. 2000).

MEMBERSHIP

Associations:

- *Quercus alba* - *Carya ovata* / *Carex pensylvanica* - *Heuchera richardsonii* Quartzite Glade Woodland (CEGL005276, G2?)

Alliances:

- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)

DISTRIBUTION

Range: This system is found in a very restricted area on quartzite, rhyolite or sandstone outcrops in the Baraboo Hills region of Wisconsin.

Divisions: 202:C

Nations: US

Subnations: WI

Map Zones: 42:C, 50:C

USFS Ecomap Regions: 222L:CC

TNC Ecoregions: 46:C

SOURCES

References: Comer et al. 2003, West and Welsh 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722961#references

Description Author: S. Menard and D. Faber-Langendoen

Version: 11 Apr 2007
Concept Author: S. Menard and D. Faber-Langendoen

Stakeholders: Midwest
ClassifResp: Midwest

1395 NORTH-CENTRAL OAK BARRENS (CES202.727)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Deciduous sparse tree canopy

National Mapping Codes: EVT 2395; ESLF 5411; ESP 1395

CONCEPT

Summary: This community occurs on well-drained, coarse-textured sandy soils derived from glacial outwash, end moraine formations, or lakeplain dune systems in the north-central U.S. into Ontario, Canada. Soils range from almost pure sand, to loamy sand, to sandy loam. The soils have low fertility, organic matter, and moisture-retention capacity. Factors which affect seasonal soil moisture are strongly related to variation in this type. This oak barrens system is a scrubby, open-treed system dominated by graminoids and shrubs. Canopy structure varies from a dominant herbaceous ground layer with sparse, scattered "savanna" canopy (5-30%), through oak-dominated scrub, to a more closed woodland canopy (30-80%). The canopy layer is dominated by *Quercus velutina*, with some *Quercus ellipsoidalis*, *Quercus macrocarpa*, and *Quercus alba* (the latter more common eastward and in woodland conditions). Occasional *Pinus banksiana* can occur in the northern parts of the range. Species found in the herb layer include *Ambrosia psilostachya*, *Amphicarpaea bracteata*, *Artemisia ludoviciana*, *Andropogon gerardii*, *Calamovilfa longifolia*, *Carex pensylvanica*, *Carex* spp., *Comandra umbellata*, *Sorghastrum nutans*, *Hesperostipa spartea* (= *Stipa spartea*), and *Schizachyrium scoparium*. Fire was an important factor in maintaining this community. Oak wilt and droughts also reduce tree cover.

Classification Comments: Black oak woodland variants may occur in this system, but because *Quercus velutina* and *Quercus ellipsoidalis* can sprout after stems have been killed by fires, stands generally have a somewhat scrubby structure that can vary from 10-60% cover over time. Some stands may occur on fairly mesic sands. In New England and (most of) New York, similar settings are occupied by pitch pine - oak barrens (Northeastern Interior Pine Barrens (CES202.590)) which are characterized by *Quercus ilicifolia*, not *Quercus ellipsoidalis*.

Similar Ecological Systems:

- Laurentian Pine-Oak Barrens (CES201.718)--is a pine-dominated system and lacks *Quercus velutina*.

DESCRIPTION

Environment: This system occurs on well-drained, coarse-textured sandy soils derived from glacial outwash, end moraine formations, or lakeplain dune systems. Soils range from almost pure sand, to loamy sand, to sandy loam. The soils have low fertility, organic matter, and moisture-retention capacity. Factors which affect seasonal soil moisture are strongly related to variation in this type.

Vegetation: This oak barrens system is a scrubby, open-treed system dominated by graminoids and shrubs. Canopy structure varies from a dominant herbaceous ground layer with sparse, scattered "savanna" canopy (5-30%), through oak-dominated scrub, to a more closed woodland canopy (30-80%). The canopy layer is dominated by *Quercus velutina*, with some *Quercus ellipsoidalis*, *Quercus macrocarpa*, and *Quercus alba* (the latter more common eastward and in woodland conditions). Occasional *Pinus banksiana* can occur in the northern parts of the range. Species found in the herb layer include *Ambrosia psilostachya*, *Amphicarpaea bracteata*, *Artemisia ludoviciana*, *Andropogon gerardii*, *Calamovilfa longifolia*, *Carex pensylvanica*, *Carex* spp., *Comandra umbellata*, *Sorghastrum nutans*, *Hesperostipa spartea* (= *Stipa spartea*), and *Schizachyrium scoparium*.

Dynamics: Fire was an important factor in maintaining this community. Oak wilt and droughts also reduce tree cover.

MEMBERSHIP

Associations:

- *Quercus alba* - (*Quercus velutina*) / *Lespedeza virginica* - *Eupatorium hyssopifolium* Woodland (CEGL006433, GNR)
- *Quercus macrocarpa* - (*Quercus ellipsoidalis*) / *Schizachyrium scoparium* - *Koeleria macrantha* Wooded Herbaceous Vegetation (CEGL002160, G2)
- *Quercus velutina* - (*Quercus alba*) - *Quercus ellipsoidalis* / *Schizachyrium scoparium* - *Lupinus perennis* Wooded Herbaceous Vegetation (CEGL002492, G3)
- *Quercus velutina* - (*Quercus ellipsoidalis*) - *Quercus alba* / *Deschampsia flexuosa* Woodland (CEGL005029, GNR)

Alliances:

- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Quercus velutina* - (*Quercus ellipsoidalis*) Wooded Herbaceous Alliance (A.1492)

DISTRIBUTION

Range: This system is found in the north-central U.S. from North Dakota to western New York and westernmost Pennsylvania (mostly historic there) and into Ontario, Canada.

Divisions: 202:C

Nations: CA, US

Subnations: IL, IN, MI, MN, ND, NY, OH, ON, PA, WI

Map Zones: 39:C, 40:C, 41:C, 42:C, 43:C, 49:C, 50:C, 51:C, 52:C, 63:C

USFS Ecomap Regions: 212Ha:CCP, 212Hb:CCC, 222I:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jf:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCP, 222K:CC, 222L:CC, 222M:CP, 222R:CC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:C

SOURCES

References: Chapman et al. 1994, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722945#references

Description Author: D. Faber-Langendoen

Version: 11 Apr 2007

Concept Author: D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

NORTHERN APPALACHIAN-ACADIAN ROCKY HEATH OUTCROP (CES201.571)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland; Ridge/Summit/Upper Slope; Rock Outcrops/Barrens/Glades; Glaciated; Acidic Soil

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Oligotrophic Soil; Very Shallow Soil; Mineral: W/ A-Horizon >10 cm; Mineral: W/ A-Horizon <10 cm; Loam Soil Texture; Sand Soil Texture; Udic; Consolidated; Long Disturbance Interval; F-Patch/Low Intensity; W-Landscape/Medium Intensity; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Broad-Leaved Shrub; Dwarf-Shrub; Graminoid; Nonvascular

National Mapping Codes: ESLF 5462

CONCEPT

Summary: This outcrop ecological system ranges across New England and adjacent Canada, and southward at higher elevations to northern Pennsylvania, on ridges or summits of resistant acidic bedrock. Throughout most of its range, it occurs at low to mid elevations (600-1000 m, lower on the coast of eastern Maine and the Maritimes). The vegetation is patchy, often a mosaic of woodlands and open glades. *Quercus rubra* and various conifers, including *Pinus strobus* and *Picea rubens*, or (especially near the coast) *Picea mariana*, are characteristic trees. Low heath shrubs, including *Kalmia angustifolia*, *Vaccinium angustifolium*, *Gaylussacia baccata*, and *Photinia melanocarpa*, are typically present. Exposure and occasional fire are the major factors in keeping the vegetation relatively open.

Classification Comments: This system transitions westward and northward into Laurentian Acidic Rocky Outcrop (CES201.019) and southward into Central Appalachian Pine-Oak Rocky Woodland (CES202.600). Where their ranges overlap or abut, this system is distinguished from the latter by the presence of more northern elements such as *Picea*, *Sorbus*, *Pinus banksiana*, etc., and lack of *Pinus rigida* and *Quercus ilicifolia* which may be found in the Central Appalachian system. This system overlaps with Laurentian Acidic Rocky Outcrop (CES201.019) only in New York state, where the latter occurs in the St. Lawrence - Champlain ecoregion (an extension of its Great Lakes affinities), and the present type occurs primarily in the Northern Appalachian ecoregion.

Similar Ecological Systems:

- Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (CES201.568)--occurs at higher elevations.
- Central Appalachian Pine-Oak Rocky Woodland (CES202.600)
- Laurentian Acidic Rocky Outcrop (CES201.019)

MEMBERSHIP

Associations:

- *Picea mariana* / *Kalmia angustifolia* Woodland (CEGL006292, G4?)
- *Picea rubens* / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* Woodland (CEGL006053, G3G5)
- *Picea rubens* / *Vaccinium angustifolium* High Allegheny Plateau Woodland (CEGL006254, G3G5)
- *Pinus banksiana* / *Kalmia angustifolia* - *Vaccinium* spp. Woodland (CEGL006041, G3G5)
- *Pinus resinosa* / *Gaylussacia baccata* - *Vaccinium angustifolium* Woodland (CEGL006010, G3G5)
- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134, G3G5)
- *Vaccinium angustifolium* - *Sorbus americana* / *Sibbaldiopsis tridentata* Dwarf-shrubland (CEGL005094, GNR)

Alliances:

- *Picea mariana* Woodland Alliance (A.3504)
- *Picea rubens* Woodland Alliance (A.546)
- *Pinus (banksiana, resinosa)* Woodland Alliance (A.507)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Dwarf-shrubland Alliance (A.1113)

DISTRIBUTION

Range: This system is found in New England and adjacent Canada west to the Adirondacks and south to northern Pennsylvania.

Divisions: 201:C

Nations: CA, US

Subnations: MA, ME, NB, NH, NS, NY, PA, QC, VT

Map Zones: 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 211F:CC, 211I:CC, M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 48:P, 60:C, 61:C, 63:C, 64:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723034#references

Description Author: S.C. Gawler

Version: 05 Oct 2004

Concept Author: S.C. Gawler and D. Faber-Langendoen

Stakeholders: Canada, East

ClassifResp: East

1165 NORTHERN ROCKY MOUNTAIN FOOTHILL CONIFER WOODED STEPPE (CES306.958)

CLASSIFIERS

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Shallow Soil; Aridic; Short Disturbance Interval; F-Patch/Low Intensity; F-Landscape/Low Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Evergreen sparse tree canopy

National Mapping Codes: EVT 2165; ESLF 5426; ESP 1165

CONCEPT

Summary: This inland Pacific Northwest ecological system occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. It also occurs east across Idaho into the eastern foothills of the Montana Rockies. The system may also occur on the lower treeline slopes of the Wyoming Rockies. These wooded steppes occur at the lower treeline/ecotone between grasslands or shrublands and forests and woodlands, typically on warm, dry, exposed sites too droughty to support a closed tree canopy. This is not a fire-maintained system. The "savanna" character results from a climate-edaphic interaction that results in widely scattered trees over shrubs or grasses, and even in the absence of fire, a "woodland" or "forest" structure will not be obtained. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This system can occur in association with cliff and canyon systems. It generally occurs on glacial till, glacio-fluvial sand and gravel, dune, basaltic rubble, colluvium, to deep loess or volcanic ash-derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. These can also occur on areas of sand dunes, scablands, and pumice where the edaphic conditions limit tree abundance. *Pinus ponderosa* (vars. *ponderosa* and *scopulorum*) and *Pseudotsuga menziesii* are the predominant conifers (not always together); *Pinus flexilis* may be present or common in the tree canopy. In interior British Columbia, *Pseudotsuga menziesii* is the characteristic canopy dominant. In transition areas with big sagebrush steppe systems, *Purshia tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *tridentata*, and *Artemisia tripartita* may be common in fire-protected sites such as rocky areas. Deciduous shrubs, such as *Physocarpus malvaceus*, *Symphoricarpos albus*, or *Spiraea betulifolia*, can be abundant in more northerly sites or more moist climates. Important grass species include *Pseudoroegneria spicata*, *Poa secunda*, *Hesperostipa* spp., *Achnatherum* spp., and *Elymus elymoides*.

Classification Comments: This is not a fire-maintained system; it occurs on sites too droughty to support a closed tree canopy. It does burn with a high-frequency / low-intensity regime, but fire is not carried because of the sparse vegetation of the edaphically constrained sites (rock outcrops, dunes, super-dry, sparse trees over shrubs and sometimes grasses but widely spaced). True "savannas" with grassy understories and high-frequency / low-intensity fires are now placed into Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030). Ponderosa woodlands and "steppes" in eastern Wyoming, eastern and central Montana, including the Missouri River Breaks, are now included in Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650). Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648) and Southern Rocky Mountain Ponderosa Pine Savanna (CES306.649) mostly contain *Pinus ponderosa* var. *scopulorum*, *Pinus ponderosa* var. *ponderosa* (= var. *brachyptera*), and *Pinus arizonica* var. *arizonica* (= *Pinus ponderosa* var. *arizonica*). The FRIS site describes different varieties of *Pinus ponderosa* and associated species. This ecological system of the northern Rockies is primarily *Pinus ponderosa* var. *ponderosa*. Johansen and Latta (2003) have mapped the distribution of two varieties (*Pinus ponderosa* var. *scopulorum* and *Pinus ponderosa* var. *ponderosa*) using mitochondrial DNA. They hybridize along the Continental Divide in Montana backing up the FRIS information.

Similar Ecological Systems:

- Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650)

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting
- Limber Pine: 219 (Eyre 1980) Intersecting
- Ponderosa Pine - Grassland (110) (Shiflet 1994) Intersecting. This SRM type includes edaphically-controlled open ponderosa over sparse grasses, corresponding to this system.
- Ponderosa Pine - Shrubland (109) (Shiflet 1994) Intersecting. This SRM type includes edaphically-controlled open ponderosa over shrubs, corresponding to this system.

DESCRIPTION

Dynamics: Periodic drought that limits tree establishment is the driving factor in this system. The concept is that of the climate-edaphic interaction that results in widely scattered trees over "shrub-steppe" of sage, bitterbrush, or sparsely distributed grasses. Tree growth is likely episodic, with regeneration episodes in years with available moisture. Tree density is limited in some areas by available growing space due to rocky conditions of the site. The tree canopy in this system will never reach woodland density or close due to the interaction of climate and edaphic factors, even in the absence of fire. This system burns occasionally, but the

vegetation is sparse enough that fires are typically not carried through the stand. Fire frequency is speculated to be 30-50 years. It can also occur on areas of sand dunes, scablands, and pumice where the edaphic conditions limit tree abundance. *Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States.

MEMBERSHIP

Associations:

- *Pinus ponderosa* - *Pseudotsuga menziesii* / *Purshia tridentata* Woodland (CEGL000214, G3)
- *Pinus ponderosa* / *Artemisia tridentata* - *Purshia tridentata* Woodland (CEGL000178, G3)
- *Pinus ponderosa* / *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Woodland (CEGL000179, G1)
- *Pinus ponderosa* / *Hesperostipa comata* Woodland (CEGL000879, G1)
- *Pinus ponderosa* / *Pseudoroegneria spicata* Woodland (CEGL000865, G4)
- *Pinus ponderosa* / *Purshia tridentata* / *Achnatherum hymenoides* Woodland (CEGL000196, G1)
- *Pinus ponderosa* / *Purshia tridentata* Woodland (CEGL000867, G3G5)
- *Pinus ponderosa* Scree Woodland (CEGL000878, G4)
- *Pseudotsuga menziesii* / *Purshia tridentata* Woodland (CEGL000909, G3Q)

Alliances:

- *Pinus ponderosa* - *Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

DISTRIBUTION

Range: This system is found in the Fraser River drainage of southern British Columbia south along the Cascades into the Modoc Plateau of California, and the northern Rocky Mountains of Washington and Oregon. In the northeastern part of its range, it extends across the northern Rocky Mountains west of the Continental Divide into northwestern Montana and south to the Snake River Plain in Idaho. In Oregon, it is most common in south-central Oregon, in lands managed by the Lakeview District of the BLM, and by the adjacent Fremont and Deschutes national forests. It also occurs on the marginal lands coming south out of the Blue Mountains, on the edge of the northern Basin and Range.

Divisions: 204:C; 304:C; 306:C

Nations: CA, US

Subnations: BC, ID, MT, OR, WA, WY

Map Zones: 1:C, 7:C, 8:C, 9:C, 10:C, 12:?, 18:P, 19:C, 20:?, 21:C

USFS Ecomap Regions: 331A:CP, 342B:CC, 342C:CC, 342D:CC, 342H:CP, 342I:CC, 342J:C?, M331A:PP, M332A:PP, M332B:PP, M332D:PP, M332E:PP, M332F:PP, M332G:PP, M333A:PP

TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 26:C, 68:C

SOURCES

References: Camp et al. 1997, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Everett et al. 2000, Franklin and Dyrness 1973, Johansen and Latta 2003, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Pfister et al. 1977, Reid et al. 1999, USFS 1993, Western Ecology Working Group n.d., Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.786411#references

Description Author: M.S. Reid and R. Crawford

Version: 29 Jan 2007

Concept Author: Western Ecology Group

Stakeholders: Canada, West

ClassifResp: West

1505 OUACHITA NOVACULITE GLADE AND WOODLAND (CES202.314)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Ozark/Ouachita; Rock Outcrops/Barrens/Glades

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2505; ESLF 5427; ESP 1505

CONCEPT

Summary: This system represents a mosaic of glades and woodlands found on novaculite geology in the central Ouachita Mountains of western Arkansas and adjacent Oklahoma. Novaculite is a weakly metamorphosed rock of sedimentary origin that is primarily composed of microcrystalline quartz and chalcedony. Examples of this system generally occupy ridgetops at 450-640 m (1476-2100 feet) elevation. They are a mosaic of small woodlands scattered on ridges and upper slopes with outcrops and patches of talus scattered throughout. Some woodland or forest patches may appear as almost linear strips interspersed with grassy openings. Wooded patches have a variable, often patchy, structure with some areas of dense canopy interspersed with more open canopies and open grassy patches. In general, the grassy openings occur on shallow soils with exposed bedrock, while the woodlands occur on somewhat deeper soils. In all cases, these are fairly extreme growing conditions due to droughty, rocky soils.

Similar Ecological Systems:

- Ozark-Ouachita Dry Oak Woodland (CES202.707)
- Ozark-Ouachita Dry-Mesic Oak Forest (CES202.708)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)

DESCRIPTION

Environment: The novaculite formation is of Devonian and Mississippian age and consists of novaculite interbedded with some shale, ranging in thickness from about 250 to 900 feet (Arkansas Geological Commission 2001, Babcock et al. 2001).

Vegetation: Several distinct communities may be recognized at a local scale within this system. Open habitats may be characterized by sparse tree cover of dwarfed (1-3 m) *Quercus marilandica* var. *ashei*, which can sometimes occur in clumps. Herbaceous cover is 100%, except where bare rock is exposed or on talus. Lichens cover 40-70% of the exposed rock surface. Open community components of this system grade into more densely wooded types, with a variable structure, dominated by *Quercus stellata*, *Ulmus alata*, *Quercus marilandica*, *Juniperus virginiana* var. *virginiana*, *Pinus echinata*, and *Carya texana*. More submesic areas have *Quercus rubra*-dominated woodlands with *Carya texana* that may approach a forest physiognomy.

Dynamics: The structure of this system is thought to be controlled by a combination of periodic fire and severe drought. Many existing overstory trees have multiple stems indicating past die-back due to severe drought of decades-long intervals. Summer leaf loss is common and snags extant. Minor droughts cause extensive die-backs in smaller stems and appear to maintain shrubby conditions in places and limit the abundance and distribution of shortleaf pine. Historically, fire is thought to have played a more important role than today in maintaining the open canopy. The effects of fire suppression are unknown but have probably allowed these woodlands to increase in density.

MEMBERSHIP

Associations:

- *Quercus marilandica* var. *ashei* / *Schizachyrium scoparium* - *Andropogon gerardii* - *Monarda fistulosa* var. *stipitatoglandulosa* - *Streptanthus maculatus* / Lichens Novaculite Glade Wooded Herbaceous Vegetation (CEGL007825, G3)
- *Quercus rubra* / *Ostrya virginiana* / *Ptelea trifoliata* - *Ribes curvatum* / *Helianthus divaricatus* Woodland (CEGL007828, G3)
- *Quercus stellata* - *Ulmus alata* - (*Juniperus virginiana* var. *virginiana*) / *Sporobolus clandestinus* - *Monarda fistulosa* var. *stipitatoglandulosa* Woodland (CEGL003756, G2)
- *Toxicodendron radicans* / (*Polymnia cossatotensis*) Sparse Vegetation (CEGL003889, G1)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

DISTRIBUTION

Range: This system is endemic to the central Ouachita Mountains in Arkansas and adjacent Oklahoma.

Divisions: 202:C

Nations: US

Subnations: AR, OK

Map Zones: 44:C

USFS Ecomap Regions: M231A:CC
TNC Ecoregions: 39:C

SOURCES

References: Arkansas Geological Commission 2001, Babcock et al. 2001, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723182#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 14 Dec 2006

Concept Author: T. Foti and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1517 PALEOZOIC PLATEAU BLUFF AND TALUS (CES202.704)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous; Herbaceous; Unglaciated; Bluff

National Mapping Codes: EVT 2517; ESLF 5430; ESP 1517

CONCEPT

Summary: This system is found in the driftless regions of southeastern Minnesota, southwestern Wisconsin, and northern Iowa and Illinois. This region was not glaciated like the surrounding areas and thus is predominated by rolling hills and bluff outcrops. This system is found primarily on bluffs and dry upper slopes along the Upper Mississippi River, although it can range into bordering regions such as the Baraboo Hills in Wisconsin. This system contains a mosaic of woodlands, savannas, prairies and sparsely vegetated limestone, dolomite, and/or sandstone outcrops, with occasional talus, especially algific talus. Soils range from thin to moderately deep and are moderately to excessively well-drained with a high mineral content. Woodlands consist of primarily a mixture of oak species such as *Quercus macrocarpa*, *Quercus rubra*, *Quercus muehlenbergii*, and *Quercus alba*. *Acer saccharum*, *Betula alleghaniensis*, and conifer species such as *Pinus* spp. and *Tsuga canadensis* may occur on more mesic and protected areas within this system. Prairie openings (also called "goat prairies") contain *Schizachyrium scoparium* and *Bouteloua curtipendula* with scattered *Juniperus virginiana*. Historically, fire was the most important dynamic maintaining these systems, however, fire suppression within the region has allowed more canopy cover and thus very few prairie openings remain. Algific talus harbors a number of unusual Pleistocene relict species, including plants and snails.

Classification Comments: This system will need review from Minnesota, Wisconsin and Iowa to make sure it is correctly characterized.

Similar Ecological Systems:

- Central Interior Calcareous Cliff and Talus (CES202.690)

MEMBERSHIP

Associations:

- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* - (*Chrysosplenium iowense*, *Aconitum noveboracense*) Herbaceous Vegetation (CEGL002387, G2)
- Moderate Cliff Sparse Vegetation (CEGL002293, G3?)
- *Pinus strobus* - (*Pinus resinosa*) Driftless Bluff Forest (CEGL002378, G2G3)
- *Pinus strobus* - *Abies balsamea* - *Betula alleghaniensis* Driftless Forest (CEGL002111, G2?)
- *Quercus muehlenbergii* - *Quercus* (*alba*, *velutina*) - (*Juniperus virginiana* var. *virginiana*) Bluff Woodland (CEGL002144, G2G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Muhlenbergia cuspidata* - *Symphyotrichum sericeum* Alkaline Herbaceous Vegetation (CEGL002403, G2)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Bedrock Bluff Herbaceous Vegetation (CEGL002245, G3G4)
- *Tsuga canadensis* - *Acer saccharum* / (*Hepatica nobilis* var. *acuta*) Driftless Forest (CEGL002597, G2)

Alliances:

- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* Herbaceous Alliance (A.1598)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Pinus strobus* - (*Pinus resinosa*) - *Populus tremuloides* Forest Alliance (A.400)
- *Pinus strobus* Forest Alliance (A.128)
- *Quercus muehlenbergii* Woodland Alliance (A.621)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Tsuga canadensis* - *Betula alleghaniensis* Forest Alliance (A.412)

DISTRIBUTION

Range: This system is found within the Paleozoic Plateau (aka Driftless Region) of southeastern Minnesota, southwestern Wisconsin and northern Iowa and Illinois.

Divisions: 202:C

Nations: US

Subnations: IA, IL, MN, WI

Map Zones: 42:C, 49:C, 50:C

USFS Ecomap Regions: 222L:CC

TNC Ecoregions: 46:C

SOURCES

References: Albert 1995b, Comer et al. 2003, Dunevitz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722956#references

Description Author: S. Menard

Version: 05 Mar 2003

Concept Author: S. Menard

Stakeholders: Midwest

ClassifResp: Midwest

PANHANDLE FLORIDA LIMESTONE GLADE (CES203.534)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5422

CONCEPT

Summary: This small-patch limestone glade system is endemic to the Panhandle of Florida (primarily Jackson County). It includes a range of limestone outcrops on hillsides and hill crests where soils are either non-existent or only shallowly present (FNAI 1990).

Related Concepts:

- Upland Glade (FNAI 1990) Equivalent

MEMBERSHIP

Associations:

- *Aquilegia canadensis* - *Asplenium heterochroum* - *Polymnia laevigata* - *Urtica chamaedryoides* Herbaceous Vegetation (CEGL004268, G1?)
- *Schoenus nigricans* - *Hedyotis nigricans* Wooded Herbaceous Vegetation (CEGL004081, G1)

Alliances:

- (*Acer leucoderme*, *Fraxinus americana*) / *Schoenus nigricans* Wooded Herbaceous Alliance (A.1918)
- *Aquilegia canadensis* - *Asplenium (heterochroum, X heteroresiliens)* Herbaceous Alliance (A.1615)

DISTRIBUTION

Range: Endemic to the Panhandle of Florida (primarily Jackson County).

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:?, 99:C

USFS Ecomap Regions: 232B:CC

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, FNAI 1990, Hardin pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723068#references

Description Author: R. Evans

Version: 06 Feb 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH-CENTRAL SALINE GLADE (CES203.291)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Very Shallow Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5418

CONCEPT

Summary: This system occurs in portions of the Coastal Plain west of the Mississippi River on soils with high saline content, which in the most extreme examples are generally not conducive to woody plant growth. Thus, the vegetation forms a mosaic primarily consisting of open herbaceous or shrubby plant communities. This type is most common, and best documented in Arkansas and western Louisiana, but also occurs in eastern Texas. At least one high-ranked plant species, *Geocarpon minimum*, occurs in this system. In Arkansas, the forested examples of this system are called "Alkali Post Oak Flat," and the herbaceous examples are called "Alkali Wet Prairie" (Arkansas Multi-Agency Wetland Planning Team 2001).

DESCRIPTION

Environment: This system occurs on soils with high saline content, which in the most extreme examples are generally not conducive to woody plant growth. The soils on which this system is found have high pH and high levels of sodium or magnesium salts in or near the surface layer. They typically have very poor drainage and a shallow hardpan. The combination of impeded drainage and unusual soil chemistry restricts the potential plant communities and provides habitat for certain rare species. The forested community apparently occurs on soils with deeper hardpans than the prairie communities. Most sites with alkali soils are believed to be former (Pleistocene) lakebeds (Arkansas Multi-Agency Wetland Planning Team 2001).

Vegetation: Some characteristic plants in examples of this system include (in stands with trees) *Quercus stellata*, *Quercus marilandica*, *Quercus similis*, as well as shrubs *Baccharis halimifolia*, *Crataegus berberifolia*, *Iva angustifolia*; grasses and graminoids include *Aristida dichotoma*, *Aristida longispica*, *Aristida oligantha*, *Aristida purpurascens*, *Distichlis spicata*, *Eleocharis* spp., *Fimbristylis* spp., *Juncus* spp., *Muhlenbergia capillaris*, *Schoenoplectus* spp., *Schizachyrium scoparium*, *Tridens strictus*, and forbs *Krigia occidentalis*, *Houstonia rosea*, *Ambrosia artemisiifolia*, *Diodia teres*, *Euthamia leptoccephala*, and *Bigelovia nuttallii*.

MEMBERSHIP

Associations:

- *Aristida longispica* - *Schizachyrium scoparium* - *Diodia teres* Saline Herbaceous Vegetation (CEGL008419, G1G2)
- *Baccharis halimifolia* - *Crataegus berberifolia* / *Eleocharis* sp. - *Tridens strictus* - *Euthamia leptoccephala* Shrubland (CEGL003904, G1)
- *Bigelovia nuttallii* - *Aristida dichotoma* - *Houstonia rosea* / *Cladonia* spp. Herbaceous Vegetation (CEGL004274, G1)
- *Eleocharis* sp. - *Iva angustifolia* - *Distichlis spicata* Herbaceous Vegetation (CEGL004171, G1)
- *Eleocharis* spp. - *Schoenoplectus* spp. - *Fimbristylis* spp. - *Juncus* spp. Southeastern Coastal Plain Inland Salt Flat Sparse Vegetation (CEGL007803, G1?)
- *Quercus stellata* - *Quercus similis* - *Quercus marilandica* Saline Woodland (CEGL008418, G2G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Baccharis halimifolia* Saturated Shrubland Alliance (A.1015)
- *Bigelovia nuttallii* Herbaceous Alliance (A.1617)
- *Eleocharis* sp. - *Iva angustifolia* Saturated Herbaceous Alliance (A.1459)
- *Eleocharis* spp. - *Schoenoplectus* spp. - *Fimbristylis* spp. - *Juncus* spp. Temporarily Flooded Sparsely Vegetated Alliance (A.1924)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

DISTRIBUTION

Range: This system is found in isolated areas of the Upper West and West Gulf Coastal Plain ecoregions, and along the boundary of the Gulf Coast Prairies and Marshes. It is also known from the Mississippi River Alluvial Plain (T. Foti pers. comm. 2005). It does not occur in Oklahoma.

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 36:?, 37:C, 44:C, 45:C

USFS Ecomap Regions: 231E:CC, 231G:CC, 234D:CC, 234E:CC

TNC Ecoregions: 31:C, 39:C, 40:C, 41:C, 42:C

SOURCES

References: Arkansas Multi-Agency Wetland Planning Team 2001, Comer et al. 2003, Foti pers. comm., Pittman 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723197#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Jun 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN AND CENTRAL APPALACHIAN MAFIC GLADE AND BARRENS (CES202.348)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Shallow Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5415

CONCEPT

Summary: This southern and central Appalachian system consists of vegetation associated with shallow soils over predominantly mafic bedrock, usually with significant areas of rock outcrop. Bedrock includes a variety of igneous and metamorphic rock types such as greenstone and amphibolite. These areas support a patchy mosaic of open woodland and grassy herbaceous vegetation sometimes with a predominant woody short-shrub community present.

Classification Comments: These glades and barrens are intermediate between other rock outcrop and forest systems, with less dense vegetation than the closed forests supported by the region's climate but with more vegetation than bare rock cover. They may grade very gradually into both kinds of systems. Systems of similar physiognomy and setting but on acidic substrates are generally included in Central Appalachian Pine-Oak Rocky Woodland (CES202.600).

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Glade and Barrens (CES202.328)

DESCRIPTION

Environment: Occurs on upper to mid slopes, usually on gentle to moderate slopes but occasionally steeper. The ground is mostly shallow soil over bedrock, usually with significant areas of rock outcrop. The rock usually has few fractures but may have a pitted or irregular surface. This rock structure supports more extensive and deeper soil development than in Southern Appalachian Granitic Dome (CES202.297), but has few of the crevices and deeper rooting sites available in Southern Appalachian Rocky Summit (CES202.327). Micro-scale soil depth and presence of seepage are important factors in determining the vegetation patterns. Shallow soil, unable to support a closed tree canopy, separates this system from forest systems. Bedrock includes a variety of igneous and metamorphic rock types. Some examples are on mafic substrates such as amphibolite, some are on felsic rock such as granitic gneiss but have flora that suggests a basic influence, and a few occur on felsic rocks and are clearly acidic. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system. Elevation may also be an important factor causing variation.

Vegetation: Vegetation is a fine mosaic of different physiognomies, with open woodland and grassy herbaceous vegetation or short shrubs predominating. Some instances may have closed canopies of small trees or large shrubs, but no examples have large canopy trees with a closed canopy. Bare rock outcrops are usually present in a minority of the area. The canopy species are species tolerant of dry, shallow soils, most commonly *Quercus prinus*, *Pinus* spp., and *Juniperus virginiana*. Basic examples may also have *Carya glabra*, *Fraxinus americana*, and other species abundant. Shrubs may be dense, with species determined by soil chemistry. The herb layer is usually fairly dense and dominated by grasses, both in treeless areas and beneath open canopy. An abundant forb component is also usually present, especially in the more basic examples. The forbs include species characteristic of other rock outcrops and grassland species, with a smaller number of forest species present.

Dynamics: The dynamics of this system are not well known. The occurrence of the system appears to be primarily determined by site physical properties, with physical and chemical properties determining vegetational variation. Fire may be an important influence on vegetation, and may in the long run be important for keeping the vegetation structure open, though the patchy distribution of vegetation might limit fire intensity. Periodic drought and wind storms may also be an important factor limiting canopy density and stature. The shallow soil would make these sites particularly prone to all three. These glades do not appear to be undergoing the kind of cyclic succession that has been described for granitic domes, but some balance of soil accumulation and destruction may be occurring on a longer term or coarser scale. It is possible that the slightly irregular curved surface of some examples represents a late stage in the weathering of old exfoliation surfaces that once supported granitic domes, but most known examples are not spatially associated with existing granitic domes.

MEMBERSHIP

Associations:

- *Carya (glabra, alba) - Fraxinus americana - (Juniperus virginiana var. virginiana)* Woodland (CEGL003752, G2)
- *Carya glabra - Fraxinus americana - Quercus prinus / Ostrya virginiana / Philadelphus hirsutus* Woodland (CEGL004995, G2)
- *Diervilla lonicera - Solidago simplex var. randii - Deschampsia flexuosa - Hylotelephium telephoides - Saxifraga michauxii*

- Herbaceous Vegetation (CEGL008536, G1)
- *Fraxinus americana* - *Carya glabra* / *Muhlenbergia sobolifera* - *Helianthus divaricatus* - *Solidago ulmifolia* Woodland (CEGL003683, G2)
 - *Fraxinus americana* / *Physocarpus opulifolius* / *Carex pensylvanica* - *Allium cernuum* - (*Phacelia dubia*) Wooded Herbaceous Vegetation (CEGL008529, G2)
 - *Kalmia latifolia* / *Schizachyrium scoparium* / *Cladonia* spp. Shrub Herbaceous Vegetation (CEGL004238, G1)
 - *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland (CEGL008508, G1?)
 - *Quercus stellata* / *Schizachyrium scoparium* - *Sorghastrum nutans* - *Pycnanthemum tenuifolium* - *Packera paupercula* Wooded Herbaceous Vegetation (CEGL006215, G1)
 - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Aletris farinosa* - *Packera paupercula* Herbaceous Vegetation (CEGL004999, G1)
 - *Selaginella rupestris* - *Croton willdenowii* - *Cheilanthes tomentosa* - (*Allium cuthbertii*) Herbaceous Vegetation (CEGL004992, G1)
 - *Selaginella rupestris* - *Schizachyrium scoparium* - *Hylotelephium telephioides* - *Allium cernuum* Herbaceous Vegetation (CEGL004991, G2)

Alliances:

- (*Fraxinus americana*, *Juniperus virginiana*) / *Carex pensylvanica* - *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.3014)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- *Saxifraga michauxii* Herbaceous Alliance (A.1621)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Schizachyrium scoparium* Shrub Herbaceous Alliance (A.1520)
- *Selaginella (tortipila, rupestris)* Herbaceous Alliance (A.1985)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering a few acres.

Size: Most examples naturally cover a few acres, with a few examples up to 10 or more acres.

Adjacent Ecological Systems:

- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Appalachian Rocky Summit (CES202.327)

Adjacent Ecological System Comments: This system is surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Appalachian Oak Forest (CES202.886). It is rarely associated with Southern Appalachian Granitic Dome (CES202.297) or Southern Appalachian Rocky Summit (CES202.327).

DISTRIBUTION

Range: This system occurs scattered in clusters in the Southern Blue Ridge and adjacent portions of the upper Piedmont and central Appalachians.

Divisions: 202:C

Nations: US

Subnations: GA?, MD, NC, PA?, SC?, TN, VA

Map Zones: 54:C, 57:C, 59:C, 61:C

USFS Ecomap Regions: 221D:CC, M221D:CC

TNC Ecoregions: 51:C, 52:C, 59:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723162#references

Description Author: M. Schafale, R. Evans, M. Pyne, S.C. Gawler

Version: 11 Oct 2004

Concept Author: M. Schafale, R. Evans, M. Pyne, S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: Southeast

1118 SOUTHERN CALIFORNIA OAK WOODLAND AND SAVANNA (CES206.938)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Mediterranean [Mediterranean Desertic-Oceanic]; Broad-Leaved Evergreen Tree; Evergreen Sclerophyllous Shrub; *Quercus agrifolia*, *Q. wislizeni*, *Q. engelmannii*

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Sideslope; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2118; ESLF 5407; ESP 1118

CONCEPT

Summary: These oak woodlands and savannas occur in coastal plains, intermountain valleys, and low mountains (such as the San Jacinto Mountains) from Ventura County, California, south into Baja California, Mexico. *Quercus agrifolia*, *Quercus wislizeni*, *Quercus engelmannii*, *Quercus kelloggii*, and/or *Juglans californica* dominate a mixed closed or open canopy. Southern chaparral species such as *Adenostoma fasciculatum*, *Artemisia californica*, *Rhus integrifolia*, *Rhus ovata*, *Rhus trilobata*, *Ceanothus* spp., *Ribes* spp., and *Arctostaphylos* spp. are also characteristic. These woodlands may occur as remnant patches on offshore islands, where they include endemic species such as *Quercus tomentella* and *Lyonothamnus floribundus*. The California central coast region may have open stands of just *Juniperus californica*, with a grassy understory. These stands belong here due to proximity to other oak stands or chaparral, and due to the heavy native or non-native grass cover. This is distinguished from Great Basin pinyon-juniper stands, which have little herbaceous understory, and *Pinus monophylla* mixed with *Juniperus californica*. These stands of only juniper are caused by repeated removal of the oaks by humans and feral pig populations. Variable canopy densities in existing occurrences are likely due to variation in soil moisture regime, natural patch dynamics of fire, and land use (fire suppression, livestock grazing, herbivory, etc.). Most of these woodlands and savannas have been heavily altered through urban and agricultural development throughout southern California.

Related Concepts:

- California Coast Live Oak: 255 (Eyre 1980) Intersecting
- Coast Live Oak Woodland (202) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Quercus engelmannii* Woodland [Placeholder] (CEGL003090, G2?)
- *Quercus tomentella* Forest (CEGL003098, G2?)

Alliances:

- *Quercus engelmannii* Woodland Alliance (A.590)
- *Quercus tomentella* Forest Alliance (A.86)

DISTRIBUTION

Range: This system occurs in coastal plains and intermountain valleys from Ventura County, California, south into Baja California, Mexico.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C, 5:C

USFS Ecomap Regions: 261B:CC, 262A:CC, 322A:PP, 322C:P?

TNC Ecoregions: 15:C, 16:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722743#references

Description Author: P. Comer, T. Keeler-Wolf, mod. G. Kittel, M.S. Reid

Version: 16 Jan 2009

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West
ClassifResp: West

SOUTHERN PIEDMONT GLADE AND BARRENS (CES202.328)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5412

CONCEPT

Summary: This system of the southern Piedmont consists of gently to moderately sloping complexes of mostly shallow soil over bedrock, usually with significant areas of exposed rock evident. Bedrock potentially includes a variety of igneous and metamorphic rock types, including shale. Examples support open vegetation of patchy, mixed physiognomy with a significant woody component. Shallow soils which impede tree growth, help distinguish this system from forest systems of the Piedmont. This system is structurally intermediate between other rock outcrop systems and forest systems.

Classification Comments: The southern Piedmont as defined here consists of TNC Ecoregion 52 (ECOMAP 231A, EPA 45), but within this region, this system is not expected to occur north of about the James River in Virginia. This system is intermediate between other rock outcrops and forest systems, with less dense vegetation than the closed forests supported by the region's climate but with more vegetation than bare rock cover. They may grade very gradually into both kinds of systems. They are analogous to Southern and Central Appalachian Mafic Glade and Barrens (CES202.348), but are distinguished by their climate, flora, and landscape setting. Southern and Central Appalachian Mafic Glade and Barrens (CES202.348) occurs in the hilly upper Piedmont, whereas this system is confined to the eastern and central Piedmont.

This system represents a collection of several different kinds of communities related primarily by structure, and could be further subdivided. The rare diabase glades are flat and have a very distinctive flora. The examples on meta-mudstone are less well known. Other kinds may occur.

Similar Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

DESCRIPTION

Environment: This system occurs on upper to midslopes, usually on moderate slopes but occasionally flat. The ground is mostly shallow soil over bedrock, usually with significant areas of rock outcrop. The rock usually has few fractures but may have a pitted or irregular surface. This rock structure supports more extensive and deeper soil development than in Southern Piedmont Granite Flatrock and Outcrop (CES202.329) or Southern Piedmont Cliff (CES202.386), but has few of the crevices and deeper rooting sites available in Southern Appalachian Rocky Summit (CES202.327). Micro-scale soil depth and presence of seepage are important factors in determining the vegetation patterns. Shallow soil, unable to support a closed tree canopy, separates this system from forest systems. Bedrock potentially includes a variety of igneous and metamorphic rock types. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system.

Vegetation: Vegetation is a fine mosaic of different physiognomies, with open woodland and grassy herbaceous vegetation or short shrubs predominating. Bare rock outcrops are usually present in a minority of the area. The canopy species are species tolerant of dry, shallow soils, most commonly *Juniperus virginiana* and various oaks and pines, but also including *Fraxinus americana*, *Ulmus alata*, and *Cercis canadensis* on basic examples. Shrubs may be dense, with species determined by soil chemistry. The herb layer is usually fairly dense and may be dominated by grasses or by a mix of grasses and forbs, both in treeless areas and beneath open canopy. The forbs include species characteristic of other rock outcrops and grassland species, with a smaller number of forest species present. Plant species richness may be fairly high in communities of this system.

Dynamics: The dynamics of this system are not well known. The occurrence of the system appears to be primarily determined by site physical properties, with physical and chemical properties determining vegetational variation. Fire may be an important influence on vegetation, and may in the long run be important for keeping the vegetation structure open, though the patchy distribution of vegetation might limit fire intensity. It is possible that fire would have allowed glade structure and vegetation to extend onto slightly deeper soils and therefore allowed for more extensive glades. Periodic drought and wind storms may also be an important factor limiting canopy density and stature. The shallow soil would make these sites particularly prone to all three. These glades do not appear to be undergoing the kind of cyclic succession that has been described for granitic flatrocks, but some balance of soil accumulation and destruction may be occurring on a longer term or coarser scale.

MEMBERSHIP

Associations:

- *Fraxinus americana* - *Carya glabra* / *Symphoricarpos orbiculatus* - *Rhus aromatica* / *Piptochaetium avenaceum* Woodland

(CEGL003684, G2)

- *Juniperus virginiana* - *Celtis tenuifolia* - *Quercus (prinus, stellata)* / *Sporobolus compositus* - *Talinum teretifolium* - *Tragia urticifolia* Wooded Herbaceous Vegetation (CEGL008485, G1)
- *Juniperus virginiana* var. *virginiana* - *Celtis tenuifolia* - *Cercis canadensis* / *Sporobolus clandestinus* - *Danthonia sericea* Woodland (CEGL008499, G2G3Q)
- *Juniperus virginiana* var. *virginiana* - *Ulmus alata* / *Schizachyrium scoparium* Woodland (CEGL004443, G2?)
- *Philadelphus hirsutus* - *Ptelea trifoliata* var. *mollis* / *Schizachyrium scoparium* - *Pycnanthemum curvipes* / *Thuidium delicatulum* Shrubland (CEGL004243, G2)
- *Pinus echinata* - *Pinus virginiana* / *Rhododendron minus* - *Kalmia latifolia* Woodland (CEGL003563, G1)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Andropogon gyrans* - *Chrysopsis mariana* Woodland (CEGL004447, G1?)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Pinus echinata* Woodland Alliance (A.515)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering no more than a couple of acres.

Size: Most examples naturally cover a few acres at most, with some less than one acre.

Adjacent Ecological Systems:

- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Piedmont Dry Oak-(Pine) Forest (CES202.339).

DISTRIBUTION

Range: This system is found scattered in clusters in the southern Piedmont, possibly extending north to about the James River in Virginia. However, the overall distribution in this region is not well-known.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA?

Map Zones: 54:C, 59:C, 61:P

USFS Ecomap Regions: 231A:CC, 231I:CC

TNC Ecoregions: 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723175#references

Description Author: M. Schafale and R. Evans

Version: 12 Dec 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN RIDGE AND VALLEY CALCAREOUS GLADE AND WOODLAND (CES202.024)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

National Mapping Codes: ESLF 5464

CONCEPT

Summary: This system consists of open glades and surrounding woodlands on shallow, high pH, rich soils of the Ridge and Valley region from southwestern Virginia southward. These glades occur in broad valley bottoms, rolling basins, and adjacent slopes where soils are shallow over flat-lying limestone strata. The flat to rolling terrain and locally xeric soils may have been especially susceptible to periodic fires that helped maintain the prairie-like openings and savanna-like woodlands. Today, much of the system is currently somewhat more closed and brushy, suggesting fire suppression. *Quercus muehlenbergii* (chinquapin oak) is typical where there is canopy.

Classification Comments: This system formerly embodied a narrower concept, being restricted to glades of "valley bottoms," and thereby, at least by implication, not those of slopes. The current concept includes glades in the southern Ridge and Valley on a variety of landforms and slope positions, as they are all sufficiently similar in floristic components and ecological processes to be grouped together. These processes and factors include erosional processes, zonal vegetation patterns, and general ecological dynamics.

Similar Ecological Systems:

- Central Appalachian Alkaline Glade and Woodland (CES202.602)--of central Appalachians, Virginia and north.
- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is related, generally to the west in the Interior Low Plateau.
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--is a more closed-canopy system with a similar range.

Related Concepts:

- Limestone and Dolomite Barrens (Fleming et al. 2005) Undetermined

DESCRIPTION

Environment: Examples occur on shallow, high pH soils, in broad valley bottoms, rolling basins, and adjacent slopes over limestone strata.

Vegetation: The vegetation of typical examples could range from open woodlands of *Quercus muehlenbergii* and *Juniperus virginiana*, with interspersed grasslands dominated by perennial *Schizachyrium scoparium*, to patches dominated by annual grasses such as varieties of *Sporobolus vaginiflorus* (e.g., var. *ozarkanus*, var. *vaginiflorus*). Some other trees that may occur in stands include *Quercus falcata*, *Quercus shumardii*, *Quercus stellata*, as well as the understory woody plants *Cercis canadensis*, *Salix humilis*, and *Viburnum rufidulum*. Some characteristic herbs include *Eryngium yuccifolium*, *Manfreda virginica*, and *Hypericum dolabriforme*.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Bouteloua curtipendula* - *Echinacea simulata* Coosa Valley Barren Herbaceous Vegetation (CEGL004045, G1)
- *Fraxinus americana* - *Carya ovata* / *Frangula caroliniana* / *Helianthus hirsutus* Woodland (CEGL008458, G1?)
- *Quercus muehlenbergii* - *Juniperus virginiana* / *Schizachyrium scoparium* - *Manfreda virginica* Wooded Herbaceous Vegetation (CEGL005131, G2G3)
- *Quercus muehlenbergii* - *Quercus (falcata, shumardii, stellata)* / *Cercis canadensis* / *Viburnum rufidulum* Forest (CEGL007699, G3)
- *Quercus muehlenbergii* / *Salix humilis* / *Eryngium yuccifolium* Woodland (CEGL006239, G1Q)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)
- *Sporobolus vaginiflorus* (var. *ozarkanus*, var. *vaginiflorus*) - *Hypericum dolabriforme* Herbaceous Vegetation (CEGL004339, G2G3)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus muehlenbergii* Woodland Alliance (A.621)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

DISTRIBUTION

Range: This system occurs from southwestern Virginia (roughly Roanoke) south through the southern Ridge and Valley into Georgia.

Divisions: 202:C

Nations: US

Subnations: GA, TN, VA

Map Zones: 48:C, 53:C, 57:C, 61:?

USFS Ecomap Regions: 221A:CC, 221B:CC, 221J:CC, 231C:CC, 231D:CC, M221A:CC

TNC Ecoregions: 50:C, 59:?

SOURCES

References: Comer et al. 2003, Keys et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722681#references

Description Author: M. Pyne, G. Fleming, R. Evans, mod. S.C. Gawler

Version: 05 May 2008

Concept Author: M. Pyne, G. Fleming, R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1119 SOUTHERN ROCKY MOUNTAIN JUNIPER WOODLAND AND SAVANNA (CES306.834)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Woody-Herbaceous; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Needle-Leaved Tree; Graminoid; Juniperus monosperma and grasses

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Lowland [Lowland]; Temperate [Temperate Continental]; Unglaciated; Intermediate Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Evergreen sparse tree canopy

National Mapping Codes: EVT 2119; ESLF 5408; ESP 1119

CONCEPT

Summary: This ecological system occupies the lower and warmest elevations, growing from 1370 to 1830 m in a semi-arid climate, primarily along the east and south slopes of the southern Rockies and Arizona-New Mexico mountains. It is best represented just below the lower elevational range of ponderosa pine and often intermingles with grasslands and shrublands. This system is best described as a savanna that has widely spaced, mature (>150 years old) juniper trees and occasionally *Pinus edulis*. *Juniperus monosperma* and *Juniperus scopulorum* (at higher elevations) are the dominant tall shrubs or short trees. These savannas may have inclusions of more dense juniper woodlands and have expanded into adjacent grasslands during the last century. Graminoid species are similar to those found in Western Great Plains Shortgrass Prairie (CES303.672), with *Bouteloua gracilis* and *Pleuraphis jamesii* being most common. In addition, succulents such as species of *Yucca* and *Opuntia* are typically present.

Similar Ecological Systems:

- Western Great Plains Shortgrass Prairie (CES303.672)

Related Concepts:

- Pinyon - Juniper: 239 (Eyre 1980) Intersecting
- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Juniperus monosperma* / *Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma* / *Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma* / *Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma* / *Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma* / *Cercocarpus montanus* - *Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma* / *Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma* / *Forestiera pubescens* Woodland (CEGL005371, GNR)
- *Juniperus monosperma* / *Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Juniperus monosperma* / Rockland Woodland (CEGL005369, GNR)
- *Juniperus monosperma* / Sparse Understory Woodland (CEGL005368, GNR)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)

DISTRIBUTION

Range: This system occupies the lower and warmest elevations, growing from 1370 to 1830 m elevation in a semi-arid climate, primarily along the east and south slopes of the southern Rockies and Arizona-New Mexico mountains. This includes the Sacramento Mountains, especially the east side; the west side has Madrean elements but is mostly southern Rocky Mountains.

Divisions: 303:C; 304:C; 306:C

Nations: US

Subnations: CO, NM

Map Zones: 24:P, 25:C, 26:?, 27:C, 28:C, 34:P

USFS Ecomap Regions: 315A:CC, 315B:CC, 315H:CC, 321A:PP, 331B:CC, 331C:C?, 331I:CC, 331J:CC, M313B:CC, M331F:CC, M331G:CC

TNC Ecoregions: 20:C, 21:C, 27:C

SOURCES

References: Anderson et al. 1985, Barnes 1987, Bassett et al. 1987, Blackburn and Tueller 1970, Comer et al. 2003, Commons et al. 1999, Dick-Peddie 1993, Dwyer and Pieper 1967, Eager 1999, Fitzhugh et al. 1987, Francis 1986, Gehlbach 1967, Ladyman and Muldavin 1996, Larson and Moir 1986, Larson and Moir 1987, Mehl 1992, Neely et al. 2001, Rogers 1950, West 1999b, West and Young 2000, Wright and Bailey 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722839#references

Description Author: NatureServe Western Ecology Team

Version: 05 Oct 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1117 SOUTHERN ROCKY MOUNTAIN PONDEROSA PINE SAVANNA (CES306.649)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Shallow Soil; Aridic; Short Disturbance Interval; F-Patch/Low Intensity; F-Landscape/Low Intensity; Needle-Leaved Tree; Graminoid; *Pinus ponderosa* with grassy understory

National Mapping Codes: EVT 2117; ESLF 5406; ESP 1117

CONCEPT

Summary: This ecological system is found predominantly in the Colorado Plateau region, west into scattered locations in the Great Basin, and north along the eastern front of the southern Rocky Mountains into southeastern Wyoming. These savannas occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 1900 m in central and northern Wyoming to 2800 m in the New Mexico mountains to well over 2700 m on the higher plateaus of the Southwest. It is found on rolling plains, plateaus, or dry slopes usually on more southerly aspects. This system is best described as a savanna that has widely spaced (<25% tree canopy cover) (>150 years old) *Pinus ponderosa* (primarily var. *scopulorum* and var. *brachyptera*) as the predominant conifer. It is maintained by a fire regime of frequent, low-intensity surface fires. A healthy occurrence often consists of open and park-like stands dominated by *Pinus ponderosa*. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. Important species include *Festuca arizonica*, *Muhlenbergia virescens*, *Pseudoroegneria spicata*, *Andropogon gerardii*, *Schizachyrium scoparium*, *Festuca idahoensis*, *Piptatherum micranthum*, and *Bouteloua gracilis*. A century of anthropogenic disturbance and fire suppression has resulted in a higher density of *Pinus ponderosa* trees, altering the fire regime and species composition. Presently, many stands contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030) in the eastern Cascades, Okanogan, and northern Rockies regions receives winter and spring rains, and thus has a greater spring "green-up" than the drier woodlands in the central Rockies.

Classification Comments: The Pine Escarpment regions of northwestern and central Nebraska are no longer included within this system; they have been lumped into Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650). Because this ecological system has undergone some important changes in its concept, the original system (CES306.826) was archived, and this new system was created to account for the new concept of ponderosa pine savannas in the southern Rocky Mountains.

The FRIS site describes different varieties of *Pinus ponderosa* and associated species. This system is mostly *Pinus ponderosa* var. *scopulorum* and *Pinus ponderosa* (= var. *brachyptera*). Johansen and Latta (2003) have mapped the distribution of two varieties (vars. *scopulorum* and *ponderosa*) using mitochondrial DNA. Hybridization along the Continental Divide in Montana backs up the FRIS information.

Similar Ecological Systems:

- Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)
- Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650)
- Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Pinus ponderosa* / *Bouteloua gracilis* Woodland (CEGL000848, G4)
- *Pinus ponderosa* / *Cercocarpus montanus* / *Andropogon gerardii* Wooded Herbaceous Vegetation (CEGL000852, G2)
- *Pinus ponderosa* / *Cornus sericea* Woodland (CEGL000853, G3)
- *Pinus ponderosa* / *Crataegus douglasii* Woodland (CEGL000855, G1)
- *Pinus ponderosa* / *Festuca arizonica* Woodland (CEGL000856, G4)
- *Pinus ponderosa* / *Festuca idahoensis* Woodland (CEGL000857, G4)
- *Pinus ponderosa* / *Purshia stansburiana* Woodland (CEGL000854, G3)

Alliances:

- *Pinus ponderosa* Temporarily Flooded Woodland Alliance (A.565)
- *Pinus ponderosa* Wooded Tall Herbaceous Alliance (A.1488)
- *Pinus ponderosa* Woodland Alliance (A.530)

DISTRIBUTION

Range: This ecological system is found predominantly in the Colorado Plateau region, west into scattered locations of the Great Basin, and north along the eastern front of the Rocky Mountains of Colorado and Wyoming. Pine woodlands and savannas of the Black Hills and central Montana are now included in Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna

(CES303.650), as are woodlands and savannas in Nebraska and northeastern Colorado.

Divisions: 303:C; 304:C; 306:C

Nations: US

Subnations: AZ, CO, NM, NV, UT, WY

Map Zones: 15:C, 16:?, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:P, 29:C, 33:P

USFS Ecomap Regions: 315A:CC, 315B:CC, 315H:CP, 321A:PP, 331B:CC, 331G:C?, 331H:CC, 331I:CC, 331J:CP, 342F:CC, M313B:PP, M331B:CC, M331F:CC, M331G:CP, M331I:CC

TNC Ecoregions: 18:C, 19:C, 20:C, 21:C, 26:P

SOURCES

References: Anderson 1999a, Comer et al. 2003, Harrington and Sackett 1992, Johansen and Latta 2003, Jones 1998d, Levad 1998, Mehl 1992, Meidinger and Pojar 1991, Western Ecology Working Group n.d., Winn 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.797989#references

Description Author: M.S. Reid, mod. K.A. Schulz

Version: 01 Oct 2007

Concept Author: M.S. Reid

Stakeholders: Midwest, West

ClassifResp: West

1403 WEST GULF COASTAL PLAIN CATAHOULA BARRENS (CES203.364)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Very Shallow Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2403; ESLF 5419; ESP 1403

CONCEPT

Summary: This system is confined to the Catahoula geologic formation of eastern Texas and western Louisiana. It includes a vegetational mosaic ranging from herbaceous-dominated areas on shallow soil and exposed sandstone to deeper soils with open woodland vegetation. Woodlands include a post oak-dominated overstory grading into longleaf pine-dominated areas. Seasonal droughtiness, shallow soils, aluminum toxicity, and periodic fires are important factors that influence the composition and structure of this system.

Classification Comments: The western boundary of this system is unclear. The Catahoula Formation extends into the Crosstimbers region as well as the Pineywoods, but it is not clear whether these areas should be considered the same system.

Related Concepts:

- Catahoula Barrens (Bridges and Orzell 1989a) Equivalent

DESCRIPTION

Environment: The habitat of this system includes shallow soil and exposed sandstone, which tend to an herbaceous-dominated vegetation expression, as well as zones of deeper soils with open woodland vegetation.

Vegetation: Undisturbed examples are dominated by *Bigelowia nuttallii*, *Aristida longispica*, *Schizachyrium scoparium*, *Croton michauxii* (= *Crotonopsis linearis*), and *Sporobolus silveanus* (Marietta and Nixon 1984).

Dynamics: Seasonal droughtiness, shallow soils, aluminum toxicity, and periodic fires are important factors that influence the composition and structure of this system.

MEMBERSHIP

Associations:

- (*Pinus palustris*) / *Schizachyrium scoparium* - *Bigelowia nuttallii* / *Cladonia* spp. Herbaceous Vegetation (CEGL003600, G1G2)
- *Bigelowia nuttallii* - *Krameria lanceolata* - *Aristida dichotoma* - *Sporobolus silveanus* Herbaceous Vegetation (CEGL002276, G1)
- *Quercus stellata* - *Carya texana* - (*Pinus palustris*) / *Chasmanthium sessiliflorum* - *Ranunculus fascicularis* Woodland (CEGL007868, G1)

Alliances:

- *Bigelowia nuttallii* Herbaceous Alliance (A.1617)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

DISTRIBUTION

Range: This system is endemic to western Louisiana and eastern Texas.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 37:C

USFS Ecomap Regions: 231E:CC, 232F:CC

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Bridges and Orzell 1989a, Comer et al. 2003, Marietta and Nixon 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723152#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Jun 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1405 WEST GULF COASTAL PLAIN NEPHELINE SYENITE GLADE (CES203.371)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Very Shallow Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2405; ESLF 5421; ESP 1405

CONCEPT

Summary: This glade system is present only in Saline and Pulaski counties, Arkansas, on distinctive, massive outcrops of igneous substrate ("nepheline syenite"). Zonal vegetation communities are present around the outcrops. Interior herbaceous-dominated zones can be mesic to wet as springs and small ephemeral streams flow across the rock outcrops and water pools in flat areas. Deeper, more heavily wooded vegetation develops along the flat or slightly sloping outcrop edges.

DESCRIPTION

Vegetation: Some examples will have open stands of *Quercus stellata*, but trees may be absent. Some typical dominant grasses include *Schizachyrium scoparium*, *Piptochaetium avenaceum*, *Aristida purpurascens*, and *Sporobolus clandestinus*. Other herbs may include *Delphinium carolinianum*, *Clinopodium arkansanum*, *Camassia scilloides*, *Sabatia campestris*, and *Talinum calycinum*. Lichens are common on the rocky substrate of some examples.

MEMBERSHIP

Associations:

- (*Quercus stellata*) / *Schizachyrium scoparium* - *Piptochaetium avenaceum* - *Aristida purpurascens* - *Delphinium carolinianum*
Nepheline Syenite Wooded Herbaceous Vegetation (CEGL008422, G1)
- *Sporobolus clandestinus* - *Clinopodium arkansanum* - *Camassia scilloides* - *Sabatia campestris* - *Talinum calycinum* - Lichens
Nepheline Syenite Herbaceous Vegetation (CEGL008421, G1)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

DISTRIBUTION

Range: This system is present only in the Upper West Gulf Coastal Plain of Saline and Pulaski counties, Arkansas. It may have existed historically in Garland and Hot Spring counties (at least partly in the Ouachita region).

Divisions: 203:C

Nations: US

Subnations: AR

Map Zones: 37:C, 44:?

USFS Ecomap Regions: 231E:CC

TNC Ecoregions: 39:?, 40:C

SOURCES

References: Arkansas Geological Commission 2006, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723145#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1404 WEST GULF COASTAL PLAIN WECHES GLADE (CES203.277)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Alkaline Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2404; ESLF 5420; ESP 1404

CONCEPT

Summary: This small-patch system is endemic to outcrops of marine sediment and glauconitic clays of the Weches Formation in central eastern Texas, where it occurs primarily in San Augustine, Nacogdoches, and Sabine counties. These outcrops are exposed by natural erosion of hillside slopes. Soils are shallow, rocky and basic, factors which tend to inhibit growth of woody vegetation. Outcrops are seepy and saturated during winter and early spring but become hard and dry in the summer. Enormous seasonal variations in species dominance can occur, but a number of herbaceous species are characteristic of this system, including the narrowly endemic annuals *Lesquerella pallida* and *Leavenworthia aurea* var. *texana*. Characteristic species include *Sedum pulchellum*, *Clinopodium arkansanum*, and *Sporobolus vaginiflorus*. A scattered shrub layer, including *Cercis canadensis*, *Cornus drummondii*, *Juniperus virginiana*, and *Sideroxylon lanuginosum*, may be present on some sites.

DESCRIPTION

Environment: Soils are mapped as Trawick series (Mollic Hapludalfs).

Vegetation: Characteristic species include *Sedum pulchellum*, *Clinopodium arkansanum*, and *Sporobolus vaginiflorus*. Other species include *Valerianella radiata*, *Galium virgatum*, *Minuartia patula* (= *Arenaria patula*), *Allium drummondii*, *Anemone caroliniana*, *Opuntia* spp., *Croton monanthogynus*, *Chamaesyce nutans* (= *Euphorbia nutans*), *Arnoglossum plantagineum* (= *Cacalia plantaginea*), and *Ipomopsis rubra*. A scattered shrub layer, including *Cercis canadensis*, *Cornus drummondii*, *Juniperus virginiana*, and *Sideroxylon lanuginosum*, may be present on some sites.

Dynamics: Soils are shallow, rocky, and basic, factors which tend to inhibit growth of woody vegetation. Outcrops are seepy and saturated during winter and early spring but become hard and dry in the summer.

MEMBERSHIP

Associations:

- *Sedum pulchellum* - *Clinopodium arkansanum* - *Sporobolus vaginiflorus* Herbaceous Vegetation (CEGL007797, G1)

Alliances:

- *Sedum pulchellum* Saturated Herbaceous Alliance (A.1820)

DISTRIBUTION

Range: This system is endemic to a localized region of eastern Texas, primarily in San Augustine, Nacogdoches, and Sabine counties. More information is needed on possible extension into Arkansas.

Divisions: 203:C

Nations: US

Subnations: AR?, TX

Map Zones: 37:C

USFS Ecomap Regions: 232F:CC

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Comer et al. 2003, Ledger and Judy 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723209#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1120 WILLAMETTE VALLEY UPLAND PRAIRIE AND SAVANNA (CES204.858)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Short Disturbance Interval; F-Landscape/Low Intensity

Non-Diagnostic Classifiers: Lowland [Lowland]; Temperate [Temperate Oceanic]

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2120; ESLF 5409; ESP 1120

CONCEPT

Summary: This grassland system is endemic to the Puget Trough and Willamette Valley. It formed a complex mosaic of varying patch sizes with wet prairies and riparian forests over much of the Willamette Valley during the pre-European settlement era. In parts of the Puget Trough, it occurred as large patches in more forested landscapes, usually associated with deep, coarse outwash deposits. Historically, it also occurred as large patches on glacially associated soils of variable texture in localized portions of the Georgia Basin in both Washington and British Columbia. It occurs on well-drained deep soils and was maintained historically by frequent anthropogenic burning. Landforms are usually flat, rolling, or gently sloping, and often part of extensive plains. Dominant vegetation is perennial bunch grasses, especially *Festuca roemerii* (= *Festuca idahoensis* var. *roemerii*) and, to a lesser degree, *Danthonia californica*, with abundant and diverse forbs. Scattered deciduous (*Quercus garryana*) and/or coniferous (*Pseudotsuga menziesii*, *Pinus ponderosa*) trees are rarely found now, but such savannas historically covered about one-third of the total acreage. In the absence of disturbance, many of them have succeeded to forest and others continue to do so.

MEMBERSHIP

Associations:

- *Danthonia californica* Valley Grassland Herbaceous Vegetation (CEGL001598, G1Q)
- *Elymus caninus* - *Festuca roemerii* - (*Koeleria macrantha*) Herbaceous Vegetation (CEGL001744, G1)
- *Festuca roemerii* - *Sericocarpus rigidus* Herbaceous Vegetation (CEGL001608, G1)
- *Pinus ponderosa* / *Carex inops* - *Festuca roemerii* Woodland (CEGL003348, G1)
- *Quercus garryana* / *Festuca (roemerii, rubra)* Wooded Herbaceous Vegetation (CEGL001714, G1)

Alliances:

- *Danthonia californica* Herbaceous Alliance (A.1254)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Quercus garryana* Wooded Herbaceous Alliance (A.1506)

DISTRIBUTION

Range: This system is endemic to the Puget Trough and Willamette Valley.

Divisions: 204:C

Nations: US

Subnations: OR, WA

Map Zones: 1:C, 2:C, 3:?, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, M242A:??, M242B:??, M261A:CC, M261D:CC

TNC Ecoregions: 2:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722817#references

Description Author: C. Chappell

Version: 09 Feb 2005

Concept Author: C. Chappell

Stakeholders: West

ClassifResp: West

UPLAND GRASSLAND AND HERBACEOUS

1415 ARKANSAS VALLEY PRAIRIE AND WOODLAND (CES202.312)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Graminoid

Non-Diagnostic Classifiers: Lowland

National Mapping Codes: EVT 2415; ESLF 7128; ESP 1415

CONCEPT

Summary: This system of prairies and associated woodlands is found in the Arkansas River Valley region of Arkansas and adjacent Oklahoma. This region is distinctly bounded by the Boston Mountains to the north and the Ouachita Mountains to the south, although it has been considered part of the Ouachita Ecoregion (TNC Ecoregion 39). The valley is characterized by broad, level to gently rolling uplands derived from shales and is much less rugged and more heavily impacted by Arkansas River erosional processes than the adjacent mountainous regions. In addition, the valley receives annual precipitation total of 2-6 inches less than the surrounding regions due to a rainshadow produced by a combination of prevailing western winds and mountain orographic effects. The shale-derived soils associated with the prairies are thin and droughty. The combined effect of droughty soils, reduced precipitation, and prevailing level topography create conditions highly conducive to the ignition and spread of fires. Stands are typically dominated by *Andropogon gerardii*, *Sorghastrum nutans*, *Panicum virgatum*, and *Schizachyrium scoparium*. Some extant examples of this system remain, but most are small and isolated. They were common on the western edge of the region bordering or possibly included in the Crosstimbers (TNC Ecoregion 32) where precipitation and agriculture conversion were lowest.

Classification Comments: There is little floristic and environmental overlap with the Grand Prairie and calcareous prairies of southern Arkansas. There may be stronger overlap with Southeastern Great Plains Tallgrass Prairie (CES205.685), and further review is needed to clarify the distinction between these two systems.

Similar Ecological Systems:

- Southeastern Great Plains Tallgrass Prairie (CES205.685)
- Texas Blackland Tallgrass Prairie (CES205.684)

DESCRIPTION

Environment: This region is distinctly bounded by the Boston Mountains to the north and the Ouachita Mountains to the south, although it has been considered part of the Ouachita Ecoregion (TNC Ecoregion 39). The valley is characterized by broad, level to gently rolling uplands derived from shales and is much less rugged and more heavily impacted by Arkansas River erosional processes than the adjacent mountainous regions. In addition, the valley receives annual precipitation total of 2-6 inches less than the surrounding regions due to a rainshadow produced by a combination of prevailing western winds and mountain orographic effects (T. Foti pers. comm. 2003). The shale-derived soils associated with the prairies are thin and droughty. The combined effect of droughty soils, reduced precipitation, and prevailing level topography create conditions highly conducive to the ignition and spread of fires. Some extant examples of this system remain, but most are small and isolated. They were common on the western edge of the region bordering or possibly included in the Crosstimbers (TNC Ecoregion 32) where precipitation and agriculture conversion were lowest (T. Foti pers. comm. 2003).

Vegetation: These prairies are typically dominated by *Schizachyrium scoparium*, *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. Other grasses include *Koeleria macrantha*, *Sporobolus heterolepis*, *Sphenopholis obtusata*, *Dichanthelium* spp., *Aristida purpurascens*, *Panicum brachyanthum*, and *Coelorachis cylindrica*. A rich forb diversity is commonly present and includes *Helianthus mollis*, *Echinacea pallida*, *Rudbeckia grandiflora*, *Silphium laciniatum*, *Symphyotrichum* spp., *Solidago* spp., *Callirhoe digitata*, *Asclepias hirtella*, *Eryngium yuccifolium*, *Delphinium carolinianum*, *Castilleja coccinea*, *Calopogon oklahomensis*, *Buchnera americana*, *Dodecatheon meadia*, *Tephrosia virginiana*, *Baptisia alba*, *Baptisia bracteata*, *Liatris pycnostachya*, and *Liatris squarrosa* var. *hirsuta*. Wetter areas support a rich diversity of rushes and sedges, including *Carex opaca* (= *Carex bicknellii* var. *opaca*), *Carex oklahomensis*, *Carex complanata*, and *Eleocharis wolfii* (T. Witsell pers. comm. 2006).

Dynamics: These prairies and woodlands were historically maintained by frequent fire. Drought cycles and grazing were also likely important ecosystem processes.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* - *Helianthus grosseserratus* Herbaceous Vegetation (CEGL002024, G2G3)
- *Andropogon gerardii* - *Sorghastrum nutans* Unglaciated Herbaceous Vegetation (CEGL002204, G3)
- *Juncus (acuminatus, brachycarpus)* - *Panicum virgatum* - *Bidens aristosa* - *Hibiscus moscheutos* ssp. *lasiocarpos* Herbaceous Vegetation (CEGL004782, G2G3)

- *Pinus echinata* - *Quercus alba* / *Schizachyrium scoparium* Woodland (CEGL002394, G3G4)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Woodland (CEGL002393, G2G3)
- *Pinus echinata* / *Schizachyrium scoparium* - *Solidago ulmifolia* - *Monarda russeliana* - *Echinacea pallida* Woodland (CEGL007815, G1G2)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* / *Schizachyrium scoparium* Woodland (CEGL002150, G2G3)
- *Quercus stellata* - *Quercus marilandica* - *Carya (glabra, texana)* / *Vaccinium arboreum* Forest (CEGL002075, G4)
- *Quercus stellata* - *Quercus marilandica* - *Quercus velutina* - *Carya texana* / *Schizachyrium scoparium* Woodland (CEGL002149, G2G3)
- *Schizachyrium scoparium* - *Bothriochloa laguroides ssp. torreyana* - *Croton willdenowii* Herbaceous Vegetation (CEGL008564, G1?)
- *Schizachyrium scoparium* - *Dichanthelium* spp. - *Buchnera americana* - *Echinacea pallida* Herbaceous Vegetation (CEGL007827, G2G3)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Pinus echinata* - *Quercus (alba, falcata, stellata, velutina)* Woodland Alliance (A.679)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Pinus echinata* Woodland Alliance (A.515)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Forest Alliance (A.253)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system occurs in the Arkansas River Valley region of Arkansas and adjacent Oklahoma.

Divisions: 202:C; 205:C

Nations: US

Subnations: AR, OK

Map Zones: 44:C

TNC Ecoregions: 32:C, 39:C

SOURCES

References: Comer et al. 2003, Foti pers. comm., Witsell pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723184#references

Description Author: T. Foti and R. Evans, mod. T. Witsell

Version: 11 Dec 2006

Concept Author: T. Foti and R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1413 BLUEGRASS SAVANNA AND WOODLAND (CES202.888)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Deep Soil; Very Short Disturbance Interval; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2413; ESLF 7126; ESP 1413

CONCEPT

Summary: This system represents deep soil savannas and woodlands of the Inner Bluegrass Basin of Kentucky (Ecoregion 711 and "S. Fork Licking River arm" of Ecoregion 71d of EPA (2004) and Woods et al. (2002)). Only remnants or stands undergoing restoration are currently extant. The original woodland-savanna aspect, especially on drier uplands, is believed to have been dominated by fire-resistant oaks, especially *Quercus muehlenbergii* and *Quercus macrocarpa*, but also with a variety of other species such as *Fraxinus quadrangulata*, *Robinia pseudoacacia*, *Gleditsia triacanthos*, *Acer saccharum*, *Fraxinus americana*, *Fraxinus pennsylvanica*, *Carya cordiformis*, *Juglans nigra*, and the rare *Gymnocladus dioicus*. The understory is composed of cool-season grasses, as far as known (e.g., *Elymus*, *Dichanthelium*) with *Arundinaria gigantea* (extensive canebrakes). Settlers referred to a "buffalo grass" of unknown identity (possibly *Dichanthelium clandestinum* or *Dichanthelium scoparium*). The fire regime is unknown. Characteristic remnant trees (e.g., *Fraxinus quadrangulata*, *Quercus macrocarpa*) are fire-tolerant.

Classification Comments: This system may, in part, be related to mesic woodland variants of Central Interior Highlands Calcareous Glade and Barrens (CES202.691). The mesic barrens and woodlands in the Interior Low Plateau have all but disappeared from the landscape, making regional assessments difficult. For information elsewhere on mesic barrens/woodlands in the Interior Highlands, see description for *Quercus stellata* - *Quercus alba* - (*Quercus falcata*) / *Schizachyrium scoparium* Woodland (CEGL004217).

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)

Related Concepts:

- Bluegrass Mesophytic Cane Forest (Evans 1991) Finer
- Bluegrass Savanna-Woodland (Evans 1991) Finer

DESCRIPTION

Environment: These savannas or woodlands occur on deep fertile soils of the Inner Bluegrass Basin of Kentucky (Ecoregion 711 and "S. Fork Licking River arm" of Ecoregion 71d of EPA (2004) and Woods et al. (2002)).

Vegetation: The original woodland-savanna aspect, especially on drier uplands, is believed to have been dominated by fire-resistant oaks, especially *Quercus muehlenbergii* and *Quercus macrocarpa*, but also with a variety of other species such as *Fraxinus quadrangulata*, *Robinia pseudoacacia*, *Gleditsia triacanthos*, *Acer saccharum*, *Fraxinus americana*, *Fraxinus pennsylvanica*, *Carya cordiformis*, *Juglans nigra*, and the rare *Gymnocladus dioicus*. The understory is composed of cool-season grasses, as far as known (e.g., *Elymus*, *Dichanthelium*) with *Arundinaria gigantea* (extensive canebrakes). Settlers referred to a "buffalo grass" of unknown identity (possibly *Dichanthelium clandestinum* or *Dichanthelium scoparium*). Historical descriptions also mention "pea vine," two or three species of nettles, Vernonia species, Ageratina altissima, and *Trifolium stoloniferum*.

Dynamics: The fire regime is unknown. Anthropogenic burning by Native Americans was probably an important part of the presettlement fire regime. Native American population decline after the 1500s may have led to a decrease in the amount and frequency of burning in these savannas. Characteristic remnant trees (e.g., *Fraxinus quadrangulata*, *Quercus macrocarpa*) are fire-tolerant. Grazing by native herbivores (white-tailed deer and bison) may have been an important factor in maintaining the open character of these savannas.

MEMBERSHIP

Associations:

- *Acer (nigrum, saccharum)* - *Carya cordiformis* Forest (CEGL004411, G1)
- *Fraxinus quadrangulata* - *Quercus macrocarpa* - *Quercus muehlenbergii* / *Arundinaria gigantea* ssp. *gigantea* / *Elymus* spp. Woodland (CEGL004436, G1)
- *Fraxinus quadrangulata* - *Quercus macrocarpa* / *Arundinaria gigantea* ssp. *gigantea* Wooded Shrubland (CEGL003835, GH)
- *Juglans nigra* - *Aesculus glabra* var. *glabra* - *Gymnocladus dioicus* / *Arundinaria gigantea* ssp. *gigantea* - (*Asimina triloba*) Forest (CEGL004437, G1)
- *Juglans nigra* - *Celtis occidentalis* Forest (CEGL004693, GNA)

Alliances:

- *Arundinaria gigantea* Wooded Shrubland Alliance (A.794)
- *Fraxinus quadrangulata* - *Quercus macrocarpa* - *Quercus muehlenbergii* Woodland Alliance (A.605)
- *Juglans nigra* - *Aesculus glabra* - *Celtis (laevigata, occidentalis)* Forest Alliance (A.232)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

DISTRIBUTION

Range: This system is restricted to the Inner Bluegrass Basin of Kentucky (Ecoregion 711 and "S. Fork Licking River arm" of Ecoregion 71d of EPA (2004) and Woods et al. (2002)). Only remnants or stands undergoing restoration are currently extant.

Divisions: 202:C

Nations: US

Subnations: KY

Map Zones: 47:C

USFS Ecomap Regions: 223F:CC

TNC Ecoregions: 44:C

SOURCES

References: Braun 1950, Bryant et al. 1980, Comer et al. 2003, EPA 2004, McEwan and McCarthy 2008, McHargue 1941, McInteer 1952, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722790#references

Description Author: M. Pyne and R. Evans

Version: 22 May 2008

Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1129 CALIFORNIA CENTRAL VALLEY AND SOUTHERN COASTAL GRASSLAND (CES206.942)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Valley; Toeslope/Valley Bottom; Mediterranean [Mediterranean Xeric-Oceanic]; Eutrophic Soil; Clay Soil Texture; F-Landscape/Low Intensity; Graminoid; *Nassella pulchra*

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Plateau; Woody-Herbaceous; Valley bottom; Valley floor; Valley side; Alluvial plain; Deep Soil; Mineral: W/ A-Horizon >10 cm; Udic; Short Disturbance Interval; Coastal plain

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2129; ESLF 7101; ESP 1129

CONCEPT

Summary: This system is found from 10-1200 m (30-3600 feet) elevation; receiving on average 50 cm (range 25-100 cm) of precipitation per year, mainly as winter rain. It is found with fine-textured soils, moist or even waterlogged in winter, but very dry in summer. Historically, these grasslands were common among oak savanna and woodland and probably experienced similar frequent fire regimes. Characteristic plant species include *Nassella pulchra*, *Aristida* spp., *Achillea millefolium* var. *borealis* (= *Achillea borealis*), *Achyraea mollis*, *Agoseris heterophylla*, *Bloomeria crocea*, *Triteleia ixioides* (= *Brodiaea lutea*), *Chlorogalum pomeridianum*, *Clarkia purpurea*, *Dodecatheon jeffreyi*, *Elymus glaucus*, *Leymus triticoides*, *Festuca californica*, *Melica californica*, *Castilleja attenuata* (= *Orthocarpus attenuatus*), and *Poa secunda* (= *Poa scabrella*).

Related Concepts:

- Coastal Prairie (214) (Shiflet 1994) Broader. Only small portions of this systems correspond to this SRM type (coastal grasslands between San Francisco Bay and Monterey).
- Valley Grassland (215) (Shiflet 1994) Intersecting. The SRM Valley grassland is described as predominantly annual grasslands and vernal pool communities.

DISTRIBUTION

Range: Found from in California from 10-1200 m (30-3600 feet) elevation.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 4:C, 5:C

USFS Ecomap Regions: 261B:CC, 262A:CC, M261C:??

TNC Ecoregions: 13:C, 15:P, 16:P

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722739#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1130 CALIFORNIA MESIC SERPENTINE GRASSLAND (CES206.943)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Ultramafic with low Ca:Mg ratio; Deep Soil; Udic; Calamagrostis ophitidis

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Woody-Herbaceous; Serpentine

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2130; ESLF 7102; ESP 1130

CONCEPT

Summary: These grasslands are of very limited distribution in California within the Coast Ranges, Sierra Nevada, and Transverse Ranges on deep soils with serpentine-rich parent material. Not all serpentinite outcrops support distinct vegetation; only those with very low Ca:Mg ratios impact biotic composition. In this system, native bunchgrass dominates, though typically in less dense cover than other perennial bunchgrass types. Characteristic species include *Calamagrostis ophitidis*, *Eschscholzia californica*, *Vulpia microstachys* var. *ciliata* (= *Festuca grayi*), *Poa secunda* (= *Poa scabrella*), *Hemizonia congesta* ssp. *luzulifolia* (= *Hemizonia luzulifolia*), *Nassella cernua*, and *Nassella pulchra*. Historic fire regimes in this system are not well known.

Related Concepts:

- Valley Grassland (215) (Shiflet 1994) Intersecting

DISTRIBUTION

Range: This system is found in the Coast Ranges, Sierra Nevada, and Transverse Ranges of California on deep soils with serpentine-rich parent material. It may also occur on serpentine in the Klamath Mountains of southern Oregon.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 1:?, 2:?, 3:C, 4:C, 6:C, 7:P

USFS Ecomap Regions: 261B:??, 263A:??, M261A:CP, M261B:CC, M261C:CP, M261E:CC, M261F:C?

TNC Ecoregions: 5:C, 12:C, 14:C, 15:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Evens and San 2004, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722738#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1131 CALIFORNIA NORTHERN COASTAL GRASSLAND (CES206.941)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Terrace; Mediterranean [Mediterranean Xeric-Oceanic]; Very Short Disturbance Interval [Periodicity/Nonrandom Disturbance]; F-Patch/Low Intensity; Graminoid

Non-Diagnostic Classifiers: Hillslope bedrock outcrop; Woody-Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2131; ESLF 7103; ESP 1131

CONCEPT

Summary: This ecological system is found in discontinuous patches below 300 m (1000 feet) elevation from San Francisco Bay north into Oregon, on coastal terraces and ridgeline balds in the Coast Ranges and Klamath Mountains. Small patches have been documented as far south as Santa Barbara and San Luis Obispo counties. It has a similar distribution to coastal shrublands (Northern California Coastal Scrub (CES206.932)) in areas that receive more rainfall than other California grasslands of the interior or southern coastal California. In recent centuries, these were fire-dominated systems, and there is a known history of Native American use of fire in these areas. While still present, annual grasses and forbs are not as prevalent in these grasslands as elsewhere in California. With fire suppression, *Baccharis pilularis* and other shrub components of north coastal scrub often invade and can replace these grasslands with scrub-dominated systems. *Agrostis* spp., *Bromus carinatus*, *Calamagrostis nutkaensis*, *Danthonia californica*, *Festuca rubra*, *Festuca idahoensis*, *Deschampsia caespitosa*, *Koeleria macrantha*, *Trisetum canescens*, and perennial forbs such as *Iris douglasiana*, *Sisyrinchium bellum*, *Grindelia hirsutula*, and *Sanicula arctopoides* are characteristic.

Similar Ecological Systems:

- North Pacific Hypermaritime Shrub and Herbaceous Headland (CES204.088)

Related Concepts:

- Coastal Prairie (214) (Shiflet 1994) Broader. Most of the SRM Coastal Prairie type corresponds to this system.

MEMBERSHIP

Associations:

- *Calamagrostis nutkaensis* - *Carex* spp. - *Juncus* spp. Herbaceous Vegetation (CEGL003378, G2)
- *Danthonia californica* - *Aira caryophyllea* Herbaceous Vegetation (CEGL003474, G3)
- *Deschampsia caespitosa* - *Danthonia californica* Coastal Herbaceous Vegetation (CEGL003325, G2)

Alliances:

- *Calamagrostis nutkaensis* Herbaceous Alliance (A.1202)
- *Danthonia californica* Herbaceous Alliance (A.1254)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)

DISTRIBUTION

Range: This system is found below 300 m (1000 feet) elevation from San Francisco Bay (and possibly farther south) north into Oregon, on coastal terraces and ridgeline balds in the Coast Ranges and Klamath Mountains.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C

USFS Ecomap Regions: 263A:CC, M261A:CC, M261B:CC

TNC Ecoregions: 5:C, 14:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722740#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1132 CENTRAL MIXEDGRASS PRAIRIE (CES303.659)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Temperate [Temperate Continental]; Shallow Soil; Loam Soil Texture; Silt Soil Texture; Ustic; F-Landscape/Medium Intensity; G-Landscape/High Intensity; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2132; ESLF 7104; ESP 1132

CONCEPT

Summary: This mixedgrass prairie system ranges from South Dakota into the Rolling Plains and the western Edwards Plateau of Texas. It is bordered by the shortgrass prairie on its western edge and the tallgrass prairie to the east. The loessal regions in west-central Kansas and central Nebraska, the Red Hills region of south-central Kansas and northern Oklahoma are all located within this system. Because of its proximity to other ecoregions, this system contains elements from both shortgrass and tallgrass prairies, which combine to form the mixedgrass prairie ecological system throughout its range. The distribution, species richness and productivity of plant species within the mixedgrass ecological system is controlled primarily by environmental conditions, in particular soil moisture and topography. Grazing and fire are important dynamic processes in this system. The relative dominance of the various grass and forb species within different associations in the system also can strongly depend on the degree of natural or human disturbance. This system can contain grass species such as *Bouteloua curtipendula*, *Schizachyrium scoparium*, *Andropogon gerardii*, *Hesperostipa comata*, *Sporobolus heterolepis*, and *Bouteloua gracilis*, although the majority of the associations within the region are dominated by *Pascopyrum smithii* or *Schizachyrium scoparium*. Numerous forb and sedge species (*Carex* spp.) can also occur within the mixedgrass system in the Western Great Plains. Although forbs do not always significantly contribute to the canopy, they can be very important. Some dominant forb species include *Ambrosia psilostachya*, *Echinacea angustifolia*, and *Lygodesmia juncea*. Oak species such as *Quercus macrocarpa* can occur also in areas protected from fire due to topographic position. This can cause an almost oak savanna situation in certain areas, although fire suppression may allow for a more closed canopy and expansion of bur oak beyond those sheltered areas. In those situations, further information will be needed to determine if those larger areas with a more closed canopy of bur oak should be considered part of Western Great Plains Dry Bur Oak Forest and Woodland (CES303.667). Likewise, within the mixedgrass system, small seeps may occur, especially during the wettest years. Although these are not considered a separate system, the suppression of fire within the region has enabled the invasion of both exotics and some shrub species such as *Juniperus virginiana* and also allowed for the establishment of *Pinus ponderosa* in some northern areas.

Classification Comments: This system is found primarily in the Central Mixed-grass Prairie (TNC Ecoregion 33); it becomes more restricted to mesic lowlands sites to the west and southwest in the shortgrass prairie region of Texas (S. Menard pers. comm. 2005). This is probably a reference to the Llano Estacado region rather than the Southern Shortgrass Prairie (TNC Ecoregion 28) (J. Teague pers. obs 2005). The Central Mixed-grass Prairie (TNC Ecoregion 33) should be extended south to include the Rolling Plains of Texas; being separated from the Southern Shortgrass Prairie (TNC Ecoregion 28) by the Caprock Escarpment (L. Elliott pers. comm. 2005).

Similar Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Western Great Plains Dry Bur Oak Forest and Woodland (CES303.667)
- Western Great Plains Mesquite Woodland and Shrubland (CES303.668)
- Western Great Plains Sand Prairie (CES303.670)

Related Concepts:

- Blue Grama - Western Wheatgrass (704) (Shiflet 1994) Finer
- Bluestem - Grama (709) (Shiflet 1994) Broader
- Bluestem - Grama Prairie (604) (Shiflet 1994) Finer

DESCRIPTION

Environment: Differences in topography and soil characteristics also occur across the range of this system. It is often characterized by rolling to extremely hilly landscapes with soils developed from loess, shale, limestone or sandstone parent material. Mollisol soils are most prevalent and range from silt loams and silty clay loams with sandy loams possible on the western edge of the range. The Red Hills region of Kansas and Oklahoma, which contains examples of this system, contains somewhat unique soil characteristics and has developed from a diversity of sources including red shale, red clay, sandy shale, siltstone, or sandstone. These soils have developed a characteristic reddish color from the primary material. These soils can consist of silt, loam, or clay and can have textures ranging from a fine sandy loam to a more clayey surface.

Vegetation: This system contains elements from both Western Great Plains Shortgrass Prairie (CES303.672) and Western Great Plains Tallgrass Prairie (CES303.673). This system typically contains grass species such as *Bouteloua curtipendula*, *Schizachyrium scoparium*, *Andropogon gerardii*, *Hesperostipa comata*, *Sporobolus heterolepis*, and *Bouteloua gracilis*, although the majority of the

associations within the region are dominated by *Pascopyrum smithii* or *Schizachyrium scoparium*. Isolated patches of *Quercus macrocarpa* also can occur.

Dynamics: Fire and grazing are the primary processes occurring within the system. The diversity in this mixedgrass system likely reflects both the short- and long-term responses of the vegetation to these often concurrent disturbance regimes. Fire suppression and overgrazing can lead to the invasion of this system by woody species such as *Juniperus virginiana* and *Pinus ponderosa*. Likewise, fire suppression may lead to a more closed canopy of bur oak.

MEMBERSHIP

Associations:

- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Bouteloua gracilis* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001756, G4)
- *Buchloe dactyloides* Modified Herbaceous Vegetation (CEGL004948, GNA)
- *Cornus drummondii* - (*Rhus glabra*, *Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Hesperostipa comata* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (CEGL002037, G5)
- *Hesperostipa comata* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001701, G4)
- *Hesperostipa curtisetata* - *Elymus lanceolatus* Herbaceous Vegetation (CEGL002253, GNR)
- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL002238, G3?)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Bouteloua curtipendula* Great Plains Herbaceous Vegetation (CEGL004066, G2)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* Forest (CEGL003628, GNA)
- *Krascheninnikovia lanata* / *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001321, G4)
- *Panicum obtusum* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001573, GNRQ)
- *Pascopyrum smithii* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001578, G5)
- *Pascopyrum smithii* - *Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation (CEGL002034, G4)
- *Pascopyrum smithii* Herbaceous Vegetation (CEGL001577, G3G5Q)
- *Pleuraphis mutica* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL002272, G4?)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Quercus macrocarpa* / Mixedgrass Loam Wooded Herbaceous Vegetation (CEGL002163, G1Q)
- *Quercus macrocarpa* / Mixedgrass Sand Wooded Herbaceous Vegetation (CEGL002162, G1)
- *Quercus macrocarpa* / Mixedgrass Shale Wooded Herbaceous Vegetation (CEGL002164, G1Q)
- *Sarcobatus vermiculatus* / *Sporobolus airoides* Shrubland (CEGL001368, G3?)
- *Schizachyrium scoparium* - (*Sorghastrum nutans*) - *Sporobolus compositus* var. *compositus* - *Liatris mucronata* Herbaceous Vegetation (CEGL004211, GNR)
- *Schizachyrium scoparium* - *Bouteloua curtipendula*, *gracilis*) - *Carex filifolia* Herbaceous Vegetation (CEGL001681, G3G4)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Bouteloua gracilis* Central Plains Herbaceous Vegetation (CEGL002246, G2G4)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Nassella leucotricha* Herbaceous Vegetation (CEGL004070, GNR)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Chalkflat Herbaceous Vegetation (CEGL002247, G2)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Loess Mixedgrass Herbaceous Vegetation (CEGL002036, G3?)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Western Great Plains Herbaceous Vegetation (CEGL001594, G3)
- *Schizachyrium scoparium* - *Lesquerella gordonii* - *Castilleja purpurea* var. *citrina* Herbaceous Vegetation (CEGL002252, G2?)
- *Yucca glauca* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675, G4)

Alliances:

- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Buchloe dactyloides* Herbaceous Alliance (A.1276)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Hesperostipa comata* - *Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Hesperostipa curtisetata* - *Elymus lanceolatus* Herbaceous Alliance (A.3523)
- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Alliance (A.1214)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Krascheninnikovia lanata* Dwarf-shrub Herbaceous Alliance (A.1565)
- *Panicum obtusum* Herbaceous Alliance (A.1238)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Pleuraphis mutica* Herbaceous Alliance (A.1249)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Quercus macrocarpa* Wooded Medium-Tall Herbaceous Alliance (A.1505)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

DISTRIBUTION

Range: This system is found throughout the central and southern areas of the western Great Plains ranging from southern South Dakota into the Rolling Plains and western Edwards Plateau of Texas.

Divisions: 205:C; 303:C

Nations: US

Subnations: CO, KS, ND, NE, OK, SD, TX

Map Zones: 27:P, 30:C, 31:C, 32:C, 33:C, 34:C, 35:C, 38:C, 39:P, 43:P

USFS Ecomap Regions: 223A:??, 251A:CP, 251B:CC, 251E:CP, 251F:CC, 251G:CC, 251H:CC, 255A:??, 315F:CC, 331B:CC, 331C:CC, 331E:CC, 331F:CC, 331H:CC, 331I:CC, 331M:CP, 332B:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC

TNC Ecoregions: 27:P, 28:P, 29:C, 32:C, 33:C, 36:C, 37:P

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999, Weaver and Albertson 1956, Weaver and Bruner 1948

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722999#references

Description Author: S. Menard and K. Kindscher

Version: 27 Sep 2005

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

1421 CENTRAL TALLGRASS PRAIRIE (CES205.683)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Glaciated plains; Herbaceous; Temperate; Glaciated; Deep Soil; Loam Soil Texture

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2421; ESLF 7134; ESP 1421

CONCEPT

Summary: This system is found primarily in the Central Tallgrass Prairie ecoregion ranging from eastern Kansas and Nebraska to northwestern Indiana. This system differs from other prairie systems to the north and south by being the most mesic with primarily deep, rich Mollisol soils. These soils are usually greater than 1 meter deep. This system is dominated by tallgrass species such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. These species typically grow to 1-2 m tall in the rich soils found in this system. Other mid- and shortgrass species, such as *Bouteloua curtipendula*, *Hesperostipa spartea*, and *Schizachyrium scoparium*, are usually present and can be common or locally dominant on patches of this system, particularly slopes or other areas with drier habitats. Several forb species are also associated with this system making it one of the most diverse grassland systems. As many as 300 herbaceous plant species could occur in this system across its range. The environment and habitat of this system do not prevent invasion by shrubs and trees. High-quality examples of this system have trees and shrubs widely scattered or clustered in areas that are wetter and/or more sheltered from fire than the surrounding grassland. Fire, drought, and grazing are the primary natural dynamics influencing this system and help prevent woody species from invading. However, conversion to agriculture has been the prime disturbance since post-European settlement. The rich soils and long growing season make this an ideal location for farming row crops, and as a result very few examples of this system remain.

Similar Ecological Systems:

- Northern Tallgrass Prairie (CES205.686)
- Southeastern Great Plains Tallgrass Prairie (CES205.685)
- Texas Blackland Tallgrass Prairie (CES205.684)

DESCRIPTION

Environment: This system differs from other prairie systems to the north and south by being the most mesic with primarily deep, rich Mollisol soils. These soils are usually greater than 1 meter deep.

Vegetation: This system is dominated by tallgrass species such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. These species typically grow to 1-2 m tall in the rich soils found in this system. Other mid- and shortgrass species, such as *Bouteloua curtipendula*, *Hesperostipa spartea*, and *Schizachyrium scoparium*, are usually present and can be common or locally dominant on patches of this system, particularly slopes or other areas with drier habitats. Several forb species are also associated with this system making it one of the most diverse grassland systems. As many as 300 herbaceous plant species could occur in this system across its range. The environment and habitat of this system do not prevent invasion by shrubs and trees. High-quality examples of this system have trees and shrubs widely scattered or clustered in areas that are wetter and/or more sheltered from fire than the surrounding grassland.

Dynamics: Fire, drought, and grazing are the primary natural dynamics influencing this system and help prevent woody species from invading. However, conversion to agriculture has been the prime disturbance since post-European settlement. The rich soils and long growing season make this an ideal location for farming row crops, and as a result very few examples of this system remain. Fire suppression can lead to increased cover of woody species.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* - *Helianthus grosseserratus* Herbaceous Vegetation (CEGL002024, G2G3)
- *Andropogon gerardii* - *Panicum virgatum* - *Schizachyrium scoparium* - (*Tradescantia tharpaii*) Herbaceous Vegetation (CEGL005231, G3?)
- *Andropogon gerardii* - *Sorghastrum nutans* - (*Sporobolus heterolepis*) - *Liatris* spp. - *Ratibida pinnata* Herbaceous Vegetation (CEGL002203, G1G2)
- *Andropogon gerardii* - *Sorghastrum nutans* - *Hesperostipa spartea* Loess Hills Herbaceous Vegetation (CEGL002025, G2)
- *Cornus drummondii* - (*Rhus glabra*, *Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* Forest (CEGL003628, GNA)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Agrostis hyemalis* - *Eleocharis* spp. Hardpan Herbaceous Vegetation (CEGL002249, G2?)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Bouteloua hirsuta* - (*Yucca glauca*) Herbaceous Vegetation (CEGL002035, G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL002214, G2G3)

- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Bouteloua curtipendula* Hill Herbaceous Vegetation (CEGL005183, G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Clinopodium arkansanum* Alkaline Herbaceous Vegetation (CEGL005179, G2)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found primarily in the Central Tallgrass Prairie (TNC Ecoregion 36) ranging from eastern Kansas and Nebraska to north-central Missouri and northwestern Indiana. In Missouri, it is attributed to EPA 47d, 47f, 72f.

Divisions: 205:C

Nations: US

Subnations: IA, IL, IN, KS, MO, NE, WI

Map Zones: 31:?, 38:C, 39:?, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 222Je:CC?, 222Jg:CC?, 222Jh:CCC, 222K:CC, 223A:CC, 251B:CC, 251C:CC, 251F:CC, 251G:CC, 251H:CC, 255A:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC

TNC Ecoregions: 36:C, 45:C, 46:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722976#references

Description Author: S. Menard, mod. J. Drake

Version: 11 Apr 2007

Concept Author: S. Menard

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1503 CHIHUAHUAN LOAMY PLAINS DESERT GRASSLAND (CES302.061)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland; Plain; Valley; Alluvial flat

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2503; ESLF 7164; ESP 1503

CONCEPT

Summary: This ecological system occurs in the northern Chihuahuan Desert and extends into limited areas of the southern Great Plains on alluvial flats, loamy plains, and basins sometimes extending up into lower piedmont slopes. Sites are typically flat or gently sloping so precipitation does not run off and may be somewhat mesic if they receive runoff from adjacent areas, but these are not wetlands. Soils are non-saline, finer textured loams or clay loam. Vegetation is characterized by perennial grasses and is typically dominated by *Pleuraphis mutica* (tobosa) or with *Bouteloua eriopoda* codominant (more historically) or *Bouteloua gracilis*. In degraded stands, *Scleropogon brevifolius*, *Dasyochloa pulchella* (= *Erioneuron pulchellum*), or *Aristida* spp. may codominate. *Pleuraphis jamesii* may become important in northern stands and *Bouteloua gracilis* in the Great Plains and on degraded stands. If present, mesic graminoids such as *Pascopyrum smithii*, *Panicum obtusum*, *Sporobolus airoides*, and *Sporobolus wrightii* typically have low cover and are restricted to drainages and moist depressions (inclusions). Scattered shrubs such as *Ephedra torreyana*, *Flourensia cernua*, *Gutierrezia sarothrae*, *Larrea tridentata*, *Opuntia imbricata*, *Prosopis glandulosa*, and *Yucca* spp. may be present, especially on degraded sites.

Classification Comments: NRCS Ecological Site Description MLRA 42 SD-2 Loamy Ecological Site (NRCS 2006) describes this system on the Jornada Experimental Range with State-and-Transition Model showing shifts in species composition with land use. Degraded stands often have scattered desert scrubs such as *Larrea tridentata*, *Flourensia cernua*, and *Prosopis glandulosa* present.

This upland grassland is similar to the bottomland/depressional wetland system Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (CES302.746) and grades into Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735) in the foothills and piedmont desert grasslands. In similar loamy plains land positions in the Great Plains, *Bouteloua gracilis*, *Buchloe dactyloides*, or *Pleuraphis jamesii* are dominant grasses in Western Great Plains Shortgrass Prairie (CES303.672).

Similar Ecological Systems:

- Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (CES302.746)

Related Concepts:

- MLRA 42 - Southern Desertic Basin (SD-1) Loamy (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-2) Loamy (NRCS 2006) Broader
- MLRA 42 - Southern Desertic Basin (SD-3) Loamy (NRCS 2006) Broader

DESCRIPTION

Environment: Examples of this system are found on alluvial flats, loamy plains, and basins sometimes extending up into lower piedmont slopes. Sites are typically flat or gently sloping so precipitation does not run off and may be somewhat mesic if they receive runoff from adjacent areas, but these are not wetlands. Soils are non-saline, finer textured loams or clay loam.

Vegetation: The vegetation in examples of this system is characterized by perennial grasses and is typically dominated by *Pleuraphis mutica* (tobosa) or with *Bouteloua eriopoda* codominant (more historically) or *Bouteloua gracilis*. In degraded stands, *Scleropogon brevifolius*, *Dasyochloa pulchella* (= *Erioneuron pulchellum*), or *Aristida* spp. may codominate. *Pleuraphis jamesii* may become important in northern stands and *Bouteloua gracilis* in the Great Plains and on degraded stands. If present, mesic graminoids such as *Pascopyrum smithii*, *Panicum obtusum*, *Sporobolus airoides*, and *Sporobolus wrightii* typically have low cover and are restricted to drainages and moist depressions (inclusions). Scattered shrubs such as *Ephedra torreyana*, *Flourensia cernua*, *Gutierrezia sarothrae*, *Larrea tridentata*, *Opuntia imbricata*, *Prosopis glandulosa*, and *Yucca* spp. may be present, especially on degraded sites.

MEMBERSHIP

Associations:

- *Pleuraphis mutica* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001638, GNRQ)
- *Pleuraphis mutica* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL002272, G4?)
- *Pleuraphis mutica* - *Scleropogon brevifolius* Herbaceous Vegetation (CEGL001640, G5)
- *Pleuraphis mutica* Monotype Herbaceous Vegetation (CEGL001637, G5?)

Alliances:

- *Pleuraphis mutica* Herbaceous Alliance (A.1249)

DISTRIBUTION

Range: This grassland system is found from the northern to central Chihuahuan Desert and extends across the Trans-Pecos and into areas of the southwestern Great Plains. It extends from western Texas across New Mexico and into southeastern Arizona. Stands are

described from Jornada del Muerto Basin, Marfa grasslands and Marathon Basin, south to central Chihuahua and Coahuila, Mexico.

Divisions: 302:C; 303:C

Nations: MX, US

Subnations: AZ, MXCH(MX), MXCO(MX), NM, TX

Map Zones: 25:C, 26:C

TNC Ecoregions: 22:C, 24:C, 28:C

SOURCES

References: Brown 1982, Dick-Peddie 1993, MacMahon and Wagner 1985, Muldavin et al. 1998a, Muldavin et al. 2000b, NRCS 2006, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.797571#references

Description Author: K.A. Schulz

Version: 04 Feb 2009

Concept Author: K.A. Schulz, S. Yanoff, and L. Elliott

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1133 CHIHUAHUAN SANDY PLAINS SEMI-DESERT GRASSLAND (CES302.736)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Sand Soil Texture; Graminoid

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Mesa; Plain; Toeslope/Valley Bottom; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Continental]; Temperate [Temperate Xeric]; Aridic; Xeromorphic Shrub; Succulent Shrub

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2133; ESLF 7105; ESP 1133

CONCEPT

Summary: This ecological system occurs across the Chihuahuan Desert and extends into the southern Great Plains where soils have a high sand content. These dry grasslands or steppe are found on sandy plains and sandstone mesas. The graminoid layer is typically dominated or codominated by *Bouteloua eriopoda* and *Sporobolus flexuosus* with characteristic Chihuahuan species. Other common species are *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa neomexicana* (minor), *Muhlenbergia arenicola*, *Pleuraphis jamesii*, *Sporobolus airoides*, *Sporobolus constrictus*, and *Sporobolus cryptandrus*. Typically, there are scattered desert shrubs and stem succulents present, such as *Ephedra torreyana*, *Ephedra trifurca*, *Opuntia imbricata*, *Yucca baccata*, *Yucca elata*, and *Yucca torreyi*, that are characteristic of the Chihuahuan Desert. The widespread shrub *Artemisia filifolia* is also frequently present, especially in the northern extent.

Classification Comments: When degraded, this grassland will convert to open to dense shrublands frequently dominated by *Prosopis glandulosa* or *Artemisia filifolia* (in its northern extent where it is too cold for *Prosopis glandulosa* to be abundant) (S. Yanoff pers. comm. 2006). This degraded type is classified as Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub (CES302.737).

Related Concepts:

- Black Grama - Sideoats Grama (703) (Shiflet 1994) Intersecting
- Blue Grama - Sideoats Grama - Black Grama (707) (Shiflet 1994) Intersecting
- Grama - Muhly - Threawn (713) (Shiflet 1994) Finer

MEMBERSHIP

Associations:

- *Ephedra torreyana* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001731, G2)
- *Ephedra trifurca* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001732, G2)
- *Sporobolus flexuosus* - *Paspalum setaceum* Herbaceous Vegetation (CEGL001694, G1G2)
- *Sporobolus flexuosus* - *Sporobolus contractus* Herbaceous Vegetation (CEGL001696, GNRQ)
- *Yucca elata* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001735, G2)

Alliances:

- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Sporobolus flexuosus* Herbaceous Alliance (A.1268)

DISTRIBUTION

Range: This Chihuahuan Desert ecological system extends into the southern Great Plains where soils have a high sand content.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), NM, TX

Map Zones: 15:?, 24:C, 25:C, 26:C, 27:C, 34:?

USFS Ecomap Regions: 313B:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322B:??, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 24:C, 28:C

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000b, Muldavin et al. 2002, Yanoff pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722936#references

Description Author: K.A. Schulz

Version: 29 Jan 2007

Stakeholders: Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

1134 COLUMBIA BASIN FOOTHILL AND CANYON DRY GRASSLAND (CES304.993)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Sideslope; Very Shallow Soil; Landslide; Graminoid

Non-Diagnostic Classifiers: Herbaceous; Temperate [Temperate Continental]; Unconsolidated; Succulent Shrub

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2134; ESLF 7106; ESP 1134

CONCEPT

Summary: These grasslands are similar floristically to Columbia Basin Palouse Prairie (CES304.792) but are distinguished by landform, soil, and process characteristics. They occur in the canyons and valleys of the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington. Occurrences are found on steep open slopes, from 90 to 1525 m (300-5000 feet) elevation. Annual precipitation is low, ranging from 4 to 10 cm. Settings are primarily long, steep slopes of 100 m to well over 400 m, with soils derived from residuum and having patchy, thin, wind-blown surface deposits. Slope failures are a common process. Fire frequency is presumed to be less than 20 years. The vegetation is dominated by patchy graminoid cover, cacti, and some forbs. *Pseudoroegneria spicata*, *Festuca idahoensis*, and *Opuntia polyacantha* are common species. Deciduous shrubs *Symphoricarpos* spp., *Physocarpus malvaceus*, *Holodiscus discolor*, and *Ribes* spp. are infrequent native species that may increase with fire exclusion.

Similar Ecological Systems:

- Columbia Basin Palouse Prairie (CES304.792)
- Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)
- Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

Related Concepts:

- Bluebunch Wheatgrass (101) (Shiflet 1994) Intersecting
- Idaho Fescue (102) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Aristida purpurea* var. *longiseta* - *Poa secunda* Herbaceous Vegetation (CEGL001781, G3)
- *Aristida purpurea* var. *longiseta* - *Pseudoroegneria spicata* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001589, G2)
- *Aristida purpurea* var. *longiseta* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001515, G1)
- *Pseudoroegneria spicata* - *Festuca idahoensis* Canyon Herbaceous Vegetation (CEGL001669, G3)
- *Pseudoroegneria spicata* - *Opuntia polyacantha* - (*Poa secunda*) Herbaceous Vegetation (CEGL001673, G3)
- *Sporobolus cryptandrus* - *Poa secunda* Herbaceous Vegetation (CEGL001516, G2)

Alliances:

- *Poa secunda* Herbaceous Alliance (A.1291)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Sporobolus cryptandrus* Herbaceous Alliance (A.1252)

DISTRIBUTION

Range: Occurs in the canyons and valleys of the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington, on steep open slopes, from 90 to 1525 m (300-5000 feet) elevation.

Divisions: 304:C; 306:C

Nations: US

Subnations: ID, OR, WA

Map Zones: 1:P, 8:C, 9:C, 10:C, 16:?, 17:?, 18:C

USFS Ecomap Regions: 331A:CC, 341G:PP, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261D:C?, M261G:CC, M331A:C?, M331D:CP, M332A:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CP, M333D:CC

TNC Ecoregions: 6:C, 8:C, 68:P

SOURCES

References: Comer et al. 2003, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Tisdale 1986, Tisdale and Bramble-Brodahl 1983

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722712#references

Description Author: R. Crawford, J. Kagan, M. Reid
Version: 08 Sep 2004
Concept Author: R. Crawford, J. Kagan, M. Reid

Stakeholders: West
ClassifResp: West

1142 COLUMBIA BASIN PALOUSE PRAIRIE (CES304.792)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Long (>500 yrs) Persistence; Loess deposit (undifferentiated); Herbaceous; Deep Soil; Mineral: W/A-Horizon >10 cm; Graminoid; Cool-season bunch grasses

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Temperate [Temperate Continental]; Glaciated

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2142; ESLF 7115; ESP 1142

CONCEPT

Summary: This once-extensive grassland system occurs in eastern Washington and Oregon, and west-central Idaho, though in very small patches there. In much of its range it is characterized by rolling topography composed of loess hills and plains over basalt plains. The climate of this region has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 38-76 cm (15-30 inches). The soils are typically deep, well-developed, and old. The cool-season bunch grasses that dominate the vegetation are adapted to this winter precipitation. Characteristic species are *Pseudoroegneria spicata* and *Festuca idahoensis* with *Hesperostipa comata*, *Achnatherum scribneri*, *Leymus condensatus*, *Leymus cinereus*, *Koeleria macrantha*, *Pascopyrum smithii*, or *Poa secunda*. Shrubs commonly found include *Amelanchier alnifolia*, *Rosa* spp., *Eriogonum* spp., *Symphoricarpos albus*, and *Crataegus douglasii*. Excessive grazing, past land use and invasion by introduced annual species have resulted in a massive conversion to agriculture or shrub-steppe and annual grasslands dominated by *Artemisia* spp. and *Bromus tectorum* or *Poa pratensis*. Remnant grasslands are now typically associated with steep and rocky sites or small and isolated sites within an agricultural landscape.

Similar Ecological Systems:

- Columbia Basin Foothill and Canyon Dry Grassland (CES304.993)
- Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

Related Concepts:

- Bluebunch Wheatgrass (101) (Shiflet 1994) Intersecting
- Idaho Fescue (102) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- (*Balsamorhiza serrata*) - *Poa secunda* Herbaceous Vegetation (CEGL001782, G2)
- *Elymus lanceolatus* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001746, G1)
- *Eriogonum compositum* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001784, G2)
- *Eriogonum douglasii* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001785, G2)
- *Eriogonum sphaerocephalum* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001448, G3)
- *Eriogonum thymoides* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001449, G3)
- *Festuca idahoensis* - *Eriogonum caespitosum* Herbaceous Vegetation (CEGL001615, G2?Q)
- *Festuca idahoensis* - *Hieracium cynoglossoides* Herbaceous Vegetation (CEGL001619, G1G2)
- *Festuca idahoensis* - *Koeleria macrantha* Herbaceous Vegetation (CEGL001620, G3Q)
- *Festuca idahoensis* - *Symphoricarpos albus* Herbaceous Vegetation (CEGL001509, G1)
- *Hesperostipa comata* - *Poa secunda* Herbaceous Vegetation (CEGL001704, G1)
- *Leymus cinereus* Herbaceous Vegetation (CEGL001479, G2G3Q)
- *Pseudoroegneria spicata* - *Balsamorhiza sagittata* - *Poa secunda* Herbaceous Vegetation (CEGL001662, G2)
- *Pseudoroegneria spicata* - *Festuca idahoensis* Palouse Herbaceous Vegetation (CEGL001670, G1)
- *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation (CEGL001677, G4?)
- *Pseudoroegneria spicata* - *Poa secunda* Lithosolic Herbaceous Vegetation (CEGL001678, G3)
- *Rosa nutkana* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001626, G1G2Q)
- *Symphoricarpos albus* - *Rosa nutkana* Shrubland (CEGL001130, G3)

Alliances:

- *Elymus lanceolatus* Herbaceous Alliance (A.1242)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Hesperostipa comata* Bunch Herbaceous Alliance (A.1270)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Poa secunda* Dwarf-shrub Herbaceous Alliance (A.1568)
- *Poa secunda* Herbaceous Alliance (A.1291)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)

- *Symphoricarpos albus* Shrubland Alliance (A.925)

DISTRIBUTION

Range: This system occurs in eastern Washington and Oregon, and west-central Idaho.

Divisions: 304:C; 306:P

Nations: CA?, US

Subnations: BC?, ID, OR, WA

Map Zones: 8:C, 9:C, 10:P

USFS Ecomap Regions: 331A:CC, 342C:C?, 342D:CP, 342H:CC, 342I:CC, M242C:PP, M242D:PP, M332A:CP, M332G:CC, M333A:CC, M333D:CP

TNC Ecoregions: 6:C, 8:P

SOURCES

References: Comer et al. 2003, Daubenmire 1988, Tisdale 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722880#references

Description Author: NatureServe Western Ecology Team, mod. M.S. Reid

Version: 23 Jan 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West
ClassifResp: West

CUMBERLAND WET-MESIC MEADOW AND SAVANNA (CES202.053)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 7165

CONCEPT

Summary: This system consists of open, prairie-like vegetation of the undissected portions of the Cumberland Plateau of Kentucky and adjacent Tennessee (Ecoregion 68a [Cumberland Plateau] of Griffith et al. (1998) and Woods et al. (2002); part of Subsection 221Hc of Keys et al. (1995)). Stands are dominated by grasses and forbs with scattered shrubby vegetation and, occasionally, trees. The scattered trees are mainly *Quercus bicolor*, *Quercus falcata*, *Quercus palustris*, *Nyssa sylvatica*, *Liquidambar styraciflua*, and *Acer rubrum* var. *trilobum* (Braun 1937). The primary dominant grass in the wetter phase is *Chasmanthium laxum* (Braun 1937). This vegetation was the predominant type here in the early 1800s and earlier and probably was maintained from burning by Native Americans.

Similar Ecological Systems:

- Eastern Highland Rim Prairie and Barrens (CES202.354)
- North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Western Highland Rim Prairie and Barrens (CES202.352)

DESCRIPTION

Environment: This system is found in an open, flat to gently rolling landscape which easily carries fire if maintained in a grassy condition.

Vegetation: Common grasses include *Andropogon glomeratus*, *Calamagrostis coarctata* (= *Calamagrostis cinnoides*) (southern), *Dichanthelium sphaerocarpon* var. *isophyllum* (= *Panicum polyanthes*), and *Dichanthelium scoparium* (= *Panicum scoparium*), plus, in drier transitions, *Panicum anceps*, *Schizachyrium scoparium*, *Sorghastrum nutans*, and locally *Andropogon gerardii*. Sedges are common, especially *Carex atlantica* (with var. *capillacea*), *Carex debilis* (with vars.), *Carex lurida* (with var. *gracilis*), *Rhynchospora capitellata*, *Rhynchospora glomerata*, *Scirpus cyperinus*, *Scirpus polyphyllus*, etc. Rushes are also common, especially *Juncus canadensis* and *Juncus marginatus* on drier sites (?); *Juncus effusus* (with var. *pylaei*) and *Juncus coriaceus* on wetter sites (?). Common ferns are *Lygodium palmatum*, *Thelypteris noveboracensis* and, in wetter places, *Athyrium filix-femina* ssp. *asplenioides* (= *Athyrium asplenioides*) and *Osmunda cinnamomea*. The most abundant herbs often include *Eupatorium fistulosum* and *Solidago rugosa*. Other typical species include *Agalinis purpurea*, *Aletris farinosa*, *Apios americana*, *Symphotrichum dumosum* (= *Aster dumosus*), *Doellingeria umbellata* (= *Aster umbellatus*), *Eupatorium pilosum*, *Eupatorium rotundifolium*, *Eupatorium perfoliatum* (richer soil?), *Linum striatum*, *Lobelia puberula*, *Lycopus virginicus*, *Platanthera ciliaris* (often in drier sites), *Potentilla simplex*, *Rhexia mariana* (less *Rhexia virginica*), *Viola primulifolia*, and *Vernonia noveboracensis* (southern). The subshrubby vine *Rubus hispidus* is also common. Regionally rare species (mostly increasing to the south) include *Bartonia paniculata*, *Gratiola pilosa*, *Helianthus angustifolius*, *Hypericum crux-andreae*, *Lobelia nuttallii*, *Dichanthelium dichotomum* var. *ensifolium* (= *Panicum ensifolium*), *Panicum rigidulum* var. *pubescens* (= *Panicum longifolium*) (locally abundant on finer soils), *Platanthera cristata* (typically in boggy forest transitions), *Polygala cruciata*, *Pycnanthemum verticillatum*?, *Rhynchospora globularis*, *Sabatia campanulata*?, *Stenanthium gramineum*, *Xyris torta*, etc. The most abundant woody species include *Acer rubrum* var. *trilobum* and *Rhus copallinum*; others include *Alnus serrulata*, *Photinia* spp. (*Photinia pyrifolia* (= *Aronia arbutifolia*), *Photinia melanocarpa* (= *Aronia melanocarpa*)), *Ilex opaca*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Lyonia ligustrina*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Pinus echinata*, *Quercus alba*, *Rhododendron* sp. (*Rhododendron cumberlandense*? (= *Rhododendron bakeri*?)), *Rubus* spp. (*Arguti* group), *Salix* spp. (*Salix humilis*, *Salix nigra*, *Salix sericea*), *Spiraea tomentosa* (local on finer textured soil?), and *Smilax glauca* (J. Campbell unpubl. data).

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Kentucky Herbaceous Vegetation (CEGL004677, G1G2)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)

DISTRIBUTION

Range: This system is found in the Cumberland Plateau of Kentucky and adjacent Tennessee.

Divisions: 202:C

Nations: US

Subnations: KY, TN

Map Zones: 47:C
TNC Ecoregions: 50:C

SOURCES

References: Braun 1937, Campbell pers. comm., Griffith et al. 1998, Keys et al. 1995, Southeastern Ecology Working Group n.d., Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.792682#references

Description Author: M. Pyne, M. Evans, C. Nordman

Version: 17 Apr 2006

Concept Author: M. Pyne, M. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1427 EAST GULF COASTAL PLAIN JACKSON PLAIN PRAIRIE AND BARRENS (CES203.353)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2427; ESLF 7140; ESP 1427

CONCEPT

Summary: This ecological system was locally dominant in the Jackson Purchase area of western Kentucky, extending into limited areas of adjacent Tennessee. This central region, called "the Barrens," has been historically subdivided from the rest of the Coastal Plain region of Kentucky (Davis 1923, Bryant and Martin 1988). A number of early reports mentioned extensive prairies in this region and also emphasized the importance of annual fires in maintaining these grasslands [see references in Bryant and Martin (1988)]. Interspersed among the extensive grasslands were likely scattered groves of oaks, especially those tolerant of frequent fires (M. Evans pers. comm.). Among the most frequent trees historically present in the entire region were *Quercus stellata*, *Quercus velutina*, and *Quercus marilandica* (Bryant and Martin 1988). With fire suppression, groves of trees rapidly expanded and largely replaced the prairies. In general, this system was found on "poorly consolidated Tertiary deposits" (Evans 1991), which are capped by loess, in the northern part of the Upper East Gulf ecoregion. High-quality examples would support a dense herbaceous layer dominated by tall grasses such as *Andropogon gerardii* and *Schizachyrium scoparium*, but the floristic composition of this type is poorly known since so few extant examples remain (M. Evans pers. comm.). *Sassafras albidum* and *Diospyros virginiana* are present in current sample data from stands attributed to this type (Bryant and Held 2001), but their presence at higher cover values is probably a symptom of fire suppression.

Classification Comments: The component associations of this system are poorly known since so few extant examples remain. The best remaining examples may be found in the West Kentucky Wildlife Management Area (M. Evans pers. comm.). This system extends, at least historically, into adjacent Henry County, TN, interpreted from the occurrence of several barrens plant species (M. Pyne pers. obs.). Related systems are known from Cretaceous gravels in the Western Highland Rim of Tennessee and from flat uplands of the Southeastern Highland Rim (this latter one includes wetter (xerohydric) barrens). It is classed as a "large-patch" system today, but larger examples are rare if they exist at all, primarily due to its fragmentation by agriculture and fire suppression.

Similar Ecological Systems:

- Western Highland Rim Prairie and Barrens (CES202.352)

Related Concepts:

- Tallgrass Prairie (Evans 1991) Intersecting
- Wet Prairie (Evans 1991) Intersecting

DESCRIPTION

Environment: Soils are predominantly thin, well-drained, and gravelly. This system likely did not develop on the deeper loess soils of the region. The former barrens were on flat to gently rolling lands just to the dry side of the moisture gradient (Bryant and Held 2001).

Vegetation: Some stands sampled by Bryant and Held (2001) were recognized by them as perhaps representing "the former barrens of the JPR" (Jackson Prairie Region). *Quercus stellata*, *Quercus falcata*, *Sassafras albidum*, and *Diospyros virginiana* were generally present in the stands sampled, which were located in those portions of Ballard, Graves and Calloway counties mapped as barrens by Davis (1923). *Andropogon gerardii*, *Schizachyrium scoparium*, and *Sorghastrum nutans*, characteristic prairie grasses, and several scrub oaks were located together in Graves County near the stands sampled (Bryant and Held 2001). Some possible shrub species include *Rosa setigera* and *Rhus copallinum*. Wetter swales dominated by *Panicum virgatum* are probably imbedded within these predominantly dry-mesic barrens.

Dynamics: Past fire and grazing constitute the major dynamic processes for the "barrens" region of the Jackson Purchase area of western Kentucky and adjacent Tennessee. Fires were probably frequent (potentially on a five-year return interval), primarily of human origin, and are thought to have occurred in late summer to early autumn prior to European settlement. Some proposed factors which have functioned to maintain the openness of this system following the reduction of fire frequency include the droughty, gravelly soils and resulting stresses to vegetation, as well as more occasional fire. Fralish et al. (1999) noted that both post oak and chestnut oak woodlands are essentially the result of fire suppression in the barrens and historic savannas. In some areas, where the soils are particularly harsh (droughty, nutrient-poor, rocky), stands may retain an open aspect in the absence of fire. Some of the extant examples are largely dependent on contemporary management regimes.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Andropogon glomeratus*, *Panicum virgatum*, *Sorghastrum nutans*) Herbaceous Vegetation (CEGL007705, G2?)

- *Andropogon gerardii* - (*Sorghastrum nutans*) Kentucky Herbaceous Vegetation (CEGL004677, G1G2)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* / *Schizachyrium scoparium* Woodland (CEGL002150, G2G3)
- *Quercus marilandica* / *Vaccinium arboreum* / *Danthonia spicata* Scrub Woodland (CEGL002425, G3G4)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Wooded Herbaceous Vegetation (CEGL002391, G2G3)
- *Spartina pectinata* Western Kentucky Herbaceous Vegetation (CEGL004118, G1Q)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

DISTRIBUTION

Range: This system occurs in the Jackson Purchase area of western Kentucky (primarily Graves County and parts of Calloway County), extending into limited areas of adjacent Tennessee.

Divisions: 203:C

Nations: US

Subnations: KY, TN?

Map Zones: 47:C

USFS Ecomap Regions: 231H:CC

TNC Ecoregions: 43:C

SOURCES

References: Bryant and Held 2001, Bryant and Martin 1988, Comer et al. 2003, Davis 1923, Evans 1991, Fralish et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723159#references

Description Author: R. Evans and M. Evans, mod. M. Pyne

Version: 23 May 2008

Concept Author: R. Evans and M. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1424 EAST-CENTRAL TEXAS PLAINS XERIC SANDYLAND (CES205.897)

CLASSIFIERS

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Sand Soil Texture; Xeric; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2424; ESLF 7137; ESP 1424

CONCEPT

Summary: This extremely xeric system of the east-central Texas Plains (EPA ecoregion 33; post oak savanna region) is found primarily on the Carrizo geologic formation, but also on other Eocene strata such as Queen City and Sparta. The combination of these very droughty soils with low levels of rainfall create extreme edaphic conditions and a locally unique environment which supports a number of endemic plant taxa. There are a number of endemics associated with this system. The vegetational component of this system includes open herbaceous-dominated sand "prairies" or "barrens" to open oak-dominated woodlands. A large number of narrowly distributed, endemic species are associated with this system, including *Abronia macrocarpa*, *Allium elmendorfii*, *Brazoria truncata* var. *pulcherrima* (= *Brazoria pulcherrima*), *Brazoria truncata* var. *truncata*, *Chaetopappa imberbis*, *Cryptantha texana*, *Dalea obovata*, *Galactia canescens*, *Hymenopappus carrizoanus*, *Lechea san-sabeana*, *Lesquerella grandiflora*, *Liatris elegans* var. *carizzana*, *Polanisia erosa* ssp. *breviglandulosa*, *Polygonella parksii*, *Prunus texana*, *Senecio ampullaceus*, *Sphaeralcea lindheimeri*, *Tephrosia lindheimeri*, and *Tetragonotheca repanda*.

Classification Comments: The endemism associated with this system has been well-documented (Sorrie and Weakley 2001, MacRoberts et al. 2003).

Similar Ecological Systems:

- East-Central Texas Plains Post Oak Savanna and Woodland (CES205.679)
- Western Great Plains Sandhill Steppe (CES303.671)

DESCRIPTION

Environment: This extremely xeric system is found primarily on the Carrizo geologic formation, but also on other Eocene strata such as Queen City and Sparta. The combination of these very droughty soils with low levels of rainfall create extreme edaphic conditions and a locally unique environment which supports a number of endemic plant taxa.

Vegetation: Stands of this system may vary in composition from open herbaceous-dominated sand "prairies" or "barrens" dominated by *Schizachyrium scoparium* to open oak-dominated woodlands. A large number of narrowly distributed, endemic species are associated with this system, including *Abronia macrocarpa*, *Allium elmendorfii*, *Brazoria truncata* var. *pulcherrima* (= *Brazoria pulcherrima*), *Brazoria truncata* var. *truncata*, *Chaetopappa imberbis*, *Cryptantha texana*, *Dalea obovata*, *Galactia canescens*, *Hymenopappus carrizoanus*, *Lechea san-sabeana*, *Lesquerella grandiflora*, *Liatris elegans* var. *carizzana*, *Polanisia erosa* ssp. *breviglandulosa*, *Polygonella parksii*, *Prunus texana*, *Senecio ampullaceus*, *Sphaeralcea lindheimeri*, *Tephrosia lindheimeri*, and *Tetragonotheca repanda*.

MEMBERSHIP

Associations:

- *Schizachyrium scoparium* - *Lechea tenuifolia* - *Acalypha radians* Herbaceous Vegetation (CEGL004913, G2G3)

Alliances:

- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)

DISTRIBUTION

Range: This system is endemic to central Texas.

Divisions: 205:C

Nations: US

Subnations: TX

Map Zones: 32:C, 35:C, 36:C, 37:P

USFS Ecomap Regions: 255C:CC, 315E:CC

TNC Ecoregions: 32:C

SOURCES

References: Comer et al. 2003, EPA 2004, MacRoberts et al. 2002a, Sorrie and Weakley 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722784#references

Description Author: R. Evans and M. Pyne

Version: 22 Sep 2008

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1417 EASTERN HIGHLAND RIM PRAIRIE AND BARRENS (CES202.354)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Very Short Disturbance Interval; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2417; ESLF 7130; ESP 1417

CONCEPT

Summary: This system represents "The Barrens" of the Southeast Highland Rim of Tennessee. This is a distinctive part of the state and ecoregion (the "Dickson-Mountview-Guthrie" Soil Association of Elder and Springer 1978, Springer and Elder 1980). It includes a series of plant communities with open canopies, ranging from herbaceous-dominated barrens (some of which are maintained today by mowing instead of fire and grazing) through savanna and woodland types. Open ponds and other wetlands are scattered throughout the landscape. The variety of relatively open habitats which are present here include prairie-like areas, as well as savanna woodlands and upland depression ponds.

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Southern Ridge and Valley Patch Prairie (CES202.453)
- Western Highland Rim Prairie and Barrens (CES202.352)

DESCRIPTION

Environment: These various barren communities occur on Fragiudult soils formed in Pleistocene loess over karstic Mississippian Limestone. Their topography is flat to gently sloping. Some proposed factors which have functioned to maintain their openness include the hardpan soils and fire (as well as natural and managed grazing, and modern anthropogenic factors such as mowing for hay, etc.). These barrens include a variety of systems whose primary presettlement environmental factors were specialized soils and extremes of hydrology, as influenced by fire and grazing. The prevalent soils within the polygon labeled "Dickson-Mountview-Guthrie" (D32 of Elder and Springer 1978, Springer and Elder 1980) are generally flatter, wetter, and more likely to have fragipans than adjoining units. Average conditions in the area of The Barrens can be summarized as follows (Wolfe 1996): January is typically the coldest month, with average high and low temperatures of 8.8Å° C (47.8Å° F) and 1.9Å° C (35.4Å° F), respectively. July is the warmest month, with average high and low temperatures of 31.3Å° C (88.3Å° F) and 18.9Å° C (66.0Å° F), respectively. Monthly mean temperatures range from 3.5Å° C (38.3Å° F) in January to 25.11Å° C (77.2Å° F) in July. The mean annual precipitation is 1438 mm (56.6 inches; Wolfe 1996, Pyne 2000). Precipitation is heaviest from November through May, averaging between 113 and 171 mm (4.4 to 6.7 in) per month. Rainfall is lightest during the months of June through October, with averages ranging from 83 mm (3.3 in) per month to a minor peak of 122 mm (4.8 in) in July.

Vegetation: Stands may vary in physiognomy from savanna-grasslands to oak-dominated woodlands and forests. Many stands are in a forested condition today due to lack of fire. Typical mesic grassland vegetation of the barrens of the southeastern Highland Rim of Tennessee is dominated by *Andropogon gerardii* along with *Schizachyrium scoparium* and *Sorghastrum nutans*. Other graminoid species present include *Andropogon glomeratus*, *Calamagrostis coarctata*, and *Panicum virgatum*. Other dominants may include *Eurybia hemispherica* (= *Aster paludosus* ssp. *hemisphericus*), *Symphotrichum dumosum* (= *Aster dumosus*), *Helianthus angustifolius*, *Potentilla simplex*, *Solidago odora*, *Solidago rugosa*, *Pteridium aquilinum*, and *Polytrichum commune*; found to a lesser extent are *Aristida purpurascens* var. *virgata* (= *Aristida virgata*), *Chasmanthium laxum*, *Dichantheium aciculare* (= *Dichantheium angustifolium*), *Dichantheium dichotomum*, *Gymnopogon brevifolius*, *Panicum anceps*, *Panicum rigidulum*, and *Panicum verrucosum*. Woody species may include *Quercus alba*, *Quercus stellata*, *Quercus falcata*, *Quercus marilandica*, *Carya* spp., *Acer rubrum*, *Rhus copallinum*, *Rosa setigera*, *Salix humilis*, *Diospyros virginiana*, *Rubus argutus*, and *Smilax glauca*. The Barrens contains a variety of natural, semi-natural, and managed openings which provide habitat for plants and animals which are unusual in the ecoregion, rare in the state, or globally rare. These include a variety of plants more at home in other ecoregions, most notably the Coastal Plain and the western prairies, including carnivorous plants and other specialized plants of ponds and other wetlands. In addition, globally rare endemic fish and disjunct amphibians and invertebrates call The Barrens their home.

Dynamics: Past fire and grazing constitute the major dynamic processes for this system. Fires were frequent (potentially on a five-year return interval, documented over approximately the last 370 years), primarily of human origin, occurring in late summer to early autumn. Forestry activities (including planting of off-site loblolly pine, which is not truly native to the region) and fire suppression have lead to the current forested condition with solar intensity as low as 10%. The current persistence of prairies, shrublands, and grassy-woodland/savannas is largely dependent on contemporary management regimes. The woodlands, savannas and

prairies are often grown up in woody vegetation (e.g., *Acer rubrum*, *Liquidambar styraciflua*, as well as *Quercus* spp. and *Carya* spp.) due to fire suppression. Woodlands dominated by *Quercus alba*, *Quercus stellata*, and to a lesser extent *Quercus marilandica* often "fill in" with less fire-tolerant species (e.g., *Quercus falcata*, *Quercus coccinea*, *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica*, etc.) resulting in a closed-canopy forest.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Andropogon glomeratus*, *Panicum virgatum*, *Sorghastrum nutans*) Herbaceous Vegetation (CEGL007705, G2?)
- *Andropogon gerardii* - *Schizachyrium scoparium* - (*Calamagrostis coarctata*, *Panicum virgatum*) Herbaceous Vegetation (CEGL007706, G2?)
- *Andropogon gerardii* - *Schizachyrium scoparium* - *Dichanthelium scoparium* - *Rhynchospora glomerata* Herbaceous Vegetation (CEGL004006, G1)
- *Juniperus virginiana* var. *virginiana* / *Rhus copallinum* / *Schizachyrium scoparium* Woodland (CEGL007704, GNA)
- *Quercus (falcata, stellata)* / *Quercus marilandica* / *Gaylussacia (baccata, dumosa)* Woodland (CEGL004922, G2G3)
- *Quercus phellos* - *Quercus alba* / *Vaccinium fuscatum* - (*Viburnum nudum*) / *Carex (barrattii, intumescens)* Forest (CEGL007364, G2)
- *Quercus phellos* - *Quercus nigra* - (*Nyssa biflora*) Forest (CEGL007405, G1?)
- *Quercus stellata* - (*Quercus coccinea*) / *Quercus marilandica* / *Vaccinium pallidum* - (*Vaccinium stamineum*) Woodland (CEGL004709, G2G3)
- *Schizachyrium scoparium* - *Andropogon (gyrans, ternarius, virginicus)* Herbaceous Vegetation (CEGL007707, G3?)
- *Schizachyrium scoparium* - *Calamagrostis coarctata* Herbaceous Vegetation (CEGL007708, GNRQ)
- *Schizachyrium scoparium* - *Panicum anceps* - *Panicum virgatum* - *Lespedeza capitata* - *Scleria* spp. Herbaceous Vegetation (CEGL004063, G1)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Spatial Summary: This system was the historic matrix system in a large region of five Tennessee counties of the southeastern Highland Rim. It is classed as a "large patch" system primarily due to its fragmentation by fire suppression, tree plantations, agriculture, and suburban development.

Adjacent Ecological Systems:

- Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)

Adjacent Ecological System Comments: The depression ponds which occur within the landscape of Eastern Highland Rim Prairie and Barrens (CES202.354) are examples of the Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018); several depression pond associations particular to the Eastern Highland Rim are described. Small wet depressions in the Eastern Highland Rim Prairie and Barrens (CES202.354), which are not distinguished physiognomically or by canopy species, are included in the concept of Eastern Highland Rim Prairie and Barrens (CES202.354). These are akin to vernal pools or wet streamheads. These small wet depressions with extensive herbaceous vegetation (e.g., *Carex*, *Juncus*, and *Panicum* species) certainly would have burned during drier periods.

DISTRIBUTION

Range: This system is restricted to "The Barrens" of the southeastern Highland Rim of Tennessee (today primarily extant in Coffee, Franklin, and Warren counties, Tennessee). This is a small part of Subsection 223Eb (USFS) and EPA Level IV Ecoregion 71g.

Divisions: 202:C

Nations: US

Subnations: TN

Map Zones: 48:C, 53:P

USFS Ecomap Regions: 223E:CC

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, Elder and Springer 1978, Pyne 2000, Springer and Elder 1980, Wolfe 1996

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723158#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 25 Jan 2008

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1425 FLORIDA DRY PRAIRIE (CES203.380)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Short Disturbance Interval; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2425; ESLF 7138; ESP 1425

CONCEPT

Summary: This system, which is endemic to subtropical Florida, is characterized by nearly treeless plains with dense cover of grasses and low shrubs, primarily *Serenoa repens*. Examples occur on flat, low-lying terrain over moderately to poorly drained soils with sandy surfaces overlying organic hardpans or clayey subsoil (FNAI 1990). This type was historically expansive in several regions of Florida (Harper 1927). Early surveyors noted large expanses of this system on the plains near the Kissimmee River, north from Lake Okeechobee, and in the area west of Lake Okeechobee (Fisheating Creek) (Huffman and Judd 1998). The original extent has been heavily reduced by clearing for agriculture and conversion for forage production. Intact examples have been further altered by fire suppression which changes the proportion of grasses and shrubs and may further alter species composition. Frequent fires were an important natural process in this system, with an estimated frequency of 1-4 years (FNAI 1990).

Classification Comments: This system grades into mesic pine flatwoods and may have nearly identical composition except for the absent or nearly absent overstory layer (Abrahamson and Hartnett 1990, FNAI 1990, Huffman and Judd 1998).

The Florida Gap program recognizes a single map unit which is apparently analogous to this type.

Similar Ecological Systems:

- South Florida Pine Flatwoods (CES411.381)

Related Concepts:

- Dry Prairie (FNAI 1990) Equivalent

DESCRIPTION

Environment: The climate where this system occurs is subtropical, characterized by hot, wet summers and mild, dry winters. Annual rainfall is about 127 cm and occurs mostly in June through September. It occurs on flat, moderately to poorly drained sandy sites. These areas are seldom inundated but may flood with several centimeters of water for short periods after heavy summer rains. The normal water table is several centimeters (in summer and fall) to several meters (in winter and spring) below the ground surface (Duever and Brinson 1984a, Hardin 1990, Abrahamson and Hartnett 1990). Soils consist of 0.1-0.9 m of undifferentiated quartz sand with a spodic horizon or clayey subsoil 30-107 cm below the surface. These acidic, nutrient-poor sands have few weatherable minerals and low clay nutrients in the surface soil (Abrahamson and Hartnett 1990). Soils supporting these sparse shrublands are classified as Arenic Haplaquods and include such series as Smyrna; types are Myakka (sandy, siliceous, hyperthermic Aeric Alaquod), Wabasso (sandy, siliceous, hyperthermic Alfic Alaquod), Oldsmar (sandy, siliceous, hyperthermic Alfic Arenic Alaquod), Immokalee (sandy, siliceous, hyperthermic Arenic Alaquod), Leon, Adamsville, and Keri sands (Moore and Swindel 1981, Duever and Brinson 1984a).

Vegetation: Intact examples of this system are generally open and essentially treeless areas dominated by *Serenoa repens* and low shrubs (*Quercus minima*, *Lyonia lucida*, *Lyonia fruticosa*, *Vaccinium darrowii*, *Vaccinium myrsinites*, *Ilex glabra*, and *Befaria racemosa*), as well as a variety of grasses (*Aristida beyrichiana*, *Schizachyrium scoparium* var. *stoloniferum*, *Sorghastrum secundum*, *Andropogon ternarius*, *Aristida spiciformis*, *Dichantherium dichotomum* var. *ensifolium*, *Dichantherium strigosum*, *Paspalum setaceum*, and others) (Huffman and Judd 1998). At least 5 fairly discrete phases or "states" of this system can be identified (Huffman and Werner 2000): good conditions are typified by abundant herbaceous cover and relatively low (<40%) cover of shrubs, especially *Serenoa repens*, degraded conditions resulting from long fire-free intervals result in reduced herbaceous cover and increased shrub coverage, to the eventual exclusion of all herbaceous cover.

Dynamics: Like the floristically and ecologically related pine flatwoods, the open structure and species composition of dry prairies is maintained by frequent fire. However, the natural fire frequency is thought to be greater than in the surrounding mesic pine flatwoods (Duever et al. 1982, Abrahamson and Hartnett 1990, Hardin 1990). Dry prairie is readily invaded by woody vegetation in the absence of fire, especially in the absence of fires which occur during the dry portions of early spring. In "good condition" this system has abundant herbaceous cover and relatively low cover (<40%) of *Serenoa repens*; degraded conditions are indicated by reduced herbaceous cover and increased cover of *Serenoa repens* (Huffman and Werner 2000). Outright replacement of dry prairies by oak - palmetto stands has been well documented at Myakka River State Park (Huffman and Blanchard 1990). Some sources suggest that examples of this system may be the result of anthropogenic factors that provided an unnaturally high fire frequency or removed vegetation through logging or grazing (Hardin 1990).

MEMBERSHIP

Associations:

- *Sabal palmetto* / *Serenoa repens* Woodland (CEGL003796, G1G2)
- *Serenoa repens* / *Aristida beyrichiana* Shrubland (CEGL004236, G2)

Alliances:

- *Sabal palmetto* Temperate Woodland Alliance (A.481)
- *Serenoa repens* / *Aristida beyrichiana* Saturated Shrubland Alliance (A.1519)

SPATIAL CHARACTERISTICS**Adjacent Ecological Systems:**

- Central Florida Herbaceous Pondshore (CES203.890)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: This system occurs in southern Florida mainly north of the Everglades and Big Cypress area. For instance, it is found on the plains near the Myakka River, Kissimmee River, as well as north of Lake Okeechobee and near Fisheating Creek (west of Lake Okeechobee).

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 232D:CC, 232G:CC

TNC Ecoregions: 55:C

SOURCES

References: Abrahamson and Hartnett 1990, Bridges 2006, Comer et al. 2003, Duever and Brinson 1984a, Duever et al. 1982, FNAI 1990, Hardin 1990, Harper 1927, Huffman and Blanchard 1990, Huffman and Judd 1998, Huffman and Werner 2000, Huffman pers. comm., Moore and Swindel 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723136#references

Description Author: R. Evans

Version: 11 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1135 INTER-MOUNTAIN BASINS SEMI-DESERT GRASSLAND (CES304.787)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Graminoid

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Intermediate Disturbance Interval; F-Landscape/Medium Intensity; G-Landscape/Low Intensity; Forb

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2135; ESLF 7107; ESP 1135

CONCEPT

Summary: This widespread ecological system includes the driest grasslands throughout the intermountain western U.S. It occurs on xeric sites over an elevation range of approximately 1450 to 2320 m (4750-7610 feet) on a variety of landforms, including swales, playas, mesas, alluvial flats, and plains. This system may constitute the matrix over large areas of intermountain basins, and also may occur as large patches in mosaics with shrubland systems dominated by *Artemisia tridentata ssp. tridentata*, *Artemisia tridentata ssp. wyomingensis*, *Atriplex* spp., *Coleogyne* spp., *Ephedra* spp., *Gutierrezia sarothrae*, or *Krascheninnikovia lanata*. Grasslands in areas of higher precipitation, at higher elevation, typically belong to other systems. Substrates are often well-drained sandy or loam soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. The dominant perennial bunch grasses and shrubs within this system are all drought-resistant plants. Dominant or codominant species are *Achnatherum hymenoides*, *Aristida* spp., *Bouteloua gracilis*, *Hesperostipa comata*, *Muhlenbergia* spp., or *Pleuraphis jamesii*. Scattered shrubs and dwarf-shrubs often are present, especially *Artemisia tridentata ssp. tridentata*, *Artemisia tridentata ssp. wyomingensis*, *Atriplex* spp., *Coleogyne* spp., *Ephedra* spp., *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Grasslands in the basins of south-central and southwestern Wyoming, dominated by *Pseudoroegneria spicata* and *Poa secunda* and containing cushion-form forbs and other species typical of dry basins, are included in this system.

Classification Comments: In the relatively high-elevation basins of Wyoming and south-central Montana, grass vegetation dominated or codominated by *Pseudoroegneria spicata* and *Poa secunda* seems to be transitional between more typical Inter-Mountain Basins Semi-Desert Grassland (CES304.787) as found farther west and south in the intermountain region and Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040) common on the foothills of the surrounding mountains. That grass vegetation is placed into this semi-desert grassland system, instead of into the foothill grassland system, for two reasons. The first is composition of the vegetation: *Pseudoroegneria*- and *Poa*-rich vegetation often contains shrubs (*Artemisia tridentata ssp. wyomingensis*, *Krascheninnikovia lanata*), other grasses (*Achnatherum hymenoides*, *Hesperostipa comata*), and cushion-form forbs common in drier vegetation of the same basins, while the species common in the foothills, especially *Festuca idahoensis* and *Leucopoa kingii*, are absent. The second is the setting: patches of the *Pseudoroegneria*- and *Poa*-rich vegetation occur in a mosaic with other basins systems, especially Inter-Mountain Basins Big Sagebrush Steppe (CES304.778), with which it often merges.

In the Columbia Plateau, this semi-desert ecological system does not include *Pseudoroegneria spicata*-dominated or -codominated associations such as *Pseudoroegneria spicata* - *Achnatherum hymenoides* Herbaceous Vegetation (CEGL001674) or *Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation (CEGL001677). Additionally, *Poa cusickii* Herbaceous Vegetation (CEGL001655) is restricted to relatively mesic sites there and does not occur in this semi-desert system as it occurs in the Columbia Plateau, but may be found in this system in Wyoming.

Similar Ecological Systems:

- Columbia Plateau Steppe and Grassland (CES304.083)
- Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

Related Concepts:

- Grama - Galleta (502) (Shiflet 1994) Finer

DESCRIPTION

Environment: Low-elevation grasslands in the Intermountain West region occur in semi-arid to arid climates at approximately 1450 to 2320 m (4750-7610 feet) elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesa tops, plateau parks, alluvial flats, and plains. These grasslands typically occur on xeric sites. This system experiences cold temperate conditions. Hot summers and cold winters with freezing temperatures and snow are common. Annual precipitation is usually from 20-40 cm (7.9-15.7 inches). A significant portion of the precipitation falls in July through October during the summer monsoon storms, with the rest falling as snow during the winter and early spring months. These grasslands occur on a variety of aspects and slopes. Sites may range from flat to moderately steep. Soils supporting this system also vary from deep to shallow, and from sandy to finer-textured. The substrate is typically derived from sandstone or shale. Some occurrences on sandy soils have a high cover of cryptogams on the soil surface. These cryptogams tend to increase the stability of the highly erodible sandy soils of these grasslands

during torrential summer rains and heavy wind storms (Kleiner and Harper 1977). *Muhlenbergia*-dominated grasslands which flood temporarily, combined with high evaporation rates in this dry system, can have accumulations of soluble salts in the soil. Soil salinity depends on the nature of the parent material and on the amount and timing of precipitation and flooding. Growth-inhibiting salt concentrations are diluted when the soil is saturated, allowing the growth of less salt-tolerant species. As the saturated soils dry, the salt concentrates until it precipitates out on the soil surface (Dodd and Coupland 1966, Ungar 1968).

Vegetation: The dominant perennial bunch grasses and shrubs within this system are all drought-resistant plants. Dominant or codominant species are *Achnatherum hymenoides*, *Aristida* spp., *Bouteloua gracilis*, *Hesperostipa comata*, *Muhlenbergia* spp., or *Pleuraphis jamesii*. Scattered shrubs and dwarf-shrubs often are present, especially *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex* spp., *Coleogyne* spp., *Ephedra* spp., *Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Grasslands in the basins of south-central and southwestern Wyoming, dominated by *Pseudoroegneria spicata* and *Poa secunda* and containing cushion-form forbs and other species typical of dry basins, are included in this system.

Dynamics: In some places, this system is maintained by frequent fires. *Bouteloua gracilis* is very grazing-tolerant and generally forms a short sod. *Pleuraphis jamesii* is only moderately palatable to livestock, but decreases when heavily grazed during drought and in the more arid portions of its range where it is the dominant grass (West 1972). This grass reproduces extensively from scaly rhizomes, which make the plant resistant to trampling by livestock and have good soil-binding properties (Weaver and Albertson 1956, West 1972). *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. (USDA 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USDA 1937). *Hesperostipa comata* is a deep-rooted grass that uses soil moisture below 0.5 m during the dry summers.

MEMBERSHIP

Associations:

- *Achnatherum hymenoides* - *Sporobolus contractus* Herbaceous Vegetation (CEGL001652, G2G4)
- *Achnatherum hymenoides* Colorado Plateau Herbaceous Vegetation (CEGL002343, GNR)
- *Achnatherum lettermanii* - *Oxytropis oreophila* Herbaceous Vegetation (CEGL002734, G2?)
- *Achnatherum nelsonii* - *Koeleria macrantha* Herbaceous Vegetation (CEGL001707, GNR)
- *Achnatherum speciosum* Herbaceous Vegetation (CEGL003112, G1Q)
- *Agropyron cristatum* - (*Pascopyrum smithii*, *Hesperostipa comata*) Semi-natural Herbaceous Vegetation (CEGL005266, GNA)
- *Aristida purpurea* Herbaceous Vegetation (CEGL005800, GNR)
- *Aristida purpurea* var. *longiseta* - *Poa secunda* Herbaceous Vegetation (CEGL001781, G3)
- *Aristida purpurea* var. *longiseta* - *Pseudoroegneria spicata* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001589, G2)
- *Aristida purpurea* var. *longiseta* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001515, G1)
- *Atriplex obovata* / *Sporobolus airoides* - *Pleuraphis jamesii* Shrub Herbaceous Vegetation (CEGL001775, GU)
- *Bouteloua eriopoda* - *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001753, GNRQ)
- *Bouteloua eriopoda* - *Pleuraphis jamesii* Herbaceous Vegetation (CEGL001751, G3)
- *Bouteloua eriopoda* Semi-desert Herbaceous Vegetation (CEGL001752, G2Q)
- *Bouteloua gracilis* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis* - *Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis* - *Hesperostipa comata* Herbaceous Vegetation [Provisional] (CEGL002932, GNR)
- *Bouteloua gracilis* - *Pleuraphis jamesii* Herbaceous Vegetation (CEGL001759, G2G4)
- *Bouteloua gracilis* Herbaceous Vegetation (CEGL001760, G4Q)
- *Bouteloua hirsuta* - *Bouteloua radicata* Herbaceous Vegetation (CEGL001765, G2)
- *Bromus inermis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation (CEGL005264, GNA)
- *Bromus tectorum* Semi-natural Herbaceous Vegetation (CEGL003019, GNA)
- *Elymus lanceolatus* Herbaceous Vegetation (CEGL002588, GNR)
- *Ericameria nauseosa* / *Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL003495, GNR)
- *Erodium cicutarium* Semi-natural Annual Herbaceous Vegetation (CEGL002085, GNA)
- *Gutierrezia sarothrae* - *Krascheninnikovia lanata* - *Atriplex canescens* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001733, G2)
- *Hesperostipa comata* - (*Bouteloua eriopoda*, *Pleuraphis jamesii*) Herbaceous Vegetation (CEGL002997, GNR)
- *Hesperostipa comata* - *Achnatherum hymenoides* Herbaceous Vegetation (CEGL001703, G2?)
- *Hesperostipa comata* Great Basin Herbaceous Vegetation (CEGL001705, G2G4)
- *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001708, G3)
- *Leymus cinereus* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001483, G3Q)
- *Muhlenbergia asperifolia* Herbaceous Vegetation (CEGL001779, GU)
- *Muhlenbergia pungens* Herbaceous Vegetation (CEGL002363, GNR)
- *Pascopyrum smithii* Herbaceous Vegetation (CEGL001577, G3G5Q)
- *Pleuraphis jamesii* Herbaceous Vegetation (CEGL001777, G2G4)
- *Pleuraphis rigida* Herbaceous Vegetation [Placeholder] (CEGL003051, G3G4)
- *Pleuraphis rigida* Shrub Herbaceous Vegetation [Placeholder] (CEGL003052, G3G4)
- *Poa cusickii* Herbaceous Vegetation (CEGL001655, G2)
- *Poa secunda* - *Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002755, GNR)
- *Poa secunda* Herbaceous Vegetation (CEGL001657, G4?)

- *Pseudoroegneria spicata* - *Achnatherum hymenoides* Herbaceous Vegetation (CEGL001674, G3G4)
- *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation (CEGL001677, G4?)
- *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001660, G2)
- *Pseudoroegneria spicata* ssp. *inermis* Herbaceous Vegetation (CEGL001661, GNR)
- *Sphaeralcea* (*coccinea*, *parvifolia*) Herbaceous Vegetation (CEGL005366, GNR)
- *Sporobolus airoides* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001686, GNRQ)
- *Sporobolus airoides* Monotype Herbaceous Vegetation (CEGL001688, GUQ)
- *Sporobolus airoides* Sod Herbaceous Vegetation [Placeholder] (CEGL001791, GNR)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Sporobolus cryptandrus* - *Poa secunda* Herbaceous Vegetation (CEGL001516, G2)
- *Sporobolus cryptandrus* Great Basin Herbaceous Vegetation (CEGL002691, GNR)
- *Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001514, G2)
- *Thinopyrum intermedium* Semi-natural Herbaceous Vegetation (CEGL002935, GNA)

Alliances:

- *Achnatherum hymenoides* Herbaceous Alliance (A.1262)
- *Achnatherum lettermanii* Herbaceous Alliance (A.2524)
- *Achnatherum nelsonii* Herbaceous Alliance (A.1271)
- *Achnatherum speciosum* Herbaceous Alliance (A.1290)
- *Agropyron cristatum* Semi-natural Herbaceous Alliance (A.3563)
- *Aristida purpurea* Herbaceous Alliance (A.2570)
- *Bouteloua eriopoda* Herbaceous Alliance (A.1284)
- *Bouteloua eriopoda* Microphyllous Evergreen Shrub Herbaceous Alliance (A.1545)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Bromus inermis* Semi-natural Herbaceous Alliance (A.3561)
- *Bromus tectorum* Semi-natural Herbaceous Alliance (A.1814)
- *Elymus lanceolatus* Herbaceous Alliance (A.1242)
- *Ericameria nauseosa* Shrub Short Herbaceous Alliance (A.1546)
- *Erodium cicutarium* Herbaceous Alliance (A.2647)
- *Hesperostipa comata* Bunch Herbaceous Alliance (A.1270)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Muhlenbergia asperifolia* Intermittently Flooded Herbaceous Alliance (A.1334)
- *Muhlenbergia pungens* Herbaceous Alliance (A.2652)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Pleuraphis jamesii* Herbaceous Alliance (A.1287)
- *Pleuraphis rigida* Herbaceous Alliance (A.1246)
- *Pleuraphis rigida* Shrub Herbaceous Alliance (A.1539)
- *Poa cusickii* Herbaceous Alliance (A.1263)
- *Poa secunda* Herbaceous Alliance (A.1291)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Sphaeralcea* (*coccinea*, *parvifolia*) Herbaceous Alliance (A.2688)
- *Sporobolus airoides* - (*Pleuraphis jamesii*) Shrub Herbaceous Alliance (A.1532)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus airoides* Sod Herbaceous Alliance (A.1241)
- *Sporobolus cryptandrus* Herbaceous Alliance (A.1252)
- *Sporobolus cryptandrus* Shrub Herbaceous Alliance (A.1525)
- *Thinopyrum intermedium* Semi-natural Herbaceous Alliance (A.2529)

DISTRIBUTION

Range: This system occurs throughout the intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) elevation. In the Bighorn Basin of north-central Wyoming, there may be some desert grasslands, but this is uncertain.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CA, CO, ID, MT?, NM, NV, OR, UT, WA, WY

Map Zones: 6:P, 7:C, 8:C, 9:C, 12:C, 13:C, 14:P, 15:C, 16:C, 17:C, 18:C, 22:C, 23:C, 24:C, 25:C, 26:?, 28:C, 29:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 322A:CC, 331A:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CP, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:C?, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CP, M331J:CP, M332G:CC, M333A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

SOURCES

References: Cable 1967, Cable 1969, Cable 1975, Comer et al. 2003, Dodd and Coupland 1966, Kleiner and Harper 1977, Mast et al. 1997, Mast et al. 1998, McClaran and Van Devender 1995, Tuhy et al. 2002, Ungar 1968, Weaver and Albertson 1956, West 1983e

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722885#references

Description Author: NatureServe Western Ecology Team, mod. G.P. Jones

Version: 02 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

1410 LLANO UPLIFT ACIDIC FOREST, WOODLAND AND GLADE (CES303.657)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Isolated Wetland [Strictly Isolated]

Non-Diagnostic Classifiers: Inselberg; Forest and Woodland (Treed); Woody-Herbaceous; Herbaceous; Moss/Lichen (Nonvascular); Ridge/Summit/Upper Slope; Rock Outcrops/Barrens/Glades; Granitic Rock; Metamorphic Rock; Igneous Rock; Temperate [Temperate Continental]; Depression; Unglaciated; Bald; Acidic Soil; Sand Soil Texture

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2410; ESLF 7159; ESP 1410

CONCEPT

Summary: This upland matrix system occurs primarily on coarse soils derived from the weathering of underlying granites in the Llano Uplift region of Texas. The underlying granitic substrate determines the range of this system. It is composed of a mosaic of vegetation types, including closed-canopy forests, open woodlands, savannas and sparsely vegetated rock outcrops. Common trees include *Quercus marilandica*, *Quercus fusiformis*, *Quercus stellata*, *Carya texana*, *Ulmus crassifolia*, and *Prosopis glandulosa*. Subcanopy species may include *Diospyros texana*, *Aloysia gratissima*, *Ungnadia speciosa*, *Ziziphus obtusifolia* var. *obtusifolia*, *Eysenhardtia texana*, *Aesculus glabra* var. *arguta*, *Opuntia engelmannii* var. *lindheimeri* (= *Opuntia lindheimeri*), *Yucca elata*, *Nolina texana*, and *Opuntia leptocaulis*. Grasslands may be dominated by *Schizachyrium scoparium*, *Sorghastrum nutans*, *Panicum virgatum*, *Bouteloua hirsuta*, *Bouteloua curtipendula*, *Nassella leucotricha*, *Bothriochloa laguroides*, and *Plantago wrightiana*. Granitic glades and barrens are sparsely vegetated by crustose and foliose lichens, several ferns and fern allies, and cacti. This system also includes small (up to 16 m in diameter) shallow depressions that hold rainwater and support wetland flora including the Texas endemic, *Isoetes lithophila*.

Classification Comments: This ecological system is defined to include a diversity of vegetation occurring on granitic outcrops and on soils that have developed over these outcrops in central Texas. In comparison to other areas of the U.S. where sparsely vegetated glades and barrens may be defined separately from the woodland surrounding them and/or the woodland separately from the forest (e.g., Southern Piedmont Granite Flatrock and Outcrop (CES202.329) just includes the sparsely vegetated barrens), these different vegetation types are included together here because they occur as an ecological complex or mosaic and they share floristic and geologic affinities that set them apart from the surrounding landscape. In the central mineral region of central Texas, granite glades and barrens are surrounded by areas of deeper soils derived from granite that support denser herbaceous or woody vegetation that includes many species found sparsely on the glades. In the eastern U.S. xeric granite outcrops are generally separated from one another by large areas of mesic to dry-mesic forests, whereas the granitic outcrops in central Texas are separated from one another by areas of coarse soils derived from the underlying granite. In addition, the xeric nature of the granite outcrops in the eastern U.S. is a stark contrast to the other vegetation in this humid temperate environment. Whereas, west of the dry line, the moisture availability of the granite outcrops in central Texas is not as starkly contrasted with the surrounding landscape. This has been suggested as a reason why the granite glades of central Texas do not support the degree of endemism that is found on the granite outcrops of the eastern U.S. (Walters and Wyatt 1982). The relationship of this ecological system to the granite glades and woodlands occurring in Oklahoma (currently included in Crosstimbers Oak Forest and Woodland (CES205.682)) needs to be further explored.

Currently this system includes dry woodlands on shallow soil and mesic woodlands on deeper soil. The more mesic woodlands tend to support *Carya texana* which is generally absent in other areas on the plateau. Further investigation is needed to determine if the mesic and dry components should be classified as two separate systems.

Similar Ecological Systems:

- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)

DESCRIPTION

Environment: This system is restricted to the Llano Uplift, also known as the central mineral region of Texas. Though named as an uplift because it is an intrusion of Precambrian metamorphic rocks and large granitic massifs, this area is generally lower in elevation than the surrounding Edwards Plateau (Walters and Wyatt 1982, Riskind and Diamond 1988). At a regional scale, it is a topographic bowl, though rock outcrops such as Enchanted Rock often produce dramatic increases in elevation at a local scale. Aside from these massif intrusions, topography is generally level to rolling. The substrate of granites, gneisses and schists determines the range of this system in central Texas. Elevation ranges from 251 to 686 m above sea level (825-2250 feet). Rainfall averages about 76 cm (30 inches), peaking in May or June and September. The central mineral region occupies approximately 1.5 million hectares in central Texas (Riskind and Diamond 1988). Mineralogy of the granitic material varies, with hornblende schist, graphite schist, quartz-feldspar gneiss and quartz-plagioclase-microcline rock common (Riskind and Diamond 1988). Soils are predominantly acidic.

Vegetation: This system is typified by a mosaic of mixed oak forests and savannas over coarse soils and sparsely vegetated areas on rock outcrops. Species such as *Quercus marilandica*, *Quercus fusiformis*, *Quercus stellata*, *Carya texana*, *Ulmus crassifolia*, and

Prosopis glandulosa may dominate the canopy of this system. Some areas are characterized by dense forest patches (mottes) of *Quercus fusiformis*, with various mixtures of other oaks and shrubs surrounded by open grasslands. Subcanopy species may include *Diospyros texana*, *Aloysia gratissima*, *Ungnadia speciosa*, *Ziziphus obtusifolia* var. *obtusifolia*, *Eysenhardtia texana*, *Aesculus glabra* var. *arguta*, *Opuntia engelmannii* var. *lindheimeri* (= *Opuntia lindheimeri*), *Yucca elata*, *Nolina texana*, and *Opuntia leptocaulis*. The ground flora may contain *Schizachyrium scoparium*, *Sorghastrum nutans*, *Panicum virgatum*, *Bouteloua hirsuta*, *Bouteloua curtipendula*, *Nassella leucotricha*, *Eragrostis intermedia*, *Croton monanthogynus*, and *Plantago wrightiana*.

In addition to oak woodlands and grasslands, this system also includes granitic glades and barrens. These are sparsely vegetated areas characterized by crustose and foliose lichens, several ferns and fern allies, and cacti, including *Cheilanthes lindheimeri*, *Pellaea ternifolia*, *Selaginella arenicola* ssp. *riddellii*, *Selaginella peruviana*, *Selaginella wrightii*, *Echinocereus reichenbachii*, and *Echinocereus triglochidiatus* (= *Echinocereus coccineus*). Other species that may occur in cracks and crevices or slight depressions with shallow, gravelly soil include *Eriogonum tenellum*, *Lechea san-sabeana*, *Sedum nuttallianum*, *Tripogon spicatus*, *Plantago wrightiana*, *Talinum parviflorum*, *Helenium amarum*, *Campanula reverchonii*, *Aphanostephus skirrhobasis*, and *Hypericum gentianoides*. Small-scale shallow vernal pools formed within barrens by weathering of the granitic surface support *Crassula aquatica*, *Sedum nuttallianum*, *Talinum parviflorum*, *Eleocharis montevidensis*, *Elatine brachysperma*, *Juncus diffusissimus*, *Allium canadense*, *Nothoscordum bivalve*, *Cooperia drummondii*, *Lepuropetalon spathulatum*, *Isoetes melanopoda*, and the Texas endemic *Isoetes lithophila*. Larger pools often exhibit a pattern of zonation of the vegetation as soil accumulates in the center. Crevices in the rock outcrops tend to support scattered, stunted individuals of trees and shrubs found in the adjacent woodland. Endemics or near-endemics occurring within this ecological system include *Isoetes lithophila*, *Campanula reverchonii*, *Eriogonum tenellum* var. *ramosissimum*, *Elatine brachysperma*, *Valerianella texana*, *Packeria texensis*, *Tradescantia pedicellata*, *Brazoria enquistii*, *Indigofera miniata* (= var. *texana*), and *Tripogon spicatus*.

Dynamics: This ecological system is a complex of vegetation types. The different physiognomies are maintained by an interaction between site conditions and disturbance dynamics. The forest patches, woodlands, savannas and grasslands are thought to have been maintained historically by various fire frequencies and intensities. In the absence of natural or prescribed fire, increased cover of woody vegetation has increased in some occurrences. Native grazing may have also played a role in preventing woody encroachment though the rough terrain of much of this system would have limited the extent of native grazers.

MEMBERSHIP

Associations:

- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL002238, G3?)
- *Quercus fusiformis* - (*Quercus stellata*) / *Schizachyrium scoparium* Granite Woodland (CEGL004937, G2?)
- *Quercus fusiformis* / *Schizachyrium scoparium* Woodland (CEGL002115, G2G4)
- *Sedum nuttallianum* - *Selaginella peruviana* Granitic Outcrop Sparse Vegetation (CEGL004396, G2)

Alliances:

- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Alliance (A.1214)
- *Quercus fusiformis* Woodland Alliance (A.477)
- *Sedum nuttallianum* Sparsely Vegetated Alliance (A.1846)

SPATIAL CHARACTERISTICS

Spatial Summary: This system is the matrix system of the Llano Uplift area (EPA ecoregion 30b) of central Texas.

Size: As a complex, this system covered large areas (>2000 ha), but occurrences of individual physiognomies (forests, woodlands, grasslands, barrens) may occur as large (50-2000 ha) or small (1-50 ha) patches.

Adjacent Ecological Systems:

- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)

Adjacent Ecological System Comments: This system is found adjacent to Edwards Plateau Limestone Savanna and Woodland (CES303.660), Edwards Plateau Limestone Shrubland (CES303.041), and is dissected by Edwards Plateau Mesic Canyon (CES303.038), Edwards Plateau Riparian (CES303.652), and Edwards Plateau Floodplain (CES303.651). A common component of Edwards Plateau Limestone Savanna and Woodland (CES303.660), *Quercus buckleyi*, is conspicuously absent from Llano Uplift Acidic Forest, Woodland and Glade (CES303.657).

DISTRIBUTION

Range: This system is restricted to the Llano Uplift region of Texas.

Divisions: 303:C

Nations: US

Subnations: TX

Map Zones: 35:C

USFS Ecomap Regions: 315D:CC

TNC Ecoregions: 29:C

SOURCES

References: Riskind and Diamond 1988, Southeastern Ecology Working Group n.d., Walters and Wyatt 1982, Whitehouse 1933

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.770686#references

Description Author: J. Teague and L. Elliott

Version: 25 Jan 2008

Concept Author: J. Teague and L. Elliott

Stakeholders: Southeast

ClassifResp: Southeast

1432 LOWER MISSISSIPPI ALLUVIAL PLAIN GRAND PRAIRIE (CES203.549)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Deep Soil

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2432; ESLF 7145; ESP 1432

CONCEPT

Summary: This system of prairies and woodlands occurs on the oldest land surfaces in the Mississippi River Alluvial Valley and the highest land surface in the river deposited portions of the ecoregion (TNC Ecoregion 42) (T. Foti pers. comm.). It occupies a very flat region up to 20 miles wide and 60 miles long bounded by present day rivers, especially the Arkansas and White, which are much lower in elevation than the Grand Prairie terrace. This terrace is covered with thin soils underlain by deep layers of impervious clay. The surface soils have been considered to be loess by some sources but are more likely silts and silty clays (T. Foti pers. comm.). Although productive, these soils are droughty due to the impervious clay subsoils. The combination of droughty soils, very flat topography, and the lack of major stream corridors in the region create conditions suitable to the ignition and spread of fires. Almost annual fires would have been necessary to maintain these prairies, and anthropogenic influences have been critical for probably 5000 years. Typical examples are dominated by *Panicum virgatum* and *Andropogon gerardii*. The vegetation includes both wet and dry prairies as well as "slashes" dominated by *Fraxinus pennsylvanica* and *Crataegus* spp.

Classification Comments: There is little floristic and environmental overlap between the Grand Prairie and calcareous prairies of southern Arkansas and the Arkansas River Valley (Ecoregion 39) manifestations of Southeastern Great Plains Tallgrass Prairie (CES205.685).

Similar Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- Southeastern Great Plains Tallgrass Prairie (CES205.685)
- Texas Blackland Tallgrass Prairie (CES205.684)

DESCRIPTION

Environment: This system occupies a very flat region up to 20 miles wide and 60 miles long bounded by present day rivers, especially the Arkansas and White, which are much lower in elevation than the Grand Prairie terrace. This terrace is covered with thin soils underlain by deep layers of impervious clay. The surface soils have been considered to be loess by some sources but are more likely silts and silty clays (T. Foti pers. comm.). Although productive, these soils are droughty due to the impervious clay subsoils. It occurs on the oldest land surfaces in the Mississippi River Alluvial Valley and the highest land surface in the river deposited portions of the ecoregion (TNC Ecoregion 42) (T. Foti pers. comm.).

Vegetation: Typical examples are dominated by *Panicum virgatum* and *Andropogon gerardii*. The vegetation includes both wet and dry prairies, as well as "slashes" dominated by *Fraxinus pennsylvanica* and *Crataegus* spp.

Dynamics: The combination of droughty soils, very flat topography, and the lack of major stream corridors in the region create conditions suitable to the ignition and spread of fires. Almost annual fires would have been necessary to maintain these prairies, and anthropogenic influences have been critical for probably 5000 years.

MEMBERSHIP

Associations:

- *Panicum virgatum* - *Andropogon gerardii* Grand Prairie Herbaceous Vegetation (CEGL007911, G2)
- *Panicum virgatum* - *Tripsacum dactyloides* Grand Prairie/Big Barrens Herbaceous Vegetation (CEGL004624, G2?)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Panicum virgatum* - *Tripsacum dactyloides* Herbaceous Alliance (A.1194)

DISTRIBUTION

Range: Examples of this system occur on the oldest land surfaces in the Mississippi River Alluvial Valley and the highest land surface in the river deposited portions of the ecoregion (TNC Ecoregion 42) (T. Foti pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AR

Map Zones: 37:C, 45:C

USFS Ecomap Regions: 234E:CC

TNC Ecoregions: 42:C

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993, Foti pers. comm., LNHP 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723053#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1136 MEDITERRANEAN CALIFORNIA ALPINE DRY TUNDRA (CES206.939)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Alpine Mosaic; Herbaceous; Temperate [Temperate Oceanic]; Udic; W-Landscape/High Intensity; Graminoid

Non-Diagnostic Classifiers: Late-lying snowpack; Ridge/Summit/Upper Slope; Sideslope; Glaciated; Shallow Soil; Forb

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2136; ESLF 7108; ESP 1136

CONCEPT

Summary: These dry meadows typically occur between 3200 and 4500 m (9700-13,600 feet) elevation in the northern Sierra Nevada, Klamath Mountains and Cascade Mountains. They are typically found on gentle to steep slopes, flat ridges and upper basins where the soil is thin and the water supply is constant and strongly regulated by snowpatch patterns. These sites are generally very well-drained and xeric once the snow melts. The system is commonly comprised of a mosaic of small-patch plant communities that are dominated by sedges, grasses and forbs. Characteristic species include *Phlox diffusa*, *Phlox covillei*, *Erigeron pygmaeus*, *Podistera nevadensis*, *Carex congdonii*, *Calamagrostis purpurascens*, *Eriogonum incanum*, *Raillardiopsis muiirii* (= *Raillardella muiirii*), *Castilleja nana*, *Erigeron compositus*, *Eriogonum ovalifolium*, *Eriogonum gracilipes*, etc. There is a rocky mesic version of this system with *Hulsea algida*, *Saxifraga tolmiei*, *Carex helleri*, *Ranunculus eschscholtzii*, *Polemonium eximium*, *Salix reticulata* (rarely), *Oxyria digyna*, *Sibbaldia procumbens*, etc. that could be found near snowmelt patches generally on sheltered, steep, rocky slopes. Alpine dry tundra typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadows.

Related Concepts:

- Alpine Grassland (213) (Shiflet 1994) Broader. SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub dominated, and wet meadows.

MEMBERSHIP

Associations:

- *Calamagrostis purpurascens* - *Leptodactylon pungens* Herbaceous Vegetation (CEGL008658, GNR)
- *Carex helleri* - *Eriogonum incanum* - *Raillardella argentea* Herbaceous Vegetation (CEGL003138, G3?)
- *Carex helleri* - *Saxifraga tolmiei* - *Luzula spicata* Herbaceous Vegetation (CEGL003139, G3?)

Alliances:

- *Calamagrostis purpurascens* Herbaceous Alliance (A.1301)
- *Carex helleri* Herbaceous Alliance (A.2603)

DISTRIBUTION

Range: This system occurs between 3200 and 4500 m (9700-13,600 feet) elevation in the northern Sierra Nevada, Klamath Mountains, and Cascade Mountains of California, Nevada and Oregon.

Divisions: 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 3:?, 6:C, 7:C

USFS Ecomap Regions: M261D:CP, M261E:CC

TNC Ecoregions: 4:C, 5:C, 12:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722742#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1137 MEDITERRANEAN CALIFORNIA SUBALPINE MEADOW (CES206.940)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Late-lying snowpack; Montane [Upper Montane]; Herbaceous; Ustic; W-Landscape/High Intensity

Non-Diagnostic Classifiers: Alpine Mosaic; Sideslope; Temperate [Temperate Oceanic]; Shallow Soil; Udic; Forb; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2137; ESLF 7109; ESP 1137

CONCEPT

Summary: This ecological system occurs at subalpine and montane elevations where finely textured soils, snow deposition, or windswept dry conditions limit tree establishment. It is typically found above 3000 m (9100 feet) elevation in California, western Nevada and Oregon. The soils in these sites can be seasonally moist to saturated in the spring but, if so, will dry out later in the growing season, and overall these are mesic to dry meadows, not wet. Characteristic plant species include *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*), *Artemisia rothrockii*, *Oreostemma alpigenum* (= *Aster alpigenuus*), *Calamagrostis breweri*, *Cistanthe umbellata* (= *Calyptridium umbellatum*), *Carex exserta*, *Eriogonum incanum*, *Horkeliella purpurascens* (= *Ivesia purpurascens*), and *Trisetum spicatum*. Burrowing mammals can increase the forb diversity. Herbs can include *Carex subnigricans*, *Carex vernacula*, *Calamagrostis breweri*, *Antennaria media*, *Potentilla drummondii*, *Lewisia pygmaea*, *Erigeron algidus*, *Lupinus lepidus*, *Dodecatheon alpinum*, and *Solidago multiradiata*. Wet meadows of *Carex*, *Calamagrostis*, *Camassia*, *Eleocharis*, *Juncus*, *Veratrum*, etc. from montane to subalpine are treated in Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998).

Related Concepts:

- Montane Meadows (216) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Calamagrostis breweri* - *Juncus drummondii* Herbaceous Vegetation (CEGL008656, GNR)
- *Calamagrostis breweri* - *Oreostemma alpigenum* Herbaceous Vegetation (CEGL008654, GNR)
- *Calamagrostis breweri* - *Trisetum spicatum* Herbaceous Vegetation (CEGL008657, GNR)

Alliances:

- *Calamagrostis breweri* Herbaceous Alliance (A.1293)

DISTRIBUTION

Range: This system occurs at subalpine elevations where finely textured soils, snow deposition, or windswept dry conditions limit tree establishment, typically above 3000 m (9100 feet) in elevation in California, Nevada and Oregon.

Divisions: 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 2:C, 3:C, 4:P, 6:C, 7:C

USFS Ecomap Regions: M242B:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CP

TNC Ecoregions: 4:P, 5:P, 12:C

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722741#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 16 Jan 2009

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1171 NORTH PACIFIC ALPINE AND SUBALPINE DRY GRASSLAND (CES204.099)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Montane [Upper Montane]; Herbaceous; Deep Soil; Ustic; Intermediate Disturbance Interval; Graminoid; Tussock-forming grasses

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Mineral: W/ A-Horizon <10 cm; F-Patch/Low Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2171; ESLF 7157; ESP 1171

CONCEPT

Summary: This high-elevation, grassland system is dominated by perennial grasses and forbs found on dry sites, particularly south-facing slopes, typically imbedded in or above subalpine forests and woodlands. Disturbance such as fire also plays a role in maintaining these open grassy areas, although drought and exposed site locations are primary characteristics limiting tree growth. It is most extensive in the eastern Cascades, although it also occurs in the Olympic Mountains. Alpine and subalpine dry grasslands are small openings to large open ridges above or drier than high-elevation conifer trees. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. These grasslands, although composed primarily of tussock-forming species, do exhibit a dense sod that makes root penetration difficult for tree species. Typical dominant species include *Festuca idahoensis*, *Festuca viridula*, and *Festuca roemerii* (the latter species occurring only in the Olympic Mountains). This system is similar to Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806), differing in its including dry alpine habitats, more North Pacific floristic elements, greater snowpack, and higher precipitation.

Similar Ecological Systems:

- Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)

Related Concepts:

- Green Fescue (103) (Shiflet 1994) Broader
- SG Subalpine Grassland (Ecosystems Working Group 1998) Broader

MEMBERSHIP

Associations:

- *Festuca roemerii* - *Delphinium glareosum* Herbaceous Vegetation (CEGL001613, G2)
- *Festuca roemerii* - *Phlox diffusa* ssp. *longistylis* Herbaceous Vegetation (CEGL001622, G2)
- *Festuca viridula* - *Eucephalus ledophyllus* Herbaceous Vegetation (CEGL001632, G4)
- *Festuca viridula* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001633, G2?Q)
- *Festuca viridula* - *Lupinus latifolius* Herbaceous Vegetation (CEGL001635, G4)

Alliances:

- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca viridula* Herbaceous Alliance (A.1257)

DISTRIBUTION

Range: This system occurs only in the Pacific Northwest mountains (Coastal and westside Cascadian).

Divisions: 204:C; 306:C

Nations: CA?, US

Subnations: BC?, OR?, WA

Map Zones: 1:C, 2:?, 7:C

USFS Ecomap Regions: 342I:CC, M242B:CC, M242C:CC, M242D:CC

TNC Ecoregions: 1:C, 3:C, 4:C, 81:C

SOURCES

References: Ecosystems Working Group 1998, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769638#references

Description Author: R. Crawford

Version: 31 Mar 2005

Concept Author: R. Crawford

Stakeholders: Canada, West
ClassifResp: West

NORTH PACIFIC HERBACEOUS BALD AND BLUFF (CES204.089)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Ridge/Summit/Upper Slope; Bluff

National Mapping Codes: ESLF 7162

CONCEPT

Summary: This system consists of mostly herbaceous-dominated areas located primarily on shallow soils from eastern Vancouver Island and the Georgia Basin south to at least the southern end of the Willamette Valley and adjacent slopes of the Coast Ranges and western Cascades, excluding areas adjacent to the outer coastline (hypermaritime climate). They are largely, if not completely, absent from the windward side of Vancouver Island, the Olympic Peninsula, and the Coast Ranges of Washington and Oregon. Due to shallow soils, steep slopes, sunny aspect, and/or upper slope position, these sites are dry and marginal for tree establishment and growth except in favorable microsites. Rock outcrops are a typical small-scale feature within balds and are considered part of this system. Sites with many favorable microsites can have a "savanna" type structure with a sparse tree layer of *Pseudotsuga menziesii* or, less commonly, *Quercus garryana*. The climate is relatively dry to wet (20 to perhaps 100 inches annual precipitation), always with a distinct dry summer season when these sites usually become droughty enough to limit tree growth and establishment. Seeps are a frequent feature in many balds and result in vernal moist to wet areas within the balds that dry out by summer. Vegetation differences are associated with relative differences in soil moisture. Most sites have little snowfall, but sites in the *Abies amabilis* zone (montane *Tsuga heterophylla* in British Columbia) can have significant winter snowpacks. Snowpacks would be expected to melt off sooner on these sunny aspect sites than surrounding areas. Fog and salt spray probably have some influence (but less than in the hypermaritime) on exposed slopes or bluffs adjacent to saltwater shorelines in the Georgia Basin, where soils on steep coastal bluffs sometime deviate from the norm and are deep glacial deposits. Slightly to moderately altered serpentine soils occur rarely. Fires, both lightning-ignited and those ignited by Native Americans, undoubtedly at least occasionally burn all these sites. Lower elevation sites in the Georgia Basin, Puget Trough, and Willamette Valley probably were burned somewhat more frequently and in some cases intentionally. Because of this fire history, the extent of this system has declined locally through tree invasion and growth, as areas formerly maintained herbaceous by burning have filled in with trees.

Grasslands are the most prevalent vegetation cover, though forblands are also common especially in the mountains. Dwarf-shrublands occur commonly, especially in mountains or foothills, as very small patches for the most part, usually in a matrix of herbaceous vegetation, most often near edges. Dominant or codominant native grasses include *Festuca roemerii*, *Danthonia californica*, *Achnatherum lemmonii*, *Festuca rubra* (near saltwater), and *Koeleria macrantha*. Forb diversity can be high. Some typical codominant forbs include *Camassia quamash*, *Camassia leichtlinii*, *Triteleia hyacinthina*, *Mimulus guttatus* (seeps), *Plectritis congesta*, *Lomatium martindalei*, *Allium cernuum*, and *Phlox diffusa* (can be considered a dwarf-shrub). Important dwarf-shrubs are *Arctostaphylos uva-ursi*, *Arctostaphylos nevadensis*, and *Juniperus communis*. Small patches and strips dominated by the shrub *Arctostaphylos columbiana* are a common feature nested within herbaceous balds. Significant portions of some balds, especially on rock outcrops, are dominated by bryophytes (mosses) and to a lesser degree lichens.

MEMBERSHIP

Associations:

- *Achnatherum lemmonii* / *Racomitrium canescens* Herbaceous Vegetation (CEGL001800, G1)
- *Danthonia californica* Valley Grassland Herbaceous Vegetation (CEGL001598, G1Q)
- *Festuca roemerii* - *Cerastium arvense* - *Koeleria macrantha* Herbaceous Vegetation (CEGL003349, G1)
- *Festuca rubra* - (*Camassia leichtlinii*, *Grindelia stricta* var. *stricta*) Herbaceous Vegetation (CEGL003347, G1)
- *Lomatium martindalei* Herbaceous Vegetation (CEGL001972, G2)

Alliances:

- *Achnatherum lemmonii* Herbaceous Alliance (A.1292)
- *Danthonia californica* Herbaceous Alliance (A.1254)
- *Festuca roemerii* Herbaceous Alliance (A.2503)
- *Festuca rubra* Herbaceous Alliance (A.1236)
- *Lomatium martindalei* Herbaceous Alliance (A.1647)

DISTRIBUTION

Range: This system occurs in the Willamette Valley, Puget Trough, Georgia Basin, eastern and northern Olympic Mountains, eastern side of Vancouver Island, western and northwestern Cascades of Washington, probably on the leeward side of the Coast Mountains in British Columbia (submaritime climates)?, Old Cascades of western Oregon, and Oregon Coast Ranges (but not the coast itself).

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, 242B:C?, M242A:CC, M242B:CC, M242C:CP, M242D:CC

TNC Ecoregions: 1:C, 2:C, 3:P, 81:C

SOURCES

References: Chappell and Christy 2004, Franklin and Dyrness 1973, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768130#references

Description Author: C. Chappell, mod. M.S. Reid

Version: 04 Apr 2005

Concept Author: C. Chappell

Stakeholders: Canada, West

ClassifResp: West

NORTH PACIFIC HYPERMARITIME SHRUB AND HERBACEOUS HEADLAND (CES204.088)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Ridge/Summit/Upper Slope; Bluff

National Mapping Codes: ESLF 7161

CONCEPT

Summary: This system consists of herbaceous- and shrub-dominated areas directly adjacent to the outer Pacific Coast from central Oregon north to Vancouver Island. These are very windy sites where wind and salt spray combine to limit tree growth. The climate is very wet, relatively warm in winter, and cool and foggy. In Oregon, fires apparently set by Native Americans also contributed to the open character of many of these sites. The relative prevalence of grasslands versus shrublands increases to the south. Steep slopes on coastal bluffs, headlands, or small islands are typical, though sometimes this system occurs on relatively level tops of headlands or islands. Soils can be shallow to bedrock or of glacial or marine sediment origin. Vegetation is dominated by perennial bunch grasses or shrubs. Dominant species include *Vaccinium ovatum*, *Gaultheria shallon*, *Rubus spectabilis*, *Calamagrostis nutkaensis*, and *Festuca rubra*. Scattered stunted trees, especially *Picea sitchensis*, are often present.

Classification Comments: California Northern Coastal Grassland (CES206.941) is somewhat similar to the grassland part of this but is more extensive (larger patches) and extends further inland and higher in elevation. In southern Oregon, the climate gets warmer and drier and the grasslands start climbing well up into the hills, picking up some southern elements of vegetation. Probably corresponds with where Northern California Coastal Scrub (CES206.932) starts also, somewhere south of Coos Bay.

Similar Ecological Systems:

- California Northern Coastal Grassland (CES206.941)

Related Concepts:

- North Coastal Shrub (204) (Shiflet 1994) Broader. This system includes portions of the SRM type that occur along coast of Oregon and Washington, particularly *Gaultheria shallon* and *Vaccinium* shrublands.

MEMBERSHIP

Associations:

- *Festuca rubra* - *Ambrosia chamissonis* Herbaceous Vegetation (CEGL003290, G1)
- *Festuca rubra* Coastal Headland Herbaceous Vegetation (CEGL001567, G2)

Alliances:

- *Festuca rubra* Herbaceous Alliance (A.1236)
- *Festuca rubra* Intermittently Flooded Herbaceous Alliance (A.1333)

DISTRIBUTION

Range: This system occurs from the southern Oregon coast north to Vancouver Island.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C

USFS Ecomap Regions: 242A:CC, M242A:CC, M242D:CP, M261A:??

TNC Ecoregions: 1:C

SOURCES

References: Chappell and Christy 2004, Franklin and Dyrness 1973, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768124#references

Description Author: C. Chappell and K. Boggs, mod. M.S. Reid

Version: 04 Apr 2005

Concept Author: C. Chappell and K. Boggs

Stakeholders: Canada, West

ClassifResp: West

1138 NORTH PACIFIC MONTANE GRASSLAND (CES204.100)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Temperate [Temperate Oceanic]; Mesotrophic Soil; Shallow Soil; Intermediate Disturbance Interval; F-Patch/Low Intensity

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Ustic

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2138; ESLF 7110; ESP 1138

CONCEPT

Summary: This ecological system includes open dry meadows and grasslands on the west side of the Cascades Mountains and northern Sierra Nevada. They occur in montane elevations up to 3500 m (10,600 feet). Soils tend to be deeper and more well-drained than the surrounding forest soils. Soils can resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. Dominant species include *Elymus* spp., *Festuca idahoensis*, and *Nassella cernua*. These large-patch grasslands are intermixed with matrix stands of red fir, lodgepole pine, and dry-mesic mixed conifer forests and woodlands.

Classification Comments: Upon review, Washington Heritage ecologists determined this system does not occur in Washington. Review in November 2008 suggests this ecological system should be lumped with Mediterranean California Subalpine Meadow (CES206.940) and that system be redefined to include the small patches of dry montane grasslands found in the Sierras and southern Cascades. For now, we've retained this as a system pending further review and comment from California ecologists.

Related Concepts:

- Idaho Fescue (102) (Shiflet 1994) Intersecting

DISTRIBUTION

Range: This system is found on the west side of the Cascades Mountains and northern Sierra Nevada, in montane elevations up to 3500 m (10,600 feet).

Divisions: 204:C; 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 1:C, 2:C, 3:C, 6:C, 7:C, 12:P

USFS Ecomap Regions: 242A:CC, 341D:CC, 342B:CP, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261D:CP, M261E:CC, M261G:CP, M331D:CC, M332G:CC

TNC Ecoregions: 5:P, 12:C, 81:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722705#references

Description Author: P. Comer, G. Kittel

Version: 24 Mar 2003

Concept Author: P. Comer, G. Kittel

Stakeholders: West

ClassifResp: West

1412 NORTH-CENTRAL INTERIOR SAND AND GRAVEL TALLGRASS PRAIRIE (CES202.695)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Esker; Kame; Lakeplain; Moraine; Outwash plain; Outwash terrace; Herbaceous; Glaciated; Sand Soil Texture; F-Patch/High Intensity; W-Patch/High Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2412; ESLF 7125; ESP 1412

CONCEPT

Summary: This system is found in the northern Midwest, particularly in Minnesota, Wisconsin, Michigan, and possibly ranging into Ontario. It is often found on glacial features such as kames, eskers, moraines, lakeplains (though excluding the Great Lakes lakeplain) and sandplains, and along eolian dunes. In contrast to the deeper, richer soils supporting other tallgrass systems in the region, the underlying soils in this system tend to be more shallow, sandy, rocky, and/or gravelly outwash soils. Organic content is significantly lower. Grassland species such as *Schizachyrium scoparium*, *Andropogon gerardii*, and *Bouteloua* spp., varying in cover from sparse to moderately dense, dominate this system. *Hesperostipa spartea* and *Sporobolus heterolepis* are also common components of this system. Woody species more tolerant of droughty conditions may be found in some examples. The most common trees are *Pinus banksiana*, *Quercus ellipsoidalis*, *Quercus macrocarpa*, and *Populus tremuloides*. Fire and drought are the major dynamics influencing this system. If fire and periodic drought are not present, woody species begin to invade this system, especially in the eastern parts of its distribution. Wind can also play a role, especially on examples found on sandplains and/or eolian dunes.

DESCRIPTION

Environment: This system is often found on glacial features such as kames, eskers, moraines, lakeplains (though excluding the Great Lakes lakeplain) and sandplains, and along eolian dunes. In contrast to the deeper, richer soils supporting other tallgrass systems in the region, the underlying soils in this system tend to be more shallow, sandy, rocky, and/or gravelly outwash soils. Organic content is significantly lower.

Vegetation: Grassland species such as *Schizachyrium scoparium*, *Andropogon gerardii*, and *Bouteloua* spp., varying in cover from sparse to moderately dense, dominate this system. *Hesperostipa spartea* and *Sporobolus heterolepis* are also common components of this system. Woody species more tolerant of droughty conditions may be found in some examples. The most common trees are *Pinus banksiana*, *Quercus ellipsoidalis*, *Quercus macrocarpa*, and *Populus tremuloides*.

Dynamics: Fire and drought are the major dynamics influencing this system. If fire and periodic drought are not present, woody species begin to invade this system, especially in the eastern parts of its distribution. Wind can also play a role, especially on examples found on sandplains and/or eolian dunes.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Calamagrostis canadensis* Sand Herbaceous Vegetation (CEGL005177, G2G3)
- *Andropogon gerardii* - *Sorghastrum nutans* - *Schizachyrium scoparium* - *Aletris farinosa* Herbaceous Vegetation (CEGL005096, G2)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Gravel Herbaceous Vegetation (CEGL002215, G3)
- *Schizachyrium scoparium* - *Bouteloua* spp. - *Hesperostipa spartea* Gravel Herbaceous Vegetation (CEGL002499, G2G3)
- *Schizachyrium scoparium* - *Danthonia spicata* - *Carex pensylvanica* - (*Viola pedata*) Herbaceous Vegetation (CEGL002318, G2G3)
- *Schizachyrium scoparium* - *Hesperostipa spartea* - *Bouteloua (curtipendula, gracilis)* Sand Herbaceous Vegetation (CEGL005204, G2G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Andropogon gerardii* - *Lespedeza capitata* Sand Herbaceous Vegetation (CEGL002210, G3)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Schizachyrium scoparium* - (*Sporobolus cryptandrus*) Herbaceous Alliance (A.1224)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the northern Midwest possibly ranging into Ontario.

Divisions: 202:C; 205:P

Nations: CA, US

Subnations: IA, IL, IN, MI, MN, MO, ND, ON, SD, WI

Map Zones: 39:C, 40:C, 41:P, 42:C, 43:P, 49:P, 50:C, 51:C, 52:C

USFS Ecomap Regions: 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCP, 212Hi:CCC, 212Hk:CCC, 212Hm:CCP, 212K:CP, 212M:CP, 212N:CP, 212Tb:CCC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jf:CCP, 222Jg:CCC, 222Jh:CCC, 222Ji:CCP, 222K:CC, 222L:CC, 222M:CC, 222N:CC, 222R:CP, 222Ua:CCC, 222Ud:CCP, 222Ue:CCP, 251A:CC, 251B:CC

TNC Ecoregions: 35:C, 36:P, 45:C, 46:C, 47:C, 48:C

SOURCES

References: Comer et al. 2003, MNNHP 1993, Thompson 1940

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722964#references

Description Author: S. Menard, mod. J. Drake

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, Midwest, Southeast
ClassifResp: Midwest

1139 NORTHERN ROCKY MOUNTAIN LOWER MONTANE, FOOTHILL AND VALLEY GRASSLAND (CES306.040)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Herbaceous; Sideslope; Very Shallow Soil; Loam Soil Texture; Silt Soil Texture; Ustic; Landslide; Graminoid; Cool-season bunch grasses

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2139; ESLF 7112; ESP 1139

CONCEPT

Summary: This ecological system of the northern Rocky Mountains is found at lower montane to foothill elevations in the mountains and large valleys of northeastern Wyoming and western Montana, west through Idaho into the Blue Mountains of Oregon, and north into the Okanagan and Fraser plateaus of British Columbia and the Canadian Rockies. They also occur to the east in the central Montana mountain "islands," foothills, as well as the Rocky Mountain Front and Big and Little Belt ranges. These grasslands are floristically similar to Inter-Mountain Basins Big Sagebrush Steppe (CES304.778), Columbia Basin Foothill and Canyon Dry Grassland (CES304.993), and Columbia Basin Palouse Prairie (CES304.792), but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. These northern lower montane and valley grasslands represent a shift in the precipitation regime from summer monsoons and cold snowy winters found in the southern Rockies to predominantly dry summers and winter precipitation. In the eastern portion of its range in Montana, winter precipitation is replaced by a huge spring peak in precipitation. They are found at elevations from 300 to 1650 m, ranging from small meadows to large open parks surrounded by conifers in the lower montane, to extensive foothill and valley grasslands below the lower treeline. Many of these valleys may have been primarily sage-steppe with patches of grassland in the past, but because of land-use history post-settlement (herbicide, grazing, fire suppression, pasturing, etc.), they have been converted to grassland-dominated areas. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a microphytic crust. The most important species are cool-season perennial bunch grasses and forbs (>25% cover), sometimes with a sparse (<10% cover) shrub layer. *Pseudoroegneria spicata*, *Festuca campestris*, *Festuca idahoensis*, or *Hesperostipa comata* commonly dominate sites on all aspects of level to moderate slopes and on certain steep slopes with a variety of other grasses, such as *Achnatherum hymenoides*, *Achnatherum richardsonii*, *Hesperostipa curtisetata*, *Koeleria macrantha*, *Leymus cinereus*, *Elymus trachycaulus*, *Bromus inermis* ssp. *pumpellianus* (= *Bromus pumpellianus*), *Achnatherum occidentale* (= *Stipa occidentalis*), *Pascopyrum smithii*, and other graminoids such as *Carex filifolia* and *Danthonia intermedia*. Other grassland species include *Opuntia fragilis*, *Artemisia frigida*, *Carex petasata*, *Antennaria* spp., and *Selaginella densa*. Important exotic grasses include *Phleum pratense*, *Bromus inermis*, and *Poa pratensis*. Shrub species may be scattered, including *Amelanchier alnifolia*, *Rosa* spp., *Symphoricarpos* spp., *Juniperus communis*, *Artemisia tridentata*, and in Wyoming *Artemisia tripartita* ssp. *rupicola*. Common associated forbs include *Geum triflorum*, *Galium boreale*, *Campanula rotundifolia*, *Antennaria microphylla*, *Geranium viscosissimum*, and *Potentilla gracilis*. A soil crust of lichen covers almost all open soil between clumps of grasses; *Cladonia* and *Peltigera* are the most common lichens. Unvegetated mineral soil is commonly found between clumps of grass and the lichen cover. The fire regime of this ecological system maintains a grassland due to rapid fire return that retards shrub invasion or landscape isolation and fragmentation that limits seed dispersal of native shrub species. Fire frequency is presumed to be less than 20 years. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub steppe ecological system. *Festuca campestris* is easily eliminated by grazing and does not occur in all areas of this system.

Classification Comments: This is the same as the Interior Plateau Grassland also called "Northern Plateau Grassland" of the Okanagan Ecoregional Plan. In Wyoming, this is distinguished from Northwestern Great Plains Mixedgrass Prairie (CES303.674) by the presence of *Festuca idahoensis* or *Carex rossii*, the lack of *Bouteloua gracilis* (which is common in CES303.674), or the presence of *Artemisia nova* or *Artemisia tripartita* ssp. *rupicola*, neither of which occur in CES303.674.

Similar Ecological Systems:

- Columbia Basin Foothill and Canyon Dry Grassland (CES304.993)
- Columbia Basin Palouse Prairie (CES304.792)
- Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)
- Inter-Mountain Basins Semi-Desert Grassland (CES304.787)
- Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)

Related Concepts:

- Bluebunch Wheatgrass (101) (Shiflet 1994) Intersecting. Several SRM range types of northern Rocky Mtns correspond to this system.
- Bluebunch Wheatgrass - Blue Grama (301) (Shiflet 1994) Finer. Several SRM range types of northern Rocky Mtns correspond to this system.
- Bluebunch Wheatgrass - Sandberg Bluegrass (302) (Shiflet 1994) Finer. Several SRM range types of northern Rocky Mtns correspond to this system.
- Bluebunch Wheatgrass - Western Wheatgrass (303) (Shiflet 1994) Finer. Several SRM range types of northern Rocky Mtns

correspond to this system.

- BS Bunchgrass Grassland (BCCDC unpubl. data) Undetermined
- Fescue Grassland (613) (Shiflet 1994) Intersecting. *Festuca campestris* grasslands are important components of this ecological system.
- Idaho Fescue (102) (Shiflet 1994) Intersecting
- Idaho Fescue - Bluebunch Wheatgrass (304) (Shiflet 1994) Broader
- Idaho Fescue - Richardson Needlegrass (305) (Shiflet 1994) Intersecting
- Idaho Fescue - Western Wheatgrass (309) (Shiflet 1994) Finer
- Needle-and-thread - Blue Grama (310) (Shiflet 1994) Finer
- no data (BGxh3/01) (Steen and Coupe 1997) Intersecting
- no data (BGxw2/01) (Steen and Coupe 1997) Intersecting
- Rough Fescue - Bluebunch Wheatgrass (311) (Shiflet 1994) Finer
- Rough Fescue - Idaho Fescue (312) (Shiflet 1994) Intersecting
- Shrubby Cinquefoil - Rough Fescue (323) (Shiflet 1994) Intersecting

DESCRIPTION

Dynamics: The natural fire regime of this ecological system likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression. Microphytic crust is very important in this ecological system. *Festuca campestris* is highly palatable throughout the grazing season. Summer overgrazing for 2 to 3 years can result in the loss of *Festuca campestris* in the stand. Although a light stocking rate for 32 years did not affect range condition, a modest increase in stocking rate led to a marked decline in range condition. The major change was a measurable reduction in basal area of *Festuca campestris*. Long-term heavy grazing on moister sites can result in a shift to a *Poa pratensis* - *Phleum pratense* (Kentucky bluegrass - timothy) type. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris*. It tolerates dormant-period grazing well but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring. Exotic species threatening this ecological system through invasion and potential complete replacement of native species include *Bromus japonicus*, *Potentilla recta*, *Euphorbia esula*, and all manner of knapweed, especially *Centaurea biebersteinii* (= *Centaurea maculosa*).

MEMBERSHIP

Associations:

- *Achnatherum nelsonii* - *Lupinus sericeus* Herbaceous Vegetation (CEGL005860, G2G3)
- *Bromus marginatus* - *Pseudoroegneria spicata* Herbaceous Vegetation [Provisional] (CEGL005861, G2?)
- *Calamagrostis rubescens* Herbaceous Vegetation (CEGL005862, G3G4?)
- *Elymus repens* Semi-natural Herbaceous Vegetation (CEGL005868, GNA)
- *Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Herbaceous Vegetation (CEGL005869, G2G3?)
- *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870, G3?)
- *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875, G3)
- *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629, G4)
- *Festuca idahoensis* - *Achnatherum richardsonii* Herbaceous Vegetation (CEGL001625, G3)
- *Festuca idahoensis* - *Carex filifolia* Herbaceous Vegetation (CEGL001898, G3)
- *Festuca idahoensis* - *Carex hoodii* Herbaceous Vegetation (CEGL001609, G3G4)
- *Festuca idahoensis* - *Eriogonum heracleoides* Herbaceous Vegetation (CEGL001616, G2)
- *Festuca idahoensis* - *Koeleria macrantha* Herbaceous Vegetation (CEGL001620, G3Q)
- *Festuca idahoensis* - *Leucopoa kingii* Herbaceous Vegetation (CEGL001901, G2?)
- *Festuca idahoensis* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001621, G4)
- *Festuca idahoensis* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001624, G4)
- *Festuca idahoensis* Herbaceous Vegetation (CEGL001897, G3Q)
- *Leymus salinus* ssp. *salmonis* - *Enceliopsis nudicaulis* Sparse Vegetation (CEGL001642, G2Q)
- *Leymus salinus* ssp. *salmonis* - *Lupinus argenteus* Sparse Vegetation (CEGL001643, G2Q)
- *Phleum pratense* - *Poa pratensis* - *Bromus inermis* Semi-natural Herbaceous Vegetation (CEGL005874, GNA)
- *Pseudoroegneria spicata* - *Carex filifolia* Herbaceous Vegetation (CEGL001665, G4)
- *Pseudoroegneria spicata* - *Eriogonum heracleoides* Herbaceous Vegetation (CEGL001668, G2Q)

Alliances:

- *Achnatherum nelsonii* Herbaceous Alliance (A.1271)
- *Calamagrostis rubescens* Herbaceous Alliance (A.2637)
- *Elymus repens* Herbaceous Alliance (A.2658)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Leymus salinus* Sparsely Vegetated Alliance (A.1258)
- *Poa pratensis* Semi-natural Herbaceous Alliance (A.3562)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)

DISTRIBUTION

Range: This lower montane, foothill and valley grassland system occurs throughout the southern interior and southern portion of the Fraser Plateau, as well as the valleys around the Fraser River in the Pavilion Ranges, the Nicola River and the Similkameen River in British Columbia. It also occurs in the mountains and large valleys of northwestern Wyoming and western Montana, east to the central Montana Rocky Mountain Front and mountain "island" ranges, west through Idaho into the Blue Mountains of Oregon.

Divisions: 207:C; 306:C

Nations: CA, US

Subnations: BC, ID, MT, OR, WA, WY

Map Zones: 8:C, 9:C, 10:C, 18:C, 19:C, 20:C, 21:C, 22:C, 29:C

USFS Ecomap Regions: 331A:CP, 331D:CC, 331N:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CP, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M331A:CP, M331B:CC, M331J:CP, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CP, M333C:CC, M333D:CP, M341A:CC

TNC Ecoregions: 6:P, 7:C, 8:C, 9:P, 26:C, 68:C

SOURCES

References: Ecosystems Working Group 1998, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769647#references

Description Author: R. Crawford, mod. M.S. Reid and G. Kittel

Version: 20 Apr 2006

Concept Author: R. Crawford

Stakeholders: Canada, West
ClassifResp: West

1140 NORTHERN ROCKY MOUNTAIN SUBALPINE-UPPER MONTANE GRASSLAND (CES306.806)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Deep Soil; Ustic; Intermediate Disturbance Interval; Graminoid; Tussock-forming grasses

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Mineral: W/ A-Horizon <10 cm; F-Patch/Low Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2140; ESLF 7113; ESP 1140

CONCEPT

Summary: This is an upper montane to subalpine, high-elevation, lush grassland system dominated by perennial grasses and forbs on dry sites, particularly south-facing slopes. It is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana, eastern Oregon, eastern Washington and Idaho. Subalpine dry grasslands are small meadows to large open parks surrounded by conifer trees but lack tree cover within them. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Grasslands, although composed primarily of tussock-forming species, do exhibit a dense sod that makes root penetration difficult for tree species. Disturbance such as fire also plays a role in maintaining these open grassy areas. Typical dominant species include *Leymus innovatus* (= *Elymus innovatus*), *Koeleria macrantha*, *Festuca campestris*, *Festuca idahoensis*, *Festuca viridula*, *Achnatherum occidentale* (= *Stipa occidentalis*), *Achnatherum richardsonii* (= *Stipa richardsonii*), *Bromus inermis* ssp. *pumpellianus* (= *Bromus pumpellianus*), *Elymus trachycaulus*, *Phleum alpinum*, *Trisetum spicatum*, and a variety of Carices, such as *Carex hoodii*, *Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Lupinus argenteus* var. *laxiflorus*, *Potentilla diversifolia*, *Potentilla flabellifolia*, *Fragaria virginiana*, and *Chamerion angustifolium* (= *Epilobium angustifolium*). This system is similar to Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040) but is found at higher elevations and is more often composed of species of *Festuca*, *Achnatherum*, and/or *Hesperostipa* with additional floristic components of more subalpine taxa. Occurrences of this system are often more forb-rich than Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824).

Similar Ecological Systems:

- North Pacific Alpine and Subalpine Dry Grassland (CES204.099)
- Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

Related Concepts:

- Alpine Idaho Fescue (108) (Shiflet 1994) Finer
- Green Fescue (103) (Shiflet 1994) Broader
- Idaho Fescue - Bluebunch Wheatgrass (304) (Shiflet 1994) Intersecting
- Idaho Fescue - Richardson Needlegrass (305) (Shiflet 1994) Intersecting. This SRM type is described as occurring at "medium to high elevations", which suggests it primarily crosswalks to this system.
- Idaho Fescue - Slender Wheatgrass (306) (Shiflet 1994) Finer
- Idaho Fescue - Threadleaf Sedge (307) (Shiflet 1994) Finer
- Idaho Fescue - Tufted Hairgrass (308) (Shiflet 1994) Finer
- Rough Fescue - Idaho Fescue (312) (Shiflet 1994) Intersecting
- Tufted Hairgrass - Sedge (313) (Shiflet 1994) Intersecting. Drier portions of this SRM type overlap with this system.

MEMBERSHIP

Associations:

- *Calamagrostis rubescens* Herbaceous Vegetation (CEGL005862, G3G4?)
- *Carex hoodii* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001595, G2)
- *Festuca campestris* Herbaceous Vegetation [Provisional] (CEGL001627, G3Q)
- *Festuca idahoensis* - (*Festuca campestris*) / *Potentilla diversifolia* Herbaceous Vegetation (CEGL001623, G3)
- *Festuca idahoensis* - *Carex filifolia* Herbaceous Vegetation (CEGL001898, G3)
- *Festuca idahoensis* - *Carex obtusata* Herbaceous Vegetation (CEGL001611, G3Q)
- *Festuca idahoensis* - *Carex scirpoidea* Herbaceous Vegetation (CEGL001899, G2Q)
- *Festuca idahoensis* - *Danthonia intermedia* Herbaceous Vegetation (CEGL001612, G3?Q)
- *Festuca idahoensis* - *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001900, G3G4)
- *Festuca idahoensis* - *Elymus trachycaulus* Herbaceous Vegetation (CEGL001614, G4)
- *Festuca viridula* - *Carex hoodii* Herbaceous Vegetation (CEGL001596, G3)
- *Festuca viridula* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001633, G2?Q)
- *Festuca viridula* - *Lupinus argenteus* var. *laxiflorus* Herbaceous Vegetation (CEGL001634, G3Q)
- *Festuca viridula* - *Potentilla flabellifolia* Herbaceous Vegetation (CEGL001636, GNRQ)

- *Phleum alpinum* - *Elymus trachycaulus* Herbaceous Vegetation (CEGL001923, G2Q)

Alliances:

- *Calamagrostis rubescens* Herbaceous Alliance (A.2637)
- *Carex hoodii* Herbaceous Alliance (A.1253)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Festuca viridula* Herbaceous Alliance (A.1257)
- *Phleum alpinum* Herbaceous Alliance (A.1310)

DISTRIBUTION

Range: This system is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana, central and eastern Oregon, eastern Washington and Idaho. It also occurs in the "island" ranges of central Montana, though it is not common, and is also found in the Bighorn Range of north-central Wyoming.

Divisions: 306:C

Nations: CA, US

Subnations: AB, BC, ID, MT, OR, WA, WY

Map Zones: 9:C, 10:C, 18:C, 19:C, 20:C, 21:C, 29:C

USFS Ecomap Regions: 331A:??, 341G:CC, 342A:CP, 342C:CC, 342D:CC, 342H:CC, 342I:C?, 342J:CC, M242B:C?, M242C:CP, M242D:CC, M331A:PP, M331B:PP, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 4:P, 7:C, 8:C, 9:P, 26:C, 68:C

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1995, Johnson 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722867#references

Description Author: M.S. Reid

Version: 07 Sep 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1420 NORTHERN TALLGRASS PRAIRIE (CES205.686)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Glaciated plains; Herbaceous; Glaciated; Deep Soil; Loam Soil Texture; F-Landscape/Low Intensity; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2420; ESLF 7133; ESP 1420

CONCEPT

Summary: This system is found primarily in the Northern Tallgrass ecoregion ranging along the Red River basin in Minnesota and the Dakotas to Lake Manitoba in Canada. It constitutes the northernmost extension of the "true" prairies. Similar to Central Tallgrass Prairie (CES205.683), this system is dominated by tallgrass species such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. However, the soils in this region are not as rich nor deep, and thus this system does not have as much species diversity as grasslands to the south. This system is often found on well-drained, drier soils and can grade into Eastern Great Plains Tallgrass Aspen Parkland (CES205.688) to the north and east. Grazing and fire influenced this system historically. Much of this system has been converted to agriculture with very few unaltered and highly fragmented examples remaining.

Similar Ecological Systems:

- Central Tallgrass Prairie (CES205.683)

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Panicum virgatum*) - *Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002199, G3G4)
- *Andropogon gerardii* - *Hesperostipa spartea* - *Sporobolus heterolepis* Herbaceous Vegetation (CEGL002202, G2G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Hesperostipa spartea* - (*Pascopyrum smithii*) Herbaceous Vegetation (CEGL002377, G3?)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Loess Mixedgrass Herbaceous Vegetation (CEGL002036, G3?)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Eastern Great Plains Tallgrass Aspen Parkland (CES205.688)

Adjacent Ecological System Comments: It can grade into Eastern Great Plains Tallgrass Aspen Parkland (CES205.688) to the north and east.

DISTRIBUTION

Range: Found primarily in the Northern Tallgrass ecoregion ranging along the Red River basin in Minnesota and the Dakotas to Lake Manitoba in Canada.

Divisions: 205:C

Nations: CA, US

Subnations: IA, MB, MN, ND, SD

Map Zones: 39:C, 40:C, 41:?, 42:C

USFS Ecomap Regions: 222N:CC, 251A:CC, 251B:CC, 251G:CC, 251H:C?, 332B:CC, 332D:CC

TNC Ecoregions: 35:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722973#references

Description Author: S. Menard

Version: 05 Mar 2003

Concept Author: S. Menard

Stakeholders: Canada, Midwest

ClassifResp: Midwest

1141 NORTHWESTERN GREAT PLAINS MIXEDGRASS PRAIRIE (CES303.674)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Herbaceous; Glaciated; Shallow Soil; Loam Soil Texture

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2141; ESLF 7114; ESP 1141

CONCEPT

Summary: This system extends from northern Nebraska into southern Canada and westward through the Dakotas to the Rocky Mountain Front in Montana and probably Wyoming, on both glaciated and non-glaciated substrates. Soil texture (which ultimately effects water available to plants) is the defining environmental descriptor; soils are primarily fine and medium-textured and do not include sands, sandy soils, or sandy loams. This system occurs on a wide variety of landforms (e.g., mesatops, stream terraces) and in proximity to a diversity of other systems. Most usually it is found in association with Western Great Plains Sand Prairie (CES303.670) which occupies the coarser-textured substrates. In various locales the topography where this system occurs is broken by many glacial pothole lakes, and this system may be proximate to Great Plains Prairie Pothole (CES303.661). On the eastern Montana plains, mixedgrass prairie is by far the predominant system. Here it occurs continuously for hundreds of square kilometers, interrupted only by riparian areas or sand prairies, which are associated with gentle rises, eroded ridges or mesas derived from sandstone. Historically, this system covered approximately 38 million ha in Nebraska, North and South Dakota, and Canada; now it covers approximately 270,000 square km in this region. The growing season and rainfall are intermediate to drier units to the southwest and mesic tallgrass regions to the east. Graminoids typically comprising the greatest canopy cover include *Pascopyrum smithii*, *Nassella viridula*, and *Festuca* spp. In Montana these include *Festuca campestris* and *Festuca idahoensis*. Other commonly dominant species in Montana are *Bouteloua gracilis*, *Hesperostipa comata*, and *Carex filifolia*, while *Festuca campestris* and *Festuca idahoensis* may be more abundant in the north and foothill/montane grassland transition areas. Remnants of *Hesperostipa curtisetata*-dominated vegetation are found in northernmost Montana and North Dakota associated with the most productive sites (largely plowed to cereal grains); this species, usually in association with *Pascopyrum smithii*, is much more abundant in Canada. Sites with a strong component of *Nassella viridula* indicate a more favorable moisture balance and perhaps a favorable grazing regime as well because this is one of the most palatable of the mid-grasses. *Hesperostipa comata* is also an important component and becomes increasingly so as improper grazing regimes favor it at the expense of (usually) *Pascopyrum smithii*; progressively more destructive grazing can result in the loss of *Pascopyrum smithii* from the system followed by drastic reduction in *Hesperostipa comata* and ultimately the dominance of *Bouteloua gracilis* (or *Poa secunda* and other short graminoids) and/or a lawn of *Selaginella densa*. *Koeleria macrantha*, at least in Montana and southern Canada, is the most pervasive grass; if it has high cover, past intensive grazing is the presumed reason. Shrub species such as *Symphoricarpos* spp. and *Artemisia frigida* and *Artemisia cana* also occur. Fire and grazing constitute the primary dynamics affecting this system. Drought can also impact this system, in general favoring the shortgrass component at the expense of the mid-grasses. With intensive grazing, cool-season exotics such as *Poa pratensis*, *Bromus inermis*, and *Bromus japonicus* can increase in dominance; both of the rhizomatous grasses have been shown to markedly depress species diversity. Shrub species such as *Juniperus virginiana* can also increase in dominance with fire suppression. This system is one of the most disturbed grassland systems in Nebraska, North and South Dakota, and Canada.

Classification Comments: This system was edited to expand the concept for central Montana mixedgrass prairie and to exclude specifically sandy soil grasslands, which are placed into Western Great Plains Sand Prairie (CES303.670). This system is similar to Central Mixedgrass Prairie (CES303.659) and can contain elements of Great Plains tallgrass and shortgrass systems. However, it differs from Central Mixedgrass Prairie (CES303.659) in that the cooler climate in this region allows natural cool-season grasses to be more important (greater than 50% cover). Cover of native, nongrazing-induced shrubs typically does not exceed 25% in conjunction with topographic relief (breaks); otherwise the stand would be considered part of Northwestern Great Plains Shrubland (CES303.662). Additional review and commentary by Canadian, Dakotan, and Nebraskan ecologists is needed to flesh out the compositional variation and range of distribution for this important grassland system. In Wyoming, this system transitions into Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040) in the foothills of the northern Wyoming mountains where *Pascopyrum smithii* communities finger up into foothills. If *Festuca idahoensis*, *Carex rossii*, *Artemisia nova*, or *Artemisia tripartita* spp. *rupicola* occur, then the example is not this system.

Similar Ecological Systems:

- Central Mixedgrass Prairie (CES303.659)
- Northwestern Great Plains Shrubland (CES303.662)

Related Concepts:

- *Elymus lanceolatus* - *Nassella viridula* Herbaceous Vegetation (MTNHP 2002b) Finer
- Fescue Grassland (613) (Shiflet 1994) Intersecting
- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. This mixedgrass prairie ecological system can have a sage component where disturbed/grazed.

- Wheatgrass (610) (Shiflet 1994) Finer
- Wheatgrass - Bluestem - Needlegrass (606) (Shiflet 1994) Intersecting
- Wheatgrass - Grama (609) (Shiflet 1994) Finer
- Wheatgrass - Grama - Needlegrass (608) (Shiflet 1994) Finer
- Wheatgrass - Needlegrass (607) (Shiflet 1994) Finer
- Wheatgrass - Saltgrass - Grama (615) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: Given the system's rather extensive geographic range, it not surprising to find it occurring on a wide variety of landforms (e.g., mesatops, stream terraces) and in proximity to a diversity of other systems. Climate and growing season length for the region this system occurs are intermediate to the shortgrass regions to the west and southwest and the tallgrass regions to the east with a shorter growing season and less humid climate compared to the range of Central Mixedgrass Prairie (CES303.659). Moisture conditions are semi-arid. This system occurs on soils derived primarily from fine-textured sedimentary rocks and deposits, but other rock types are included so long as their weathering products are not coarse-textured, namely not sands, sandy soils, or sandy loams and relatively stable. It is found primarily on planar to gently rolling topography but is found on broken topography hillslopes as well.

Vegetation: This system contains greater than 50% cover of natural, cool-season grasses such as *Festuca* spp., *Pascopyrum smithii*, *Elymus lanceolatus*, *Hesperostipa comata*, *Hesperostipa curtisetata*, and *Nassella viridula*. *Hesperostipa comata* becomes increasingly important where improper grazing regimes have favored it at the expense of (usually) *Pascopyrum smithii*; progressively more destructive grazing can result in the loss of *Pascopyrum smithii* from the system followed by drastic reduction in *Hesperostipa comata* and ultimately the dominance of *Bouteloua gracilis* (or *Poa secunda* and other short graminoids) and/or a lawn of *Selaginella densa*. *Koeleria macrantha*, at least in Montana and southern Canada, is the most pervasive grass; if it has high cover, past intensive grazing is the presumed reason. Shrub species such as *Symphoricarpos* spp. and *Artemisia frigida* also occur. Cover of native, nongrazing-induced shrubs typically does not exceed 25% in conjunction with topographic relief (breaks); otherwise the stand would be considered part of Northwestern Great Plains Shrubland (CES303.662). Cool-season exotics such as *Poa pratensis*, *Bromus inermis*, and *Bromus japonicus* can increase in dominance with overgrazing; both of the above-named rhizomatous grasses are sufficiently aggressive to outcompete natives regardless of disturbance regime. Likewise, shrub species such as *Juniperus virginiana* can also increase in dominance with fire suppression.

Dynamics: Fire and grazing constitute the primary dynamics affecting this system. Drought can also impact this system. It should be acknowledged that this system occurs within the very same biotope as Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) or Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777), the only difference being that fire has not been present where the sagebrush systems occur, a purely stochastic outcome. Heavy grazing causes cool-season exotics such as *Poa pratensis* and *Bromus inermis* to increase in dominance. Conversion to agriculture also impacts this system; however, the degree of agricultural alteration of this system is highly variable by geographic region with Montana (and Wyoming??) having experienced much less impact than the estimated 75% percent of the Nebraska-Dakota-south-central Canada region, where this system has been heavily altered. In Montana, this system is the major sustainer of livestock grazing with overall far less than half of it having been lost to agriculture; several Montana counties have more than 90% of this system remaining intact, though impacted by grazing to varying degrees.

MEMBERSHIP

Associations:

- *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065, G3G4Q)
- *Amelanchier alnifolia* Shrubland (CEGL002183, GNR)
- *Artemisia cana* ssp. *cana* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001556, G4)
- *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001531, G3Q)
- *Betula pumila* - *Salix* spp. Prairie Fen Shrubland (CEGL002189, G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001503, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Schizachyrium scoparium* Shrub Herbaceous Vegetation (CEGL002198, G3G4)
- *Elaeagnus commutata* / *Pascopyrum smithii* Shrubland (CEGL001099, G3?)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Elymus lanceolatus* - *Koeleria macrantha* Herbaceous Vegetation (CEGL002237, GNR)
- *Festuca altaica* - (*Hesperostipa* spp., *Achnatherum* spp.) Herbaceous Vegetation (CEGL002436, GNR)
- *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875, G3)
- *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629, G4)
- *Festuca campestris* Herbaceous Vegetation [Provisional] (CEGL001627, G3Q)
- *Festuca idahoensis* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001610, G3)
- *Hesperostipa comata* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (CEGL002037, G5)
- *Hesperostipa curtisetata* - *Elymus lanceolatus* Herbaceous Vegetation (CEGL002253, GNR)
- *Hesperostipa curtisetata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL003789, G3G4?)
- *Hesperostipa neomexicana* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001709, G3?)
- *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001708, G3)
- *Juniperus horizontalis* / *Schizachyrium scoparium* Dwarf-shrubland (CEGL001394, G4)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Bouteloua curtipendula* Great Plains Herbaceous Vegetation

(CEGL004066, G2)

- *Pascopyrum smithii* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (CEGL001579, G4)
- *Pascopyrum smithii* - *Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation (CEGL002034, G4)
- *Pascopyrum smithii* - *Nassella viridula* Herbaceous Vegetation (CEGL001583, G3G4)
- *Pascopyrum smithii* Herbaceous Vegetation (CEGL001577, G3G5Q)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Pseudoroegneria spicata* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001663, G3)
- *Pseudoroegneria spicata* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001664, G4)
- *Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675, G4)
- *Schizachyrium scoparium* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001682, G3)
- *Schizachyrium scoparium* - *Muhlenbergia cuspidata* Herbaceous Vegetation (CEGL001683, G3?)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)

Alliances:

- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Artemisia cana* ssp. *cana* Shrub Herbaceous Alliance (A.2554)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance (A.1526)
- *Betula pumila* - (*Salix* spp.) Saturated Shrubland Alliance (A.1021)
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)
- *Elaeagnus commutata* Shrubland Alliance (A.918)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Elymus lanceolatus* - *Koeleria macrantha* Herbaceous Alliance (A.3520)
- *Festuca altaica* Herbaceous Alliance (A.1250)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Hesperostipa comata* - *Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Hesperostipa curtisetata* - *Elymus lanceolatus* Herbaceous Alliance (A.3523)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Juniperus horizontalis* Dwarf-shrubland Alliance (A.1080)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Pseudoroegneria spicata* - *Bouteloua gracilis* Herbaceous Alliance (A.1239)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Schizachyrium scoparium* Herbaceous Alliance (A.1240)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Great Plains Prairie Pothole (CES303.661)
- Northwestern Great Plains Shrubland (CES303.662)
- Western Great Plains Sand Prairie (CES303.670)
- Western Great Plains Shortgrass Prairie (CES303.672)
- Western Great Plains Tallgrass Prairie (CES303.673)

Adjacent Ecological System Comments: Across much of the western portion of its range, this system exists intimately associated with Western Great Plains Sand Prairie (CES303.670), at least as we have redefined Western Great Plains Sand Prairie). This system may be proximate to Great Plains Prairie Pothole (CES303.661) at various locations across its distribution.

DISTRIBUTION

Range: This system extends from northern Nebraska into southern Canada, and west to central Montana. The U.S. range corresponds to Bailey et al. (1994) sections 331D, 331E, 331F (mostly), 331G, 332A, 332B, and perhaps minor extensions into 251B, and in Canada to the Moist Mixed Grassland and Fescue Grassland.

Divisions: 205:P; 303:C

Nations: CA, US

Subnations: AB, MB, MT, ND, NE, SD, SK, WY

Map Zones: 20:C, 22:C, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CC, 332B:CC, 332C:CC, 332D:CC, 342A:CP, 342F:CC, 342G:CC, M331A:CP, M331B:CC, M331I:CC, M331J:C?, M334A:CC

TNC Ecoregions: 26:C, 34:C, 66:P, 67:C

SOURCES

References: Bailey et al. 1994, Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999, Weaver 1954

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722984#references

Description Author: S. Menard and K. Kindscher, mod. G. Kittel, S. Cooper, M.S. Reid

Version: 27 Apr 2006

Concept Author: S. Menard and K. Kindscher, mod. S. Cooper and G. Kittel

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

1508 OZARK PRAIRIE AND WOODLAND (CES202.326)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Graminoid

Non-Diagnostic Classifiers: Lowland

FGDC Crosswalk: Vegetated

National Mapping Codes: EVT 2508; ESLF 5429; ESP 1508

CONCEPT

Summary: This system of prairies and associated woodlands is found in the undissected portions of the Springfield Plateau region of Arkansas, Oklahoma, and Missouri (Ecoregion 39a) (EPA 2004). This region is characterized by broad, level to gently rolling uplands derived from limestone and chert. It is much less rugged than the adjacent mountainous regions and more dissected portions of the Springfield Plateau. In addition, this region receives an annual precipitation total of 5-15 cm (2-6 inches) less than the surrounding regions due to a rainshadow produced by a combination of prevailing western winds and orographic effects. The limestone and chert-derived soils associated with the prairies are thin and droughty. The combined effect of droughty soils, reduced precipitation, and prevailing level topography create conditions highly conducive to the ignition and spread of fires. Stands are typically dominated by *Andropogon gerardii*, *Sorghastrum nutans*, *Panicum virgatum*, and *Schizachyrium scoparium*. Few extant examples of this system remain and most are small and isolated.

Classification Comments: There is little floristic and environmental overlap with the Grand Prairie and calcareous prairies of southern Arkansas. There may be stronger overlap with Southeastern Great Plains Tallgrass Prairie (CES205.685), and further review is needed to verify the distinction between these two systems.

Similar Ecological Systems:

- Southeastern Great Plains Tallgrass Prairie (CES205.685)
- Texas Blackland Tallgrass Prairie (CES205.684)

DESCRIPTION

Environment: This region is distinctly bounded by the Boston Mountains to the south. This region is characterized by broad, level to gently rolling uplands derived from limestone and chert. It is much less rugged than the adjacent mountainous regions and more dissected portions of the Springfield Plateau. In addition, this region receives an annual precipitation total of 5-15 cm (2-6 inches) less than the surrounding regions due to a rainshadow produced by a combination of prevailing western winds and orographic effects. The limestone and chert-derived soils associated with the prairies are thin and droughty. The combined effect of droughty soils, reduced precipitation, and prevailing level topography create conditions highly conducive to the ignition and spread of fires. Few extant examples of this system remain and most are small and isolated.

Vegetation: These prairies are typically dominated by *Schizachyrium scoparium*, *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. Other grasses include *Koeleria macrantha*, *Sporobolus heterolepis*, *Sphenopholis obtusata*, *Dichanthelium* spp., *Aristida purpurascens*, *Panicum brachyanthum*, *Phalaris caroliniana*, *Tripsacum dactyloides*, and *Spartina pectinata*. A rich forb diversity is commonly present and includes *Helianthus mollis*, *Helianthus grosseserratus*, *Rudbeckia subtomentosa*, *Silphium laciniatum*, *Symphotrichum* spp., *Solidago* spp., *Camassia scilloides*, *Echinacea pallida*, *Callirhoe digitata*, *Asclepias hirtella*, *Eryngium yuccifolium*, *Delphinium carolinianum*, *Castilleja coccinea*, *Calopogon oklahomensis*, *Buchnera americana*, *Dodecatheon meadia*, *Amorpha canescens*, *Tephrosia virginiana*, *Orbexilum pedunculatum*, *Baptisia alba*, *Baptisia bracteata*, *Liatris pycnostachya*, and *Liatris squarrosa* var. *hirsuta* (= *Liatris hirsuta*). Wetter areas support a rich diversity of rushes and sedges, including *Carex opaca*, *Carex oklahomensis*, *Carex buxbaumii*, *Carex scoparia*, *Carex conjuncta*, *Carex davisii*, *Carex arkansana*, *Eleocharis tenuis* var. *verrucosa*, *Eleocharis wolfii*, and *Rhynchospora macrostachya*.

Dynamics: These prairies and woodlands were historically maintained by frequent fire. Drought cycles and grazing were also likely important ecosystem processes.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* - *Helianthus grosseserratus* Herbaceous Vegetation (CEGL002024, G2G3)
- *Andropogon gerardii* - *Sorghastrum nutans* Unglaciated Herbaceous Vegetation (CEGL002204, G3)
- *Juncus (acuminatus, brachycarpus)* - *Panicum virgatum* - *Bidens aristosa* - *Hibiscus moscheutos* ssp. *lasiocarpos* Herbaceous Vegetation (CEGL004782, G2G3)
- *Schizachyrium scoparium* - *Bothriochloa laguroides* ssp. *torreyana* - *Croton willdenowii* Herbaceous Vegetation (CEGL008564, G1?)
- *Schizachyrium scoparium* - *Dichanthelium* spp. - *Buchnera americana* - *Echinacea pallida* Herbaceous Vegetation (CEGL007827, G2G3)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the Springfield Plateau subsection of the Ozark Plateau region of Arkansas, Oklahoma, and Missouri, possibly ranging into a limited area of Kansas.

Divisions: 202:C

Nations: US

Subnations: AR, KS?, MO, OK

Map Zones: 44:C

USFS Ecomap Regions: 223A:CC

TNC Ecoregions: 38:C

SOURCES

References: EPA 2004, Foti pers. comm., Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798088#references

Description Author: T. Witsell

Version: 01 Feb 2007

Concept Author: T. Witsell

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1418 PENNYROYAL KARST PLAIN PRAIRIE AND BARRENS (CES202.355)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2418; ESLF 7131; ESP 1418

CONCEPT

Summary: This system consists of open, prairielike vegetation of the northwestern Highland Rim (Pennyroyal Plateau) of Tennessee and adjacent Kentucky (Ecoregion 71e [Western Pennyroyal Karst Plain] of Griffith et al. (1998) and Woods et al. (2002); part of Subsection 222Eh of Keys et al. (1995)). Stands are dominated by grasses and forbs with scattered shrubby vegetation and, occasionally, trees. The scattered trees are mainly *Quercus falcata* and *Quercus imbricaria*. *Quercus alba* and *Quercus marilandica* would also be expected. The primary dominant grass is *Schizachyrium scoparium*, with some *Sorghastrum nutans* present. Other more mesic grasses (*Andropogon gerardii*, *Tripsacum dactyloides*) are restricted to ditches. The largest extant examples are presently found on Fort Campbell Military Reservation, Tennessee, where ecological burning and fires from live munitions use result in open herbaceous-dominated landscapes. This vegetation was the predominant type here in the early 1800s and probably originated from burning by Native Americans.

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- Eastern Highland Rim Prairie and Barrens (CES202.354)
- Southern Ridge and Valley Patch Prairie (CES202.453)
- Western Highland Rim Prairie and Barrens (CES202.352)

Related Concepts:

- Limestone Prairie (Evans 1991) Finer
- Tallgrass Prairie (Evans 1991) Finer
- Wet Prairie (Evans 1991) Finer

DESCRIPTION

Environment: This system is found in an open rolling landscape which easily carries fire if maintained in a grassy condition.

Vegetation: Stands of this system are dominated by grasses and forbs with scattered shrubby vegetation trees. The scattered trees are mainly *Quercus falcata* and *Quercus imbricaria*. The primary dominant grass is *Schizachyrium scoparium*, with some *Sorghastrum nutans* present. Other more mesic grasses (*Andropogon gerardii*, *Tripsacum dactyloides*) are restricted to ditches. Other herbaceous components may include *Andropogon gyrans*, *Andropogon ternarius*, *Lespedeza capitata*, *Lespedeza virginica*, *Symphytotrichum novae-angliae* (= *Aster novae-angliae*), *Sericocarpus linifolius* (= *Aster solidagineus*), *Coreopsis major*, *Coreopsis tripteris*, *Helianthus angustifolius*, *Helianthus hirsutus*, *Helianthus mollis*, *Helianthus occidentalis*, *Silphium trifoliatum*, *Solidago juncea*, *Pycnanthemum tenuifolium*, *Pycnanthemum verticillatum* var. *pilosum* (= *Pycnanthemum pilosum*), and *Lobelia puberula*. In addition, *Rudbeckia subtomentosa*, *Prenanthes barbata*, and *Agalinis auriculata* (= *Tomanthera auriculata*) are rare plants found in some examples. Other typical woody species include *Cornus florida*, *Cercis canadensis*, *Prunus angustifolia*, *Ilex decidua*, *Rhus copallinum*, *Rosa carolina*, and *Symphoricarpos orbiculatus*.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Kentucky Herbaceous Vegetation (CEGL004677, G1G2)
- *Schizachyrium scoparium* - (*Helianthus mollis*, *Helianthus occidentalis*, *Silphium trifoliatum*) Herbaceous Vegetation (CEGL007805, G2G3)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the northern Highland Rim (Pennyroyal Plateau) of Tennessee and adjacent Kentucky.

Divisions: 202:C

Nations: US

Subnations: KY, TN

Map Zones: 47:C
USFS Ecomap Regions: 223E:CC
TNC Ecoregions: 44:C

SOURCES

References: Baskin et al. 1994, Baskin et al. 1999, Chester 1988, Chester et al. 1997, Comer et al. 2003, Evans 1991, Griffith et al. 1998, Keys et al. 1995, McInteer 1946, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723157#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 22 May 2008

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast
ClassifResp: Southeast

1143 ROCKY MOUNTAIN ALPINE FELL-FIELD (CES306.811)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine Slopes; Alpine/AltiAndino [Alpine/AltiAndino]; Herbaceous; Ridge/Summit/Upper Slope; Oligotrophic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Very Short Disturbance Interval; W-Patch/High Intensity; Cushion plants

Non-Diagnostic Classifiers: Patterned ground (undifferentiated); Saddle; Temperate [Temperate Continental]; Glaciated; Ustic; W-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2143; ESLF 7116; ESP 1143

CONCEPT

Summary: This ecological system is found discontinuously at alpine elevations throughout the Rocky Mountains, west into the mountainous areas of the Great Basin, and north into the Canadian Rockies. Small areas are represented in the west side of the Okanagan Ecoregion in the eastern Cascades. These are wind-scoured fell-fields that are free of snow in the winter, such as ridgetops and exposed saddles, exposing the plants to severe environmental stress. Soils on these windy unproductive sites are shallow, stony, low in organic matter, and poorly developed; wind deflation often results in a gravelly pavement. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes and often densely haired and thickly cutinized. Plant cover is 15-50%, while exposed rocks make up the rest. Fell-fields are usually within or adjacent to alpine tundra dry meadows. Common species include *Arenaria capillaris*, *Geum rossii*, *Kobresia myosuroides*, *Minuartia obtusiloba*, *Myosotis asiatica*, *Paronychia pulvinata*, *Phlox pulvinata*, *Sibbaldia procumbens*, *Silene acaulis*, *Trifolium dasyphyllum*, and *Trifolium parryi*.

Classification Comments: Alpine fell-fields in the Cascades occur at a very small-scale spatial pattern not mappable (recognizable) at landscape levels. These small-scale fell-fields are conceptually included here.

Related Concepts:

- Alpine Rangeland (410) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Arenaria capillaris* / *Polytrichum piliferum* Herbaceous Vegetation (CEGL005855, G2G3)
- *Carex albonigra* - *Myosotis asiatica* Herbaceous Vegetation (CEGL005863, G2G3)
- *Carex paysonis* - *Sibbaldia procumbens* Herbaceous Vegetation (CEGL005865, G3G4?)
- *Dasiphora fruticosa* ssp. *floribunda* / *Artemisia michauxiana* Shrub Herbaceous Vegetation [Provisional] (CEGL005833, G3G4)
- *Geum rossii* - *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001965, G3?)
- *Kobresia myosuroides* - *Euphrasia disjuncta* Herbaceous Vegetation (CEGL005872, G2?)
- *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001919, G4)
- *Paronychia pulvinata* - *Silene acaulis* Dwarf-shrubland (CEGL001976, G5)
- *Phlox pulvinata* - *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001980, G2Q)
- *Phlox pulvinata* Herbaceous Vegetation [Provisional] (CEGL002740, G4)
- *Potentilla sierrae-blancae* Herbaceous Vegetation (CEGL001982, G1)
- *Rubus idaeus* Scree Shrubland (CEGL001134, GU)
- *Sibbaldia procumbens* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001933, G3?)
- *Silene acaulis* Herbaceous Vegetation (CEGL001934, G5?)
- *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001935, G4)
- *Trifolium parryi* Herbaceous Vegetation (CEGL001936, GU)

Alliances:

- *Arenaria capillaris* Herbaceous Alliance (A.2630)
- *Carex albonigra* Herbaceous Alliance (A.2638)
- *Carex paysonis* Herbaceous Alliance (A.2640)
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Kobresia myosuroides* Herbaceous Alliance (A.1326)
- *Minuartia obtusiloba* Herbaceous Alliance (A.1630)
- *Paronychia pulvinata* Dwarf-shrubland Alliance (A.1085)
- *Phlox pulvinata* Herbaceous Alliance (A.1651)
- *Potentilla sierrae-blancae* Herbaceous Alliance (A.1652)
- *Rubus idaeus* ssp. *strigosus* Shrubland Alliance (A.927)

- *Sibbaldia procumbens* Herbaceous Alliance (A.1635)
- *Silene acaulis* Herbaceous Alliance (A.1636)
- *Trifolium (dasyphyllum, nanum)* Herbaceous Alliance (A.1637)
- *Trifolium parryi* Herbaceous Alliance (A.1638)

DISTRIBUTION

Range: This system is found discontinuously at alpine elevations throughout the Rocky Mountains, west into the mountainous areas of the Great Basin. Outlier sites occur in the northeastern Cascades and on Mount Rainier in Washington.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 1:P, 9:P, 10:C, 12:?, 16:C, 17:C, 19:C, 20:?, 21:C, 23:P, 24:P, 25:C, 28:C

USFS Ecomap Regions: 331J:CC, 341G:PP, M242B:CP, M242C:CC, M242D:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:PP, M341B:PP, M341C:PP

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C

SOURCES

References: Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Hamann 1972, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Willard 1963

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722862#references

Description Author: R. Crawford

Version: 07 Sep 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1144 ROCKY MOUNTAIN ALPINE TURF (CES306.816)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine Slopes; Alpine/AltiAndino [Alpine/AltiAndino]; Oligotrophic Soil; Very Shallow Soil; Mineral: W/A-Horizon <10 cm; Aridic; Very Long Disturbance Interval; Graminoid

Non-Diagnostic Classifiers: Long (>500 yrs) Persistence; Herbaceous; Temperate [Temperate Continental]; Glaciated; Periglacial

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2144; ESLF 7117; ESP 1144

CONCEPT

Summary: This widespread ecological system occurs above upper treeline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and isolated alpine sites in the northeastern Cascades. It is found on gentle to moderate slopes, flat ridges, valleys, and basins, where the soil has become relatively stabilized and the water supply is more or less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This system is characterized by a dense cover of low-growing, perennial graminoids and forbs. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate and mat-forming plants with thick rootstocks or taproots characterize the forbs. Dominant species include *Artemisia arctica*, *Carex elynoides*, *Carex siccata*, *Carex scirpoidea*, *Carex nardina*, *Carex rupestris*, *Festuca brachyphylla*, *Festuca idahoensis*, *Geum rossii*, *Kobresia myosuroides*, *Phlox pulvinata*, and *Trifolium dasyphyllum*. Many other graminoids, forbs, and prostrate shrubs can also be found, including *Calamagrostis purpurascens*, *Deschampsia caespitosa*, *Dryas octopetala*, *Leucopoa kingii*, *Poa arctica*, *Saxifraga* spp., *Selaginella densa*, *Sibbaldia procumbens*, *Silene acaulis*, *Solidago* spp., and *Trifolium parryi*. Although alpine dry tundra is the matrix of the alpine zone, it typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadow systems.

Related Concepts:

- Alpine Rangeland (410) (Shiflet 1994) Broader
- AT Alpine Tundra, Mesic to dry sites (Ecosystems Working Group 1998) Broader

MEMBERSHIP

Associations:

- *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland (CEGL005830, G3G4)
- *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland (CEGL005831, G2G3)
- *Arctostaphylos uva-ursi* / *Solidago multiradiata* Dwarf-shrubland (CEGL005832, G2G3)
- *Artemisia arctica* ssp. *arctica* Herbaceous Vegetation (CEGL001848, GU)
- *Calamagrostis purpurascens* Herbaceous Vegetation (CEGL001850, G2)
- *Carex arapahoensis* Herbaceous Vegetation (CEGL001851, GU)
- *Carex duriuscula* - *Poa secunda* Herbaceous Vegetation (CEGL001736, G2Q)
- *Carex ebenea* - *Trifolium parryi* Herbaceous Vegetation (CEGL001873, GUQ)
- *Carex elynoides* - *Geum rossii* Herbaceous Vegetation (CEGL001853, G4)
- *Carex elynoides* - *Lupinus argenteus* Herbaceous Vegetation (CEGL001854, G3)
- *Carex elynoides* - *Oreoxis* spp. Herbaceous Vegetation (CEGL001855, G4)
- *Carex elynoides* - *Oxytropis sericea* Herbaceous Vegetation (CEGL001856, G3)
- *Carex elynoides* Herbaceous Vegetation (CEGL001852, G4)
- *Carex haydeniana* Herbaceous Vegetation (CEGL001875, GU)
- *Carex perglobosa* - *Silene acaulis* Herbaceous Vegetation (CEGL001858, GU)
- *Carex rupestris* - *Geum rossii* Herbaceous Vegetation (CEGL001861, G4)
- *Carex rupestris* - *Potentilla ovina* Herbaceous Vegetation (CEGL001862, G4)
- *Carex rupestris* - *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001863, G3G4)
- *Carex rupestris* var. *drummondiana* Herbaceous Vegetation (CEGL001864, G4)
- *Carex scirpoidea* - *Geum rossii* Herbaceous Vegetation (CEGL001866, G4)
- *Carex scirpoidea* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001867, G3?)
- *Carex scirpoidea* - *Zigadenus elegans* Herbaceous Vegetation (CEGL005866, G4G5)
- *Carex siccata* - *Geum rossii* Herbaceous Vegetation (CEGL001808, GU)
- *Carex* spp. - *Geum rossii* Herbaceous Vegetation (CEGL001870, G4Q)
- *Carex vernacula* Herbaceous Vegetation (CEGL001868, GU)
- *Cirsium scopulorum* - *Polemonium viscosum* Herbaceous Vegetation (CEGL001959, GU)
- *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892, G4)
- *Dryas octopetala* - *Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001893, G3?)

- *Dryas octopetala* Dwarf-shrub Herbaceous Vegetation (CEGL001891, G3?)
- *Festuca brachyphylla* - *Geum rossii* var. *turbinatum* Herbaceous Vegetation (CEGL001895, GUQ)
- *Festuca brachyphylla* - *Trisetum spicatum* Herbaceous Vegetation (CEGL001896, G3?)
- *Festuca brachyphylla* Herbaceous Vegetation (CEGL001797, G4?)
- *Festuca thurberi* Subalpine Grassland Herbaceous Vegetation (CEGL001631, G3)
- *Geum rossii* - *Carex albonigra* Herbaceous Vegetation (CEGL001966, G1G2Q)
- *Geum rossii* - *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001965, G3?)
- *Geum rossii* - *Selaginella densa* Herbaceous Vegetation (CEGL001968, G2G3Q)
- *Geum rossii* - *Trifolium* spp. Herbaceous Vegetation (CEGL001970, G3)
- *Geum rossii* Herbaceous Vegetation (CEGL001964, G4G5Q)
- *Kobresia myosuroides* - *Carex rupestris* var. *drummondiana* Herbaceous Vegetation (CEGL001907, G3)
- *Kobresia myosuroides* - *Geum rossii* Herbaceous Vegetation (CEGL001908, G5)
- *Kobresia myosuroides* - *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001909, GU)
- *Leucopoa kingii* - *Carex elynoides* Herbaceous Vegetation (CEGL001911, G3)
- *Leucopoa kingii* - *Oxytropis campestris* Herbaceous Vegetation (CEGL001912, G3?)
- *Leucopoa kingii* - *Phlox pulvinata* Herbaceous Vegetation (CEGL001913, G3)
- *Leucopoa kingii* - *Poa fendleriana* ssp. *fendleriana* Herbaceous Vegetation (CEGL001914, G3)
- *Leucopoa kingii* Herbaceous Vegetation (CEGL001910, G3Q)
- *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001919, G4)
- *Poa arctica* ssp. *grayana* Herbaceous Vegetation (CEGL001924, GU)
- *Poa lettermanii* Herbaceous Vegetation (CEGL001927, GU)
- *Poa nervosa* - *Achnatherum lettermanii* Herbaceous Vegetation (CEGL001656, G1G2)
- *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666, G3?)
- *Ribes montigenum* Shrubland (CEGL001133, GU)
- *Saxifraga chrysantha* Sparse Vegetation (CEGL001929, GU)
- *Sibbaldia procumbens* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001933, G3?)

Alliances:

- *Arctostaphylos uva-ursi* Dwarf-shrubland Alliance (A.1079)
- *Artemisia arctica* Herbaceous Alliance (A.1624)
- *Calamagrostis purpurascens* Herbaceous Alliance (A.1301)
- *Carex (ebenea, haydeniana)* Herbaceous Alliance (A.1302)
- *Carex arapahoensis* Herbaceous Alliance (A.1319)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Carex elynoides* Herbaceous Alliance (A.1303)
- *Carex perglobosa* Herbaceous Alliance (A.1304)
- *Carex rupestris* Herbaceous Alliance (A.1307)
- *Carex scirpoidea* Herbaceous Alliance (A.1308)
- *Carex siccata* Herbaceous Alliance (A.1298)
- *Carex vernacula* Herbaceous Alliance (A.1309)
- *Cirsium scopulorum* Herbaceous Alliance (A.1608)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Festuca brachyphylla* Herbaceous Alliance (A.1321)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Kobresia myosuroides* Herbaceous Alliance (A.1326)
- *Leucopoa kingii* Herbaceous Alliance (A.1323)
- *Minuartia obtusiloba* Herbaceous Alliance (A.1630)
- *Poa arctica* Herbaceous Alliance (A.1311)
- *Poa lettermanii* Herbaceous Alliance (A.1327)
- *Poa nervosa* Herbaceous Alliance (A.1264)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Ribes montigenum* Shrubland Alliance (A.926)
- *Saxifraga (chrysantha, mertensiana)* Sparsely Vegetated Alliance (A.1632)
- *Sibbaldia procumbens* Herbaceous Alliance (A.1635)

DISTRIBUTION

Range: This system occurs above upper treeline throughout the North American Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, central Wyoming, and isolated alpine sites in the northeastern Cascades.

Divisions: 204:P; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 1:P, 7:P, 9:?, 10:C, 12:P, 16:C, 17:C, 18:?, 19:C, 20:?, 21:C, 22:?, 23:C, 24:C, 25:C, 28:C, 29:C

USFS Ecomap Regions: 341E:PP, 341G:PP, 342B:PP, 342J:PP, M242D:PP, M331A:CC, M331B:CC, M331D:CC, M331E:CC,

M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CP, M341C:CC, M341D:CC
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C

SOURCES

References: Anderson 1999a, Baker 1980a, Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Ecosystems Working Group 1998, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Schwan and Costello 1951, Thilenius 1975, Willard 1963

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722857#references

Description Author: R. Crawford, mod. M.S. Reid

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West
ClassifResp: West

1145 ROCKY MOUNTAIN SUBALPINE-MONTANE MESIC MEADOW (CES306.829)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Silt Soil Texture; Clay Soil Texture; Udic; Forb

Non-Diagnostic Classifiers: Sideslope; Temperate [Temperate Continental]; Shallow Soil; Mineral: W/ A-Horizon >10 cm; W-Patch/Medium Intensity; W-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2145; ESLF 7118; ESP 1145

CONCEPT

Summary: This Rocky Mountain ecological system is restricted to sites from lower montane to subalpine where finely textured soils, snow deposition, or windswept dry conditions limit tree establishment. Many occurrences are small patch in spatial character, and are often found in mosaics with woodlands, more dense shrublands, or just below alpine communities. It is typically found above 2000 m in elevation in the southern part of its range and above 600 m in the northern part. These upland communities occur on gentle to moderate-gradient slopes and relatively moist habitats. The soils are typically seasonally moist to saturated in the spring, but if so will dry out later in the growing season. These sites are not as wet as those found in Rocky Mountain Alpine-Montane Wet Meadow (CES306.812). Vegetation is typically forb-rich, with forbs often contributing more to overall herbaceous cover than graminoids. Some stands are comprised of dense grasslands, these often being taxa with relatively broad and soft blades, but where the moist habitat promotes a rich forb component. Important taxa include *Erigeron* spp., Asteraceae spp., *Mertensia* spp., *Penstemon* spp., *Campanula* spp., *Lupinus* spp., *Solidago* spp., *Ligusticum* spp., *Thalictrum occidentale*, *Valeriana sitchensis*, *Rudbeckia occidentalis*, *Balsamorhiza sagittata*, and *Wyethia* spp. Important grasses include *Deschampsia caespitosa*, *Koeleria macrantha*, perennial *Bromus* spp., and a number of *Carex* species. *Dasiphora fruticosa* ssp. *floribunda* and *Symphoricarpos* spp. are occasional but not abundant. Burrowing mammals can increase the forb diversity.

Classification Comments: There are probably quite a number of *Carex*- and *Calamagrostis*-dominated types that could be cited as constituent associations.

Similar Ecological Systems:

- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Related Concepts:

- Idaho Fescue - Tufted Hairgrass (308) (Shiflet 1994) Intersecting
- Sedge - Sphagnum (ESSFdc2/09) (Steen and Coupe 1997) Intersecting
- Tall Forb (409) (Shiflet 1994) Intersecting
- Tufted Hairgrass - Sedge (313) (Shiflet 1994) Intersecting. Forb-rich portions of this SRM type overlap with this system.

MEMBERSHIP

Associations:

- *Agastache urticifolia* - *Heliomeris multiflora* Herbaceous Vegetation (CEGL001937, GNR)
- *Antennaria microphylla* - *Artemisia scopulorum* Herbaceous Vegetation (CEGL001847, G1Q)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Deschampsia caespitosa* - *Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880, G5)
- *Deschampsia caespitosa* - *Geum rossii* Herbaceous Vegetation (CEGL001884, G5)
- *Deschampsia caespitosa* - *Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885, GU)
- *Deschampsia caespitosa* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001887, GU)
- *Deschampsia caespitosa* - *Phleum alpinum* Herbaceous Vegetation (CEGL001888, G3Q)
- *Deschampsia caespitosa* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001889, G5)
- *Deschampsia caespitosa* - *Symphotrichum foliaceum* Herbaceous Vegetation (CEGL001881, G2Q)
- *Geum rossii* - *Trifolium* spp. Herbaceous Vegetation (CEGL001970, G3)
- *Heracleum maximum* - *Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940, G4)
- *Ivesia gordonii* - *Eriogonum caespitosum* Herbaceous Vegetation (CEGL001903, G2?)
- *Ivesia gordonii* - *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001902, G2?)
- *Ligusticum filicinum* - *Delphinium X occidentale* Herbaceous Vegetation (CEGL001941, G3)
- *Ligusticum porteri* - *Lupinus parviflorus* ssp. *myrianthus* Herbaceous Vegetation (CEGL001915, GU)
- *Ligusticum porteri* - *Vicia americana* Herbaceous Vegetation (CEGL001916, G3)
- *Ligusticum tenuifolium* - *Trollius laxus* ssp. *albiflorus* Herbaceous Vegetation (CEGL001917, GU)
- *Lupinus argenteus* - *Fragaria virginiana* Herbaceous Vegetation (CEGL001942, G3?)
- *Lupinus* spp. - *Poa* spp. Herbaceous Vegetation (CEGL001943, G1Q)
- *Luzula glabrata* var. *hitchcockii* - *Erythronium grandiflorum* Herbaceous Vegetation (CEGL005873, GNR)

- *Mertensia ciliata* Herbaceous Vegetation (CEGL001944, G3)
- *Phleum alpinum* - *Achillea millefolium* Herbaceous Vegetation (CEGL001920, G5)
- *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001935, G4)
- *Trifolium parryi* Herbaceous Vegetation (CEGL001936, GU)
- *Wyethia amplexicaulis* Herbaceous Vegetation (CEGL001947, G3?)
- *Xerophyllum tenax* Herbaceous Vegetation (CEGL005859, GNR)

Alliances:

- *Agastache urticifolia* Herbaceous Alliance (A.1602)
- *Antennaria microphylla* Herbaceous Alliance (A.1623)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Heracleum maximum* Temporarily Flooded Herbaceous Alliance (A.1661)
- *Ivesia gordonii* Herbaceous Alliance (A.1627)
- *Ligusticum filicinum* Herbaceous Alliance (A.1604)
- *Ligusticum porteri* Herbaceous Alliance (A.1601)
- *Ligusticum tenuifolium* Herbaceous Alliance (A.1628)
- *Lupinus argenteus* Herbaceous Alliance (A.1605)
- *Luzula glabrata* var. *hitchcockii* Herbaceous Alliance (A.2641)
- *Mertensia ciliata* Herbaceous Alliance (A.1606)
- *Phleum alpinum* Herbaceous Alliance (A.1310)
- *Trifolium (dasyphyllum, nanum)* Herbaceous Alliance (A.1637)
- *Trifolium parryi* Herbaceous Alliance (A.1638)
- *Wyethia amplexicaulis* Herbaceous Alliance (A.1607)
- *Xerophyllum tenax* Herbaceous Alliance (A.1600)

DISTRIBUTION

Range: This system is very widespread in the Rocky Mountain cordillera from New Mexico north into Canada. It probably occurs in the Black Hills region, as well as the "island ranges" of central Montana.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 8:?, 9:C, 10:C, 12:C, 13:C, 15:C, 16:C, 17:P, 18:C, 19:C, 20:C, 21:C, 22:P, 23:C, 24:C, 25:C, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 322A:CC, 331A:CC, 331J:CC, 341A:CP, 341B:CC, 341E:CP, 341F:CP, 341G:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342H:CC, 342J:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CP

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C, 68:C

SOURCES

References: Buckner 1977, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ellison 1954, Fritz 1981, Gregory 1983, Hall 1971, Hammerson 1979, Marr 1977a, Meidinger and Pojar 1991, Nachlinger 1985, Neely et al. 2001, Potkin and Munn 1989, Starr 1974

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722844#references

Description Author: NatureServe Western Ecology Team

Version: 23 Jan 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West
ClassifResp: West

CLASSIFIERS

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2439; ESLF 7152; ESP 1439

CONCEPT

Summary: This system occurs on well-drained portions of clay dunes (lomas) rising above surrounding coastal tidal flats. It is a xeric, subtropical shrubland dominated by thorny evergreen shrubs, generally 2-4 m tall. Composition of this system is extremely variable, and there is usually no clear dominant, except locally. Local dominants may include *Citharexylum berlandieri*, *Leucophyllum frutescens*, *Havardia pallens* (= *Pithecellobium pallens*), and *Ebenopsis ebano*. While there is often no clear dominant, *Yucca treculeana* is a constant and conspicuous emergent in many occurrences (Johnston 1952). Some lomas may be flooded by the sea during severe storm events. Vegetation in this system is sometimes influenced by salt spray, high winds, limited rooting depth, saline water table, and extreme xeric conditions. Soils are typically Point Isabel clay loam.

DESCRIPTION

Environment: This system occurs on well-drained portions of clay dunes (lomas) rising above surrounding coastal tidal flats. At the time of formation, lomas were located on the leeward side of irregularly flooded lagoons and tidal flats that when dry provided the source for the wind-blown clayey sediments.

MEMBERSHIP

Associations:

- *Citharexylum berlandieri* - *Yucca treculeana* - *Ebenopsis ebano* - *Phaulothamnus spinescens* Shrubland (CEGL002170, G1)
- *Maytenus phyllanthoides* - *Prosopis reptans* / *Spartina patens* Herbaceous Vegetation (CEGL007764, G2?)
- *Sporobolus wrightii* Herbaceous Vegetation (CEGL002232, G2?)

Alliances:

- *Ebenopsis ebano* - *Phaulothamnus spinescens* Shrubland Alliance (A.723)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Sporobolus wrightii* Saturated Herbaceous Alliance (A.1435)

DISTRIBUTION

Range: This coastal system is known from Aransas County, Texas, south to Mexico.

Divisions: 301:C

Nations: US

Subnations: TX

Map Zones: 36:C

USFS Ecomap Regions: 255D:CC, 315E:??

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003, Johnston 1952

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723124#references

Description Author: J. Teague

Version: 13 Jan 2003

Concept Author: J. Teague

Stakeholders: Southeast
ClassifResp: Southeast

1442 SOUTH TEXAS SAND SHEET GRASSLAND (CES301.538)

CLASSIFIERS

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2442; ESLF 7155; ESP 1442

CONCEPT

Summary: This system occurs on the ridge-and-swale topography within 100 km of the Texas coast on the Holocene-aged eolian sand deposits of the South Texas Sand Sheet (primarily Kenedy and Brooks counties and extending into adjacent Jim Hogg, Hidalgo, and Willacy counties). While the vegetation of the ridges and swales is somewhat distinct, they are not separated here. In general, ridges are dominated by *Schizachyrium littorale* and a mixture of forbs, and swales are dominated by *Paspalum monostachyum*, *Andropogon gerardii*, *Muhlenbergia capillaris*, and *Sorghastrum nutans*. *Paspalum plicatulum* may be important in both environments. In addition to the dominants, common herbaceous components include *Eragrostis* spp., *Acalypha radians*, *Argythamnia mercurialina* var. *pilosissima*, *Chamaecrista flexuosa* var. *texana*, *Cnidoscolus texanus*, *Croton argyranthemus*, *Dalea phleoides*, *Froelichia floridana*, *Galactia canescens*, *Gaura mckelveyae*, *Helianthemum georgianum*, *Monarda fruticulosa* (= *Monarda punctata* var. *fruticulosa*), *Phlox cuspidata*, *Rhynchosia americana*, *Stillingia sylvatica*, and *Thelesperma nuecense*. These grasslands occur intermixed with woodlands dominated by *Quercus fusiformis* and/or *Prosopis glandulosa* var. *glandulosa*.

Similar Ecological Systems:

- Central and South Texas Coastal Fringe Forest and Woodland (CES203.464)
- Central and Upper Texas Coast Dune and Coastal Grassland (CES203.465)

DESCRIPTION

Environment: This system occurs on deep sands of the Pleistocene-aged Ingleside barrier-strandplain and the Holocene-aged eolian sand deposits of the South Texas Sand Sheet. Topography varies from larger dunes to smaller ridges and swales.

Vegetation: In general, the vegetation of the ridges is dominated by *Schizachyrium littorale* and a mixture of forbs, and swales are dominated by *Paspalum monostachyum*, *Andropogon gerardii*, *Muhlenbergia capillaris*, and *Sorghastrum nutans*. *Paspalum plicatulum* may be important in both environments. In addition to the dominants, common herbaceous components include *Eragrostis* spp., *Acalypha radians*, *Argythamnia mercurialina* var. *pilosissima*, *Chamaecrista flexuosa* var. *texana*, *Cnidoscolus texanus*, *Croton argyranthemus*, *Dalea phleoides*, *Froelichia floridana*, *Galactia canescens*, *Gaura mckelveyae*, *Helianthemum georgianum*, *Monarda fruticulosa* (= *Monarda punctata* var. *fruticulosa*), *Phlox cuspidata*, *Rhynchosia americana*, *Stillingia sylvatica*, and *Thelesperma nuecense*. These grasslands occur intermixed with woodlands dominated by *Quercus fusiformis* and *Prosopis glandulosa* var. *glandulosa*.

Dynamics: Fire, climate, and edaphic factors all likely played a role historically in maintaining a more open structure in this vegetation. Historically, fire likely limited the development of woody cover. Likewise, edaphic conditions limited this system to deep sandy soils. Loss of these natural processes often results in a shift toward a more closed canopy and decrease in native grass cover. Threats to this system include fire suppression, invasive exotics, and damage by vehicles.

MEMBERSHIP

Associations:

- *Quercus fusiformis* - *Prosopis glandulosa* var. *glandulosa* / *Malvaviscus arboreus* var. *drummondii* Forest (CEGL007785, G3)
- *Schizachyrium littorale* - *Paspalum plicatulum* Texas Sand Sheet Herbaceous Vegetation (CEGL007821, GNR)

Alliances:

- *Paspalum monostachyum* - (*Panicum amarum*, *Schizachyrium littorale*) Herbaceous Alliance (A.1200)
- *Quercus fusiformis* Forest Alliance (A.1926)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central and South Texas Coastal Fringe Forest and Woodland (CES203.464)

DISTRIBUTION

Range: This system is endemic to Texas. It is found within 100 km of the coast on the Holocene-aged eolian sand deposits of the South Texas Sand Sheet primarily Kenedy and Brooks counties and extending into adjacent Jim Hogg, Hidalgo, and Willacy counties.

Divisions: 301:C

Nations: US

Subnations: TX

Map Zones: 36:C

USFS Ecomap Regions: 315E:CC

TNC Ecoregions: 30:C, 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723064#references

Description Author: J. Teague

Version: 23 Jan 2008

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

1423 SOUTHEASTERN GREAT PLAINS TALLGRASS PRAIRIE (CES205.685)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Graminoid

Non-Diagnostic Classifiers: Lowland; Unglaciated; Shallow Soil; F-Landscape/Medium Intensity; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2423; ESLF 7136; ESP 1423

CONCEPT

Summary: This system is found primarily within the Flint Hills and Osage Plains of Kansas and Oklahoma. Small patches can be found in the Ozarks of Missouri and the Arbuckle Mountains of Oklahoma. In southern Oklahoma and Texas, this is the primary natural system of the "Grand Prairie" or "Fort Worth Prairie," ranging south into the Lampasas Cutplain of Texas (EPA 29d and 29e, respectively). It is distinguished from Central Tallgrass Prairie (CES205.683) by having more species with southwestern geographic affinities and the presence of a thin soil layer over limestone beds ranging to more acidic substrates, although some areas of deeper soil are found within the region, especially on lower slopes, draws, and terraces. Because of the presence of the rocky substrate close to the surface and the rolling topography, this area is relatively unsuitable for agriculture. The Flint Hills contain one of the largest remaining, relatively intact pieces of tallgrass prairie. The vegetation in this system is typified by tallgrass species such as *Andropogon gerardii*, *Panicum virgatum*, *Schizachyrium scoparium*, and *Sorghastrum nutans* forming a dense cover. A moderate to high density of forb species also occurs. Species composition varies geographically, with *Oligoneuron rigidum* (= *Solidago rigida*), *Liatris punctata*, *Symphotrichum ericoides*, *Lespedeza capitata*, and *Viola pedatifida* occurring in some localities. Areas of deeper soil, especially lower slopes along draws, slopes and terraces, can include *Baptisia alba* var. *macrophylla*, *Liatris pycnostachya*, and *Vernonia missurica*. Shrub and tree species are relatively infrequent and, if present, constitute less than 10% cover in the area. Fire and grazing constitute the major dynamic processes for this region. Although many of the native common plant species still occur, grazing does impact this region. Poor grazing practices can lead to soil erosion and invasion by cool-season grasses such as *Bromus inermis* within its range.

Classification Comments: This includes the Flint Hills, in addition to prairies in Oklahoma and Missouri south of the glacial line (including Ozarks of Missouri). There may need to be further review concerning the prairies in Missouri and Oklahoma. Southeastern Great Plains Tallgrass Prairie (CES205.685) lies to the west of the floristically related Texas Blackland Tallgrass Prairie (CES205.684), and is more widespread, ranging from Texas north to Kansas.

Similar Ecological Systems:

- Arkansas Valley Prairie and Woodland (CES202.312)
- Central Tallgrass Prairie (CES205.683)
- Lower Mississippi Alluvial Plain Grand Prairie (CES203.549)
- Ozark Prairie and Woodland (CES202.326)
- Texas Blackland Tallgrass Prairie (CES205.684)
- West Gulf Coastal Plain Northern Calcareous Prairie (CES203.377)

Related Concepts:

- Flint Hills Tallgrass Prairie (Lauver et al. 1999) Finer

DESCRIPTION

Environment: This system is typified by the thin soil layer over limestone beds or acidic substrates such as chert or granite, although areas of deeper soils are possible along lower slopes, draws, and terraces. The topography is rolling and mostly unsuitable for agriculture.

Vegetation: Tallgrass species such as *Andropogon gerardii*, *Panicum virgatum*, *Schizachyrium scoparium*, and *Sorghastrum nutans* predominate this system and often form a dense cover. Forb species such as *Oligoneuron rigidum* (= *Solidago rigida*), *Liatris punctata*, *Symphotrichum ericoides*, *Lespedeza capitata*, and *Viola pedatifida* can also occur. In those areas of deeper soils, *Baptisia alba* var. *macrophylla*, *Liatris pycnostachya*, and *Vernonia missurica* can also occur within their range. Tree and shrub species are relatively infrequent and constitute less than 10% cover. Some other plant species which can occur include *Andropogon ternarius*, *Aristida dichotoma*, *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Bouteloua hirsuta*, *Calamagrostis canadensis*, *Coreopsis grandiflora*, *Danthonia spicata*, *Helianthus grosseserratus*, *Mentzelia oligosperma*, *Rudbeckia missouriensis*, *Silene regia*, *Croton willdenowii*, and *Tradescantia bracteata*.

Dynamics: Fire and grazing are the prevalent dynamic processes in examples of this system. Overgrazing can lead to soil erosion and invasion of cool-season grasses. Fire suppression can lead to increased cover of woody species.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* - *Helianthus grosseserratus* Herbaceous Vegetation (CEGL002024, G2G3)

- *Andropogon gerardii* - *Sorghastrum nutans* - *Schizachyrium scoparium* Flint Hills Herbaceous Vegetation (CEGL002201, G4?)
- *Andropogon gerardii* - *Sorghastrum nutans* Unglaciated Herbaceous Vegetation (CEGL002204, G3)
- *Bouteloua curtipendula* - *Bouteloua (eriopoda, gracilis)* Herbaceous Vegetation (CEGL002250, G4)
- *Juniperus ashei* / *Bouteloua (curtipendula, hirsuta)* Woodland (CEGL002125, G2G3)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* Forest (CEGL003628, GNA)
- *Muhlenbergia reverchonii* - *Croton monanthogynus* Herbaceous Vegetation (CEGL004785, G2G3)
- *Schizachyrium scoparium* - (*Sorghastrum nutans*) - *Sporobolus compositus* var. *compositus* - *Liatris mucronata* Herbaceous Vegetation (CEGL004211, GNR)
- *Schizachyrium scoparium* - *Aristida dichotoma* - *Croton willdenowii* / Lichens Wooded Herbaceous Vegetation (CEGL002242, G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Rudbeckia missouriensis* - *Mentzelia oligosperma* Wooded Herbaceous Vegetation (CEGL002251, G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Andropogon ternarius* - *Coreopsis grandiflora* Sandstone - Shale Herbaceous Vegetation (CEGL002212, G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Danthonia spicata* - *Silene regia* Chert Herbaceous Vegetation (CEGL002211, G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Tradescantia bracteata* Alkaline Bedrock Herbaceous Vegetation (CEGL005280, G1G2)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Bouteloua curtipendula* Herbaceous Alliance (A.1244)
- *Juniperus ashei* Woodland Alliance (A.501)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Muhlenbergia reverchonii* Herbaceous Alliance (A.1218)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found primarily within the Flint Hills and Osage Plains of Kansas and Oklahoma. Small patches can be found in the Ozarks of Missouri and the Arbuckle Mountains of Oklahoma. In southern Oklahoma and Texas, this is the primary natural system of the "Grand Prairie" or "Fort Worth Prairie," ranging south into the Lampasas Cutplain of Texas (EPA 29d and 29e, respectively). In Missouri, it is attributed to EPA 40c, 40d, and possibly 39k.

Divisions: 205:C

Nations: US

Subnations: KS, MO, OK, TX

Map Zones: 32:P, 35:C, 38:P, 43:C, 44:C

USFS Ecomap Regions: 223A:PP, 251E:CC, 251F:CC, 251G:CC, 251H:CC, 255A:CC, 255E:CC, 332E:CC

TNC Ecoregions: 32:C, 36:C, 37:C, 38:P

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Lauver et al. 1999, Ricketts et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722974#references

Description Author: S. Menard and K. Kindscher, mod. M. Pyne and J. Teague

Version: 23 Jan 2008

Concept Author: S. Menard and K. Kindscher, mod. M. Pyne and T. Foti

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1414 SOUTHERN APPALACHIAN GRASS AND SHRUB BALD (CES202.294)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Herbaceous; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2414; ESLF 7127; ESP 1414

CONCEPT

Summary: This ecological system consists of dense herbaceous and shrubland communities in the highest elevational zone of the southern Appalachians, generally above 1524 m (5000 feet) but occasionally to 1220 m (4000 feet), and at slightly lower elevations at its northern limit in Virginia and West Virginia, and in the Cumberland Mountains along the Virginia-Kentucky border. Vegetation consists either of dense shrub-dominated areas (heath balds) or dense herbaceous cover dominated by grasses or sedges (grassy balds). The combination of high-elevation, non-wetland sites and dense herbaceous or shrub vegetation without appreciable rock outcrop conceptually distinguishes this system from all others in the southern Appalachians. However, the widespread areas of degraded spruce-fir with grass and shrub cover and the invasion of grassy balds by trees blur the distinction somewhat.

Classification Comments: Grassy balds and heath balds differ in a number of ways and are often recognized as distinct entities. Whether these need to be split out at the system level, rather than just at the association level, has been questioned (M. Schafale pers. comm.). This system occurs in settings similar to Southern Appalachian Rocky Summit (CES202.327) and might be broadened to encompass that system.

DESCRIPTION

Environment: This system generally occurs at elevations above 1524 m (5000 feet) but may range as low as 1220 m (4000 feet) in the Southern Blue Ridge. It is also of limited extent above 1035 m (3400 feet) in the Cumberland Mountains along the Virginia-Kentucky border. It occurs on broad ridgetops and narrow spur ridges. Elevation and orographic effects (winds cooling as they rise to create increased condensation) make the climate cool and wet, with heavy moisture input from fog as well as high rainfall. Convex slopes and exposure to wind offset the moisture input to some extent. Concentration of air pollutants has been implicated as an important anthropogenic stress in this elevational range in recent years. Soils range from shallow and rocky to fairly deep residual soils. Any kind of bedrock may be present, but most sites have erosion-resistant felsic igneous or metamorphic rocks, with slate and quartzite particularly frequent. The sites that support balds are not obviously different from similar sites that support spruce-fir forests, so the origin of these communities continues to be fodder for debate. Fire may be an important factor in some examples, whereas grazing and/or exposure to the elements may help maintain others.

Vegetation: Vegetation consists either of dense shrubs (heath balds or blackberry) or dense herbaceous cover dominated by grasses or sedges (grassy balds). Heath balds are most often dominated by *Rhododendron catawbiense*, but substantial examples are also dominated by *Rhododendron carolinianum*, *Kalmia latifolia*, or a mixture of shrubs. One large example, dominated by *Alnus viridis* ssp. *crispa*, is generally also regarded as related to the heath balds. Grassy balds are characteristically dominated by *Danthonia compressa* or *Carex* spp. Large areas have also become dominated by *Rubus allegheniensis* and by mixtures of native grasses with exotic pasture grasses. Most examples of grassy balds have some invading shrubs and trees, often dense enough to threaten the herbaceous vegetation. Heath balds may contain sparse stunted trees barely larger than the shrub canopy.

Dynamics: The dynamics that maintain and that created the communities in this system have been a major topic of debate, so far without resolution. Most grassy bald occurrences show a strong tendency to succeed to shrub or forest vegetation under present conditions, suggesting that some important maintenance process has been lost. Grazing by native herbivores (elk and bison) and periodic fire have both been suggested as natural mechanisms to keep out woody vegetation. Others have suggested that all grassy balds are of anthropogenic origin and were never ecologically stable. The most definitive grassy balds have been documented as present at the time of the first European settlement, making documentation of their origin impossible. The presence of shade-intolerant disjunct herb species in some suggests even greater age. Some areas of the spruce-fir system degraded by a combination of logging, slash fires, and grazing resemble grassy balds, but most do not. The universal cattle grazing in grassy balds by early settlers has further obscured their original character and evidence of processes.

Heath balds are more widely regarded as being created or maintained by fire. However, heavy organic accumulations in the soil suggest great age for some. Most show very limited tendency to succeed to forest, suggesting that the dense shrub layer is highly competitive and that only infrequent fire would be needed to maintain them. As with the grassy balds, spruce-fir forests burned in historical times do not usually develop vegetation identical to heath balds.

MEMBERSHIP

Associations:

- (*Prunus pensylvanica*, *Sorbus americana*) - *Rubus* spp. Successional Shrubland (CEGL007293, GNA)
- *Alnus viridis* ssp. *crispa* / *Carex pensylvanica* Shrubland (CEGL003891, G1)
- *Carex pensylvanica* Herbaceous Vegetation (CEGL004094, G1)

- *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Herbaceous Vegetation (CEGL004242, G1)
- *Danthonia spicata* - *Solidago rugosa* ssp. *aspera* Herbaceous Vegetation (CEGL004760, GNA)
- *Kalmia latifolia* - *Gaylussacia (baccata, brachycera)* Cumberland Shrubland (CEGL008470, G3)
- *Kalmia latifolia* - *Rhododendron catawbiense* - (*Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum*) Shrubland (CEGL003814, G2G3)
- *Leiophyllum buxifolium* Dwarf-shrubland (CEGL003951, G1)
- *Minuartia groenlandica* - *Paronychia argyrocoma* - *Saxifraga michauxii* Herbaceous Vegetation (CEGL008509, G1)
- *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland (CEGL008508, G1?)
- *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876, G1)
- *Rhododendron carolinianum* Shrubland (CEGL003816, G2)
- *Rhododendron catawbiense* - *Pieris floribunda* Shrubland (CEGL004516, G1)
- *Rhododendron catawbiense* Shrubland (CEGL003818, G2)
- *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland (CEGL003892, GNA)
- *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893, GNA)

Alliances:

- *Alnus viridis* ssp. *crispa* Shrubland Alliance (A.929)
- *Carex pensylvanica* Herbaceous Alliance (A.1278)
- *Danthonia compressa* Herbaceous Alliance (A.1280)
- *Danthonia spicata* Herbaceous Alliance (A.1281)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- *Leiophyllum buxifolium* Dwarf-shrubland Alliance (A.1063)
- *Rhododendron (catawbiense, carolinianum)* - *Kalmia latifolia* Shrubland Alliance (A.744)
- *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance (A.930)
- *Saxifraga michauxii* Herbaceous Alliance (A.1621)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch to large-patch system, sometimes occurring as single patches, sometimes as complexes of small patches.

Size: Individual patches of both grassy bald and heath bald range from 10 acres or less, to occasional expanses of hundreds of acres. Heath balds sometimes occur as complexes of small patches on spur ridges. Separation rules will have a strong effect on the aggregate acreage of defined occurrences in these situations, but the largest occurrences are fairly contiguous.

Adjacent Ecological Systems:

- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Northern Hardwood Forest (CES202.029)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Appalachian Seepage Wetland (CES202.317)

Adjacent Ecological System Comments: This system is virtually always bordered by Southern Appalachian Northern Hardwood Forest (CES202.029) or Central and Southern Appalachian Spruce-Fir Forest (CES202.028). It may also contain embedded small patches of Southern Appalachian Rocky Summit (CES202.327) and Southern Appalachian Seepage Wetland (CES202.317).

DISTRIBUTION

Range: This system ranges from the Balsam Mountains and Great Smoky Mountains of North Carolina and Tennessee northward to Virginia and West Virginia. The system is also of limited extent in the Cumberland Mountains along the Virginia-Kentucky border. The current status in Georgia is open to question and was apparently never extensive in any case.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, TN, VA, WV

Map Zones: 57:C, 61:C

USFS Ecomap Regions: M221A:CC, M221B:CC

TNC Ecoregions: 50:C, 51:C, 59:C

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723195#references

Description Author: M. Schafale and R. Evans, mod. S.C. Gawler and M. Pyne

Version: 05 May 2008

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1426 SOUTHERN ATLANTIC COASTAL PLAIN DUNE AND MARITIME GRASSLAND (CES203.273)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Graminoid; Coast

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2426; ESLF 7139; ESP 1426

CONCEPT

Summary: This system consists primarily of grasslands and related shrublands of Atlantic Coastal Plain barrier islands and related near-coastal areas from North Carolina southward to northern and central Florida. On the portion of the Florida Coast from south of Cape Canaveral to the sandy portions of the Florida Keys, this system occurs in a more attenuated fashion. A distinct system could be recognized, but this does not seem necessary. Upland plant communities and non-flooded wetlands (including "maritime wet grasslands") are included in this system as embedded or "inclusional" shrublands. The environment of this system is highly dynamic. Reworking of sand by storms or by slower eolian processes may completely change the local environment in a short time, and portions of the system may occupy sites fairly early in the process of primary succession. The combined effects of chronic and extreme salt spray and ocean overwash prevent or dramatically inhibit woody plant growth.

Classification Comments: This system was separated from Northern Atlantic Coastal Plain Dune and Swale (CES203.264) to parallel broad-scale biogeographic and climatic differences believed to be important in this environment. The northern part of this broad transition was labeled by Cowardin et al. (1979) as the Virginian Province and the southern region as the Carolinian Province, although the demarcated boundary differs somewhat from that used here. A primary indicator of this transition is the shift in vegetation dominance on the dunes from *Uniola paniculata* in the south to *Ammophila breviligulata* in the north. Although the location of this shift itself is somewhat imprecise because of widespread planting of both species on artificially enhanced dunes, this boundary appears to be well approximated by Omernik Ecoregion 63g vs. 63d (EPA 2004).

Similar Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)
- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)--occurs to the north.
- Southeastern Coastal Plain Interdunal Wetland (CES203.258)
- Southern Atlantic Coastal Plain Maritime Forest (CES203.537)
- Southwest Florida Dune and Coastal Grassland (CES203.539)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Coastal Grassland (FNAI 1990) Intersecting
- Coastal Strand (FNAI 1992b) Intersecting

DESCRIPTION

Environment: Occurs on barrier islands and similar coastal strands, on sand dunes and sand flats. Strong salt spray is an important influence on vegetation in many parts. Overwash by sea water during storms is important on sand flats not protected by continuous dunes. On dunes, present or recent sand movement is an important factor. The combination of these factors prevents the dominance of woody vegetation. Sites may be either dry or saturated by freshwater from rainfall and local water table. Areas connected to tidal influence and areas with ponded freshwater are placed in other systems. Soils are sandy, with little organic matter and little or no horizon development. Soils may be excessively drained on the higher dunes. Soils are low in nutrient-holding capacity, but aerosol input of sea salt provides a continuous source of nutrients. There is variation in vegetation patterns and patch size with the aspect of the barrier island. Barrier islands that face south tend to have better developed dune fields, and often have extensive Maritime Forest systems. East-facing barrier islands naturally have less continuous dunes and more overwash flats.

Vegetation: Vegetation consists of a set of grassland and other herbaceous associations. *Uniola paniculata* is the characteristic dominant on the youngest dunes and those most exposed to salt spray and less commonly *Panicum amarum* (Pinson 1973). *Spartina patens* or *Schizachyrium littorale* tend to dominate older dunes and sand flats. Component communities tend to be low in plant species richness, but have a characteristic set of forbs and occasional low shrubs associated with them. Wetter sand flats and dune swales may be dominated by a variety of herbs and sometimes have fairly high species richness. Also included in this system are patches of transition shrub communities or shrub thickets.

Dynamics: The environment of this system is one of the most dynamic in existence for terrestrial vegetation. Reworking of sand by storms or by slower eolian processes may completely change the local environment in a short time, changing one association to another or changing this system into a different system. Many of these sites are fairly early in the process of primary succession on recent surfaces. Chronic salt spray is an ongoing stress. Overwash and extreme salt spray in storms is a frequent disturbance. Vegetation interacts strongly with geologic processes; the presence of grass is an important factor in the development of new dunes. Alteration of dynamic processes, such as artificial enhancement of dunes by planting or sand fencing, can have drastic effects on this

system, causing large areas to succeed to woody vegetation. Fire is probably not a major natural factor in this system, but may have been important locally. Most vegetation is too sparse to carry fire well.

MEMBERSHIP

Associations:

- *Iva imbricata* / *Uniola paniculata* - *Helianthus debilis* ssp. *debilis* Herbaceous Vegetation (CEGL004001, G2G3)
- *Morella cerifera* / *Spartina patens* Shrubland (CEGL003839, G3G4)
- *Morella pensylvanica* / *Diodia teres* Shrubland (CEGL003881, G2)
- *Muhlenbergia filipes* - *Spartina patens* - *Eustachys petraea* Herbaceous Vegetation (CEGL004051, G2)
- *Quercus virginiana* - (*Ilex vomitoria*) Shrubland (CEGL003833, G3)
- *Sabal palmetto* / *Glyceria septentrionalis* - *Carex stipata* - *Woodwardia virginica* Woodland (CEGL007784, G3?)
- *Salix caroliniana* / *Hibiscus grandiflorus* / *Polygonum punctatum* Woodland (CEGL004272, G3G4)
- *Salix caroliniana* / *Sacciolepis striata* - *Boehmeria cylindrica* Woodland (CEGL004222, G2?)
- *Serenoa repens* - *Sabal palmetto* - *Ilex vomitoria* - *Sideroxylon tenax* Shrubland (CEGL003812, G1)
- *Smilax auriculata* - *Toxicodendron radicans* Vine-Shrubland (CEGL003885, GNRQ)
- *Smilax auriculata* / *Heterotheca subaxillaris* - *Strophostyles helvula* - (*Uniola paniculata*) Herbaceous Vegetation (CEGL004234, G2G3)
- *Spartina patens* - *Schoenoplectus pungens* - *Solidago sempervirens* Herbaceous Vegetation (CEGL004097, G2G3)
- *Uniola paniculata* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004040, G3?)
- *Uniola paniculata* - *Schizachyrium littorale* - *Panicum amarum* Herbaceous Vegetation (CEGL004039, G3)
- *Uniola paniculata* Herbaceous Vegetation (CEGL004038, G3)

Alliances:

- *Morella cerifera* Saturated Shrubland Alliance (A.1906)
- *Morella pensylvanica* - (*Prunus maritima*) Shrubland Alliance (A.902)
- *Muhlenbergia filipes* Herbaceous Alliance (A.1217)
- *Quercus virginiana* - *Ilex vomitoria* - (*Morella cerifera*) Shrubland Alliance (A.785)
- *Sabal palmetto* Saturated Woodland Alliance (A.488)
- *Salix caroliniana* Seasonally Flooded Woodland Alliance (A.1914)
- *Serenoa repens* Temperate Shrubland Alliance (A.750)
- *Smilax* spp. - *Toxicodendron radicans* Vine-Shrubland Alliance (A.909)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Uniola paniculata* Subtropical Herbaceous Alliance (A.1153)
- *Uniola paniculata* Temperate Herbaceous Alliance (A.1199)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as a large-patch or local matrix system.

Size: Occurs in narrow to broad bands, up to several miles wide, extending along the length of barrier islands. Individual patches may cover a thousand or more acres. However, some of the best remnants are naturally small, occurring on smaller islands.

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)

DISTRIBUTION

Range: This system ranges on the Atlantic Coast from northern North Carolina (Omernik ecoregion 63g) to central Florida. The northern limit is a transition zone from around Kitty Hawk, North Carolina, to the Virginia-North Carolina border.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC

Map Zones: 55:C, 56:?, 58:C

USFS Ecomap Regions: 232C:CC, 232I:CC

TNC Ecoregions: 55:?, 56:C, 57:C

SOURCES

References: Comer et al. 2003, Cowardin et al. 1979, EPA 2004, Pinson 1973

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723213#references

Description Author: R. Evans, mod. M. Pyne

Version: 22 Sep 2008

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1430 SOUTHERN COASTAL PLAIN BLACKLAND PRAIRIE AND WOODLAND (CES203.478)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Circumneutral Soil; Deep Soil; Clay Soil Texture; Graminoid

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2430; ESLF 7143; ESP 1430

CONCEPT

Summary: This system includes natural grassland vegetation and associated wooded vegetation found primarily in two relatively small natural regions in the southeastern Coastal Plains, primarily in Alabama and Mississippi (with one of these extending barely into southern Tennessee), and a related area of southern Georgia. The larger of these, the so-called Black Belt, is approximately 480 km (300 miles) long and 40-50 km (25-30 miles) wide, and is delineated as the Black Belt Subsection 231Ba of Keys et al. (1995) and the Blackland Prairie Ecoregion 65a of Griffith et al. (2001). The smaller and more southerly one of the two is known as the Jackson Prairie region, is found on younger geologic strata and is delineated as the Jackson Hills Subsection (231Bj) of Keys et al. (1995) and as the Jackson Prairie Ecoregion (65r) of EPA (2004). The vegetation of this system is comprised of natural grasslands and associated wooded vegetation (woodlands and savannas). The Black Belt region derives its name from the nearly black, rich topsoil that developed over Selma Chalk, and has long been noted as a distinct topographic region in the state of Mississippi (Lowe 1921). In Alabama, the formations on which this system primarily occurs are Demopolis Chalk and Mooreville Chalk (members of the Selma Group). In Tennessee, only Demopolis Chalk is mapped (Hardeman 1966). Examples occur over relatively deep soils (as opposed to "glades and barrens" on or adjacent to rock outcrops), with circumneutral surface soil pH. Vegetation of this ecological system includes evergreen *Juniperus virginiana*-dominated forests and deciduous *Quercus*-dominated woodlands of varying densities, interspersed with native prairielike grasslands. Much of the natural vegetation of the region has been converted to pasture and agricultural uses, but even old-field vegetation reflects the distinctive composition of the flora and ecological dynamics. In most cases individual prairie openings are small and isolated from one another, but were formerly more extensive prior to European settlement, forming a mosaic of grasslands and woodlands under frequent fire regimes. The flora has much in common with other prairies of the East Gulf Coastal Plains, as well as the classic Midwestern prairies. Within this natural region, there are pockets of acidic soils which produce more typical pine-oak woodland or forest vegetation. The Jackson Prairie component of the system includes natural grassland vegetation and associated wooded vegetation in the Jackson Hills Subsection (231Bj) of Keys et al. (1995) also called the Jackson Prairie Ecoregion (65r) of EPA (2004), a relatively small natural region of Mississippi and adjacent Alabama. This system occurs on montmorillonitic Vertisols, which are deep, slowly permeable soils formed in residuum weathered from marl or chalk. Examples occur in a larger matrix of primarily acidic soils and of generally *Pinus taeda*-dominated forest vegetation. In most cases individual prairie openings are small and isolated from one another but were formerly more extensive prior to European settlement, forming a mosaic of grassland and woodland under frequent fire regimes. Much of the natural vegetation of the region has been converted to pasture and agricultural uses, with concomitant destruction of most prairie remnants.

Classification Comments: "Blackland Prairies" occur primarily in two discrete areas of the East Gulf Coastal Plain: Jackson Prairie and the Black Belt. There is also an area in the Atlantic Coastal Plain of Georgia which is included here. It is a "blackland" but not a "black belt" prairie. Much of the natural vegetation of the region has been converted to pasture and agricultural uses, with concomitant destruction of most prairie remnants (DeSelm and Murdock 1993). Of the approximately 100,000 acres of Blackland Prairies mapped during the general land surveys of the early and mid 1800s in Mississippi, probably less than 500 acres of Jackson Prairie vegetation exists today, even if one considers grazed areas and vacant agricultural lands with a semblance of prairie species (R. Wieland pers. comm.). Almost all of the lands were converted to agriculture. Some of the lands are now reverting back to prairie after being abandoned. More recently, lands are being converted to fescue pasture; other abandoned lands have become stands of eastern red-cedar. The number of acres in good condition is probably less than 100. The flora has much in common with other prairies of the East Gulf Coastal Plains as well as the classic Midwestern prairies.

DESCRIPTION

Environment: The Black Belt component of this system generally occurs on Cretaceous age chalk, marl and calcareous clay. This includes calcareous soils of the Sumter, Binnsville, and Demopolis series, described as beds of marly clay over Selma Chalk (including the Demopolis and Mooreville formations). The area has an average annual precipitation of 130-140 cm and a frost-free period of 200-250 days. The soils of the Jackson Prairie openings are presently mapped as the Maytag Series, a fine montmorillonitic, thermic Entic Chromudert. This deep slowly permeable soil has formed in residuum weathered from marl of chalk of the Blackland Prairies (Wieland 1995). Examples occur in a larger matrix of primarily acidic soils and of generally *Pinus taeda*-dominated forest vegetation (Jones 1971).

Vegetation: Vegetation of this ecological system includes evergreen *Juniperus virginiana*-dominated forests and deciduous *Quercus*-dominated woodlands of varying densities, interspersed with native prairie-like grasslands. Much of the natural

vegetation of the region has been converted to pasture and agricultural uses, but even old-field vegetation reflects the distinctive composition of the flora and ecological dynamics. The oak woodlands of the Black Belt component typically contain *Quercus stellata*, *Quercus muehlenbergii*, and *Quercus marilandica*. Other woody components include *Quercus falcata*, *Carya alba*, *Carya glabra*, *Fraxinus americana*, *Celtis laevigata*, *Cercis canadensis* var. *canadensis*, *Crataegus engelmannii*, *Diospyros virginiana*, *Ilex decidua*, *Prunus angustifolia*, *Frangula caroliniana*, *Sideroxylon lycioides*, and *Ulmus alata*. Prairie forbs and grasses may persist in small openings and in edge situations in the more heavily forested areas of the Black Belt. The presence of *Juniperus virginiana*-dominated zones may represent invasion by this species in the absence of sufficiently frequent or intense fire (DeSelm and Murdock 1993). Pines are generally absent, being inhibited by the higher surface soil pH. In the grass-dominated areas of the Black Belt, *Schizachyrium scoparium* and *Sorghastrum nutans* are the principal herbs. Other herbaceous taxa include *Andropogon glomeratus*, *Andropogon virginicus*, *Bouteloua curtipendula*, *Panicum virgatum*, and *Schizachyrium scoparium*, with lesser amounts of *Paspalum floridanum*, *Setaria parviflora*, and *Sporobolus indicus* (exotic). Other common species include *Arnoglossum plantagineum*, *Symphotrichum dumosum* (= *Aster dumosus*), *Symphotrichum patens* (= *Aster patens*), *Crotalaria sagittalis*, *Dalea candida*, *Dalea purpurea*, *Desmanthus illinoensis*, *Desmodium ciliare*, *Dracopis amplexicaulis*, *Liatris aspera*, *Liatris squarrosa*, *Liatris squarrolosa*, *Neptunia lutea*, *Ratibida pinnata*, *Ruellia humilis*, *Silphium terebinthinaceum*, *Silphium trifoliatum* var. *latifolium*, and *Solidago nemoralis*. In depressions and drainages, *Andropogon gerardii* and/or *Panicum virgatum* will have greater importance (DeSelm and Murdock 1993). At this more mesic end of the continuum, invasion by woody plants is a more serious threat to the system. Moist, seepy inclusions within this system are often dominated by *Rhynchospora colorata* and *Scleria verticillata*; *Rhynchospora divergens*, *Lythrum alatum* var. *lanceolatum*, *Mitreola petiolata*, and *Mecardonia acuminata* also occur but much less frequently (A. Schotz pers. comm.). The most prominent tall grasses of the Jackson Prairie component are *Andropogon gerardii*, *Schizachyrium scoparium*, *Sorghastrum nutans*, and *Panicum virgatum*. Additional tall grasses include *Tripsacum dactyloides*, *Andropogon glomeratus*, and *Paspalum floridanum*. Along with *Schizachyrium scoparium*, two other species provide over 50% cover in prairie openings: *Carex cherokeensis* and *Helenium autumnale*. Other plants closely affiliated with less disturbed prairie openings include *Dalea purpurea*, *Dalea candida*, *Sporobolus compositus* var. *macer*, *Muhlenbergia capillaris*, *Penstemon laxiflorus* (= *Penstemon australis* ssp. *laxiflorus*), *Symphotrichum novae-angliae* (= *Aster novae-angliae*), *Echinacea purpurea*, *Manfreda virginica*, *Ruellia purshiana*, *Desmanthus illinoensis*, and *Spiranthes magnicamporum* (Wieland 1995).

Dynamics: In the presettlement landscape and throughout the nineteenth century, a combination of fire and grazing (first by native ungulates and then by free-ranging cattle) kept these sites open and grass-dominated. The Black Belt was one of the South's most important agricultural areas before the American Civil War (Smith 1911). A long history of cultivation and disturbance has left few large, intact prairies remaining. With range enclosure and fire suppression increasing during the twentieth century, the dynamics of the landscape changed, and the coverage of fire-intolerant woody species increased. The formerly extensive system is now reduced to patches or its flora persists in pastures which are under more continuous grazing pressure than the former processes would have allowed. This has probably led to more uniformity of the vegetation and would favor some taxa over others. More study is needed.

MEMBERSHIP

Associations:

- (*Quercus sinuata*) / *Sorghastrum nutans* - *Ratibida pinnata* - *Hedyotis nigricans* var. *nigricans* - (*Glandularia bipinnatifida*) Georgia Chalk Prairie Herbaceous Vegetation (CEGL004247, G1)
- *Crataegus (crus-galli, marshallii)* Jackson Prairie Shrubland [Provisional] (CEGL003976, G3?)
- *Crataegus crus-galli* - *Ilex decidua* - *Crataegus viridis* Shrubland (CEGL004532, GNR)
- *Juniperus virginiana* var. *virginiana* - (*Celtis laevigata*, *Prunus angustifolia*, *Sideroxylon lycioides*) Woodland (CEGL007747, G2)
- *Quercus stellata* - *Quercus muehlenbergii* / *Schizachyrium scoparium* - *Sorghastrum nutans* Black Belt Woodland (CEGL004670, G2G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Dalea candida* - *Liatris squarrosa* - (*Silphium terebinthinaceum*) Black Belt Herbaceous Vegetation (CEGL004664, G1)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Dalea purpurea* - *Silphium integrifolium* Jackson Prairie Herbaceous Vegetation (CEGL004020, G1)

Alliances:

- *Crataegus (crus-galli, marshallii)* Shrubland Alliance (A.899)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system has several distinct components. The Black Belt Prairie component is primarily restricted to the Black Belt (Subsection 231Ba) (Keys et al. 1995) or Blackland Prairie area (Ecoregion 65a) and Flatwoods/Blackland Prairie Margins area (Ecoregion 65b) of Griffith et al. (2001). This region is primarily in Alabama and Mississippi, ranging north in a depauperate form to southern Tennessee (McNairy County) (DeSelm 1989b). The Jackson Prairie component of this system is found in a relatively small natural region of Mississippi, known as the Jackson Hills Subsection 231Bj of Keys et al. (1995) and the Jackson Prairie Ecoregion 65r of EPA (2004). There is also a recently recognized component found in limited parts of Georgia (e.g., on both sides of the Ocmulgee River on the Fort Valley Plateau of Bleckley, Houston, Peach, and Twiggs counties). There are also outlying occurrences southward in the Chunnenuggee Hills and Red Hills (both of these parts of the Southern Hilly Coastal Plain - Ecoregion 65d), and Buhrstone/Lime Hills (Ecoregion 65q) of southern Alabama (in Washington, Wilcox, Monroe, and Clark counties). There are some limited examples in Ecoregion 65i (Fall Line Hills; e.g., Jones Bluff in Alabama).

Divisions: 203:C

Nations: US

Subnations: AL, GA, MS, TN

Map Zones: 46:C, 55:C

USFS Ecomap Regions: 231B:CC, 232B:CC

TNC Ecoregions: 43:C, 53:?, 56:C

SOURCES

References: Comer et al. 2003, DeSelm 1989b, DeSelm and Murdock 1993, EPA 2004, Griffith et al. 2001, Hardeman 1966, Jones 1971, Keys et al. 1995, Lowe 1921, Tanner 1960, Wieland 1995, Wieland pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723108#references

Description Author: A. Schotz, R. Evans, M. Pyne

Version: 23 May 2008

Concept Author: A. Schotz, R. Evans, M. Pyne, R. Wieland

Stakeholders: Southeast

ClassifResp: Southeast

1419 SOUTHERN RIDGE AND VALLEY PATCH PRAIRIE (CES202.453)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2419; ESLF 7132; ESP 1419

CONCEPT

Summary: This system is a collection of deep soil prairies and barrens found historically in the Coosa Valley of northwestern Georgia and adjacent Alabama and related areas including barrens at Oak Ridge, Tennessee. This system was formerly widespread, but is now found only in scattered and isolated remnants (DeSelm and Murdock 1993). Vegetation is typically prairie-like and may have supported scattered trees depending upon fire-return interval. Some typical species found in examples of this system include *Andropogon gerardii*, *Sorghastrum nutans*, *Panicum anceps*, *Panicum virgatum*, *Tripsacum dactyloides*, *Schizachyrium scoparium*, *Helianthus mollis*, *Helianthus occidentalis*, *Silphium trifoliatum*, and *Silphium terebinthinaceum*.

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Eastern Highland Rim Prairie and Barrens (CES202.354)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Western Highland Rim Prairie and Barrens (CES202.352)

DESCRIPTION

Vegetation: Some typical species found in examples of this system include *Andropogon gerardii*, *Sorghastrum nutans*, *Panicum anceps*, *Panicum virgatum*, *Tripsacum dactyloides*, *Schizachyrium scoparium*, *Helianthus mollis*, *Helianthus occidentalis*, *Silphium trifoliatum*, and *Silphium terebinthinaceum*.

Dynamics: Vegetation is typically prairie-like and may have supported scattered trees depending upon fire-return interval. With prolonged lack of fire (and grazing) areas may succeed to forested vegetation, becoming indistinguishable from adjacent hardwood forests.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Bouteloua curtipendula* - *Echinacea simulata* Coosa Valley Barren Herbaceous Vegetation (CEGL004045, G1)
- *Andropogon gerardii* - *Panicum (anceps, virgatum)* Herbaceous Vegetation (CEGL007931, G2?)
- *Andropogon gerardii* - *Sorghastrum nutans* - *Pycnanthemum virginianum* Herbaceous Vegetation (CEGL006039, G2?)
- *Schizachyrium scoparium* - *Andropogon gerardii* - *Silphium terebinthinaceum* Coosa Valley Barren Herbaceous Vegetation (CEGL004757, G1)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Silphium* spp. Herbaceous Vegetation (CEGL007932, G2?)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system occurs in the Coosa River valley of northwestern Georgia, Tennessee, and northeastern Alabama, and related areas of the Ridge and Valley physiographic province, including barrens at Oak Ridge, Tennessee.

Divisions: 202:C

Nations: US

Subnations: AL, GA, TN

Map Zones: 48:C, 53:P

USFS Ecomap Regions: 221J:CC, 231D:CC, M221A:CC

TNC Ecoregions: 50:C

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993, DeSelm et al. 1969

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723129#references

Description Author: M. Pyne and R. Evans
Version: 23 Jan 2008
Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

1146 SOUTHERN ROCKY MOUNTAIN MONTANE-SUBALPINE GRASSLAND (CES306.824)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Acidic Soil; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Silt Soil Texture; Aridic; Short Disturbance Interval; Graminoid; Cool-season bunch grasses

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Sideslope; Temperate [Temperate Continental]; Shallow Soil; F-Patch/Low Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2146; ESLF 7119; ESP 1146

CONCEPT

Summary: This Rocky Mountain ecological system typically occurs between 2200 and 3000 m elevation on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: *Danthonia intermedia*, *Danthonia parryi*, *Festuca idahoensis*, *Festuca arizonica*, *Festuca thurberi*, *Muhlenbergia filiculmis*, or *Pseudoroegneria spicata*. The subdominants include *Muhlenbergia montana*, *Bouteloua gracilis*, and *Poa secunda*. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus. Small-patch representations of this system do occur at high elevations of the Trans-Pecos where they present as occurrences of *Festuca arizonica* - *Blepharoneuron tricholepis* Herbaceous Vegetation (CEGL004508). These occurrences often occupy sites adjacent to Madran Oriental Chaparral (CES302.031).

Classification Comments: Montane grasslands are very similar and intergrade with their subalpine counterparts, but are separated here to represent those species that do not occur at higher altitudes.

MEMBERSHIP

Associations:

- *Agrostis variabilis* Herbaceous Vegetation (CEGL001846, G2G3)
- *Bromus inermis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation (CEGL005264, GNA)
- *Carex duriuscula* Herbaceous Vegetation (CEGL001874, GUQ)
- *Danthonia intermedia* - *Solidago multiradiata* Herbaceous Vegetation (CEGL001879, G3G4)
- *Danthonia intermedia* Herbaceous Vegetation (CEGL001794, G2G3)
- *Danthonia parryi* Herbaceous Vegetation (CEGL001795, G3)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Elymus lanceolatus* Herbaceous Vegetation (CEGL002588, GNR)
- *Festuca arizonica* - *Blepharoneuron tricholepis* Herbaceous Vegetation (CEGL004508, G1G2)
- *Festuca arizonica* - *Muhlenbergia filiculmis* Herbaceous Vegetation (CEGL001605, GU)
- *Festuca arizonica* - *Muhlenbergia montana* Herbaceous Vegetation (CEGL001606, G3)
- *Festuca idahoensis* - *Danthonia intermedia* Herbaceous Vegetation (CEGL001612, G3?Q)
- *Festuca idahoensis* - *Festuca thurberi* Herbaceous Vegetation (CEGL001617, G3G4)
- *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL001618, G2G3)
- *Festuca idahoensis* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001624, G4)
- *Festuca thurberi* - *Lathyrus lanszwertii* var. *leucanthus* Herbaceous Vegetation (CEGL001630, G4)
- *Festuca thurberi* Subalpine Grassland Herbaceous Vegetation (CEGL001631, G3)
- *Leymus cinereus* Herbaceous Vegetation (CEGL001479, G2G3Q)
- *Muhlenbergia filiculmis* Herbaceous Vegetation (CEGL001780, G2)
- *Muhlenbergia montana* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001647, G1G2)
- *Muhlenbergia montana* Herbaceous Vegetation (CEGL001646, G3G4)
- *Muhlenbergia pungens* Herbaceous Vegetation (CEGL002363, GNR)
- *Pascopyrum smithii* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001578, G5)
- *Pascopyrum smithii* Herbaceous Vegetation (CEGL001577, G3G5Q)
- *Poa fendleriana* Herbaceous Vegetation (CEGL001925, GU)
- *Poa pratensis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation (CEGL005265, GNA)
- *Poa secunda* Herbaceous Vegetation (CEGL001657, G4?)
- *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Pseudoroegneria spicata* - *Poa fendleriana* Herbaceous Vegetation (CEGL001676, G1G2)
- *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001660, G2)

Alliances:

- *Agrostis variabilis* Herbaceous Alliance (A.1318)
- *Bromus inermis* Semi-natural Herbaceous Alliance (A.3561)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Danthonia intermedia* Herbaceous Alliance (A.1315)
- *Danthonia parryi* Herbaceous Alliance (A.1316)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Elymus lanceolatus* Herbaceous Alliance (A.1242)
- *Festuca arizonica* Herbaceous Alliance (A.1245)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Muhlenbergia filiculmis* Herbaceous Alliance (A.1288)
- *Muhlenbergia montana* Herbaceous Alliance (A.1260)
- *Muhlenbergia pungens* Herbaceous Alliance (A.2652)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Poa fendleriana* Herbaceous Alliance (A.1336)
- *Poa pratensis* Semi-natural Herbaceous Alliance (A.3562)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)

DISTRIBUTION

Range: This system occurs between 2200 and 3000 m elevation in the Colorado Rockies. Where it transitions in Wyoming to Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806) still needs to be clarified.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, NM, UT, WY

Map Zones: 12:C, 15:C, 16:C, 17:P, 21:P, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:C, 29:C, 33:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CP, 313D:CP, 315A:CC, 315H:CP, 321A:PP, 322A:??, 331B:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, 342A:CC, 342E:CC, 342F:CC, 342G:CC, 342J:CC, M313A:CC, M313B:CC, M331A:CP, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M341A:CC, M341B:CC, M341C:CC

TNC Ecoregions: 18:C, 19:C, 20:C, 21:C

SOURCES

References: Bowns and Bagley 1986, Comer et al. 2002, Comer et al. 2003, Hess 1981, Hess and Wasser 1982, Moir 1967, Neely et al. 2001, Passey et al. 1982, Shepherd 1975, Stewart 1940, Tuhy et al. 2002, Turner 1975, Turner and Dortignac 1954

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722849#references

Description Author: NatureServe Western Ecology Team

Version: 22 Dec 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

1431 SOUTHWEST FLORIDA DUNE AND COASTAL GRASSLAND (CES203.539)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Graminoid; Coast

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2431; ESLF 7144; ESP 1431

CONCEPT

Summary: This system occurs in the Gulf of Mexico along the southwestern coast of Florida. Components of this system include herbaceous vegetation on dunes and related vegetation just inland of the dunes, often on recently deposited sands. These are generally upland plant communities and less commonly non-flooded dune swale wetlands. Although vegetation is mostly herbaceous, there are typically scattered shrubs of various heights present. Examples of this system occupy one of four distinctive coastal regions in Florida. Although a given community component of this system may overlap in species composition with those of other Florida coastal regions, there are important and sometimes considerable differences based on plant species composition, vegetation structure, and physical site characteristics (Johnson and Muller 1993a). The dune vegetation, like that of other Florida regions, includes *Uniola paniculata*, *Panicum amarum* var. *amarulum*, and *Iva imbricata*. *Scaevola plumieri*, *Chamaesyce mesembrianthemifolia*, and *Coccoloba uvifera* help distinguish this system from those to the north. However, while all other dune communities in Florida have frequently occurring distinctive species which help distinguish them, such species are lacking in this system. However, more inland coastal grassland components of this system sometimes include *Schizachyrium sanguineum* (= *Schizachyrium semiberbe*) and *Bouteloua hirsuta*, among other species not found in coastal grasslands elsewhere in Florida (Johnson and Muller 1993a).

Classification Comments: The spatial boundary between this system and Florida Panhandle Beach Vegetation (CES203.266) is clearly separated by the Big Bend region (see Tanner 1960, Johnson and Muller 1993a). Within this system, there is a large amount of variation along a north-to-south gradient. A finer distinction could be made in the future.

Similar Ecological Systems:

- Florida Panhandle Beach Vegetation (CES203.266)
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Coastal Grassland (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Bouteloua hirsuta* - (*Muhlenbergia filipes*) Herbaceous Vegetation (CEGL004093, G1)
- *Cladium mariscus* ssp. *jamaicense* - *Fimbristylis castanea* - *Symphytotrichum tenuifolium* Herbaceous Vegetation (CEGL003968, G2?)
- *Ernodea littoralis* / *Uniola paniculata* - *Muhlenbergia filipes* Herbaceous Vegetation (CEGL004000, G1G2)
- *Schizachyrium sanguineum* var. *sanguineum* - *Muhlenbergia filipes* - *Cirsium horridulum* - (*Waltheria indica*) Herbaceous Vegetation (CEGL003964, G1)

Alliances:

- *Cladium mariscus* ssp. *jamaicense* Seasonally Flooded Tropical Herbaceous Alliance (A.1157)
- *Muhlenbergia filipes* Herbaceous Alliance (A.1217)
- *Schizachyrium sanguineum* Herbaceous Alliance (A.1151)
- *Uniola paniculata* Subtropical Herbaceous Alliance (A.1153)

DISTRIBUTION

Range: Found along the western coast of Florida south of the Big Bend region to the Florida Keys.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 232D:CC, 411A:CC

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723063#references

Description Author: R. Evans
Version: 31 Mar 2003
Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

1440 TAMAULIPAN CLAY GRASSLAND (CES301.987)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Tropical/Subtropical [Tropical Xeric]; Calcareous; Clay Soil Texture

Non-Diagnostic Classifiers: Lowland [Lowland]; Plain; Toeslope/Valley Bottom; Alkaline Soil

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2440; ESLF 7153; ESP 1440

CONCEPT

Summary: This Tamaulipan ecological system occurs on clay prairies near the Gulf Coast and drier sites further inland. Substrates are fine calcareous clays and clay loam. Occasional fires and root pruning from montmorillonitic clay limit shrub invasion, if the grassland is not overgrazed. If overgrazed the land will convert to stable thornscrub dominated by *Prosopis glandulosa* and *Celtis pallida*. Vegetation is dominated by perennial mid and short grasses such as *Schizachyrium scoparium*, *Paspalum* spp., *Chloris pluriflora*, *Buchloe dactyloides*, with other grasses such as *Bothriochloa saccharoides*, *Bouteloua curtipendula*, *Chloris andropogonoides*, *Nassella leucotricha*, *Schedonnardus paniculatus*, *Setaria leucopila*, and clumps of *Andropogon gerardii* on less clayey sites. *Prosopis glandulosa* or *Quercus fusiformis* are often present as scattered mottes or are restricted to drainages. *Opuntia engelmannii* var. *lindheimeri* is often present.

DISTRIBUTION

Range: Occurs on clay prairies near the Gulf Coast and drier sites further inland.

Divisions: 301:C

Nations: MX, US

Subnations: MXCO?(MX), MXNU?(MX), MXTM(MX), TX

Map Zones: 36:C

TNC Ecoregions: 30:C, 31:C

SOURCES

References: Comer et al. 2003, McLendon 1991

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722718#references

Description Author: NatureServe Western Ecology Team

Version: 21 Mar 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1438 TAMAULIPAN SAVANNA GRASSLAND (CES301.985)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Tropical/Subtropical [Tropical Xeric]

Non-Diagnostic Classifiers: Toeslope/Valley Bottom

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2438; ESLF 7151; ESP 1438

CONCEPT

Summary: This Tamaulipan ecological system is dominated by perennial grasses with sparse overstory of mesquite or oak trees and thornscrub. Dominant grasses are *Cynodon* spp. This system was once a common matrix system, but has largely been converted to desert scrub and exists as remnant patches. Degraded subtropical forests and woodlands may have similar structure but are not included in this system because different ecological processes maintain them.

MEMBERSHIP

Associations:

- *Bothriochloa barbinodis* - *Chloris pluriflora* Herbaceous Vegetation (CEGL002236, G2?)
- *Prosopis glandulosa* var. *glandulosa* - *Parkinsonia texana* var. *macra* - (*Cordia boissieri*, *Koeberlinia spinosa*) Shrubland (CEGL007762, G4)

Alliances:

- *Bothriochloa barbinodis* Herbaceous Alliance (A.1209)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)

DISTRIBUTION

Divisions: 301:C

Nations: MX, US

Subnations: MXCO(MX), MXNU(MX), MXTM(MX), TX

Map Zones: 36:C

TNC Ecoregions: 30:C, 31:C

SOURCES

References: Brown 1982, Brown et al. 1998, Comer et al. 2003, CONABIO 2003b, Webster 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722720#references

Description Author: NatureServe Western Ecology Team

Version: 21 Mar 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1441 TAMAULIPAN TALLGRASS GRASSLAND (CES301.988)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Toeslope/Valley Bottom; Tropical/Subtropical [Tropical Xeric]; Deep Soil; Sand Soil Texture

Non-Diagnostic Classifiers: Plain; Loam Soil Texture; Short Disturbance Interval; F-Patch/High Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2441; ESLF 7154; ESP 1441

CONCEPT

Summary: This ecological system occurs on the most favorable growing sites in the South Texas Plain where rainfall is highest or locally on lower slopes and near water. Substrates are deep sands and sandy loam soils. The vegetation is dominated by tall perennial grasses such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Tripsacum dactyloides*.

DISTRIBUTION

Range: South Texas Plain.

Divisions: 301:C

Nations: MX, US

Subnations: MXCO?(MX), MXNU?(MX), MXTM(MX), TX

Map Zones: 36:C

TNC Ecoregions: 30:C, 31:C

SOURCES

References: Comer et al. 2003, Johnston 1963, McLendon 1991

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722717#references

Description Author: NatureServe Western Ecology Team

Version: 21 Mar 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1422 TEXAS BLACKLAND TALLGRASS PRAIRIE (CES205.684)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Mima mound; Herbaceous; Unglaciaded; Loam Soil Texture; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2422; ESLF 7135; ESP 1422

CONCEPT

Summary: This system is found primarily in the Blackland Prairie region of Texas but can range into southern Oklahoma. It is typified by the presence of dark alkaline Vertisol soils over calcareous parent material interspersed with patches of acidic, sandy loam Alfisols and Mollisols. Microtopography such as gilgai and mima mounds can occur and are important microhabitats that lead to a high degree of plant diversity in this system. *Schizachyrium scoparium* and *Sorghastrum nutans* are the most frequent species with *Andropogon gerardii* as a possible associate, especially on the patches of Mollisol soils. *Tripsacum dactyloides* and *Panicum virgatum* are common associates on the Vertisol soils, especially on the gilgai microtopography. Fire and grazing constitute the major natural dynamics influencing this system. Infrequent, but intense, fires prevent woody species from establishing. Fire suppression and over grazing have allowed woody species to invade, and heavy grazing has allowed species such as *Buchloe dactyloides* and *Bouteloua rigidisetata* to invade.

Classification Comments: This system (CES205.684) lies to the east of the floristically related Southeastern Great Plains Tallgrass Prairie (CES205.685), and is primarily, if not entirely, found in Texas (and possibly Oklahoma).

Similar Ecological Systems:

- Arkansas Valley Prairie and Woodland (CES202.312)
- Central Tallgrass Prairie (CES205.683)
- Lower Mississippi Alluvial Plain Grand Prairie (CES203.549)
- Ozark Prairie and Woodland (CES202.326)
- Southeastern Great Plains Tallgrass Prairie (CES205.685)
- West Gulf Coastal Plain Northern Calcareous Prairie (CES203.377)

DESCRIPTION

Environment: This system is typified by the presence of dark alkaline Vertisol soils over calcareous parent material interspersed with patches of acidic, sandy loam Alfisols and Mollisols. Microtopography such as gilgai and mima mounds can occur and are important microhabitats that lead to a high degree of plant diversity in this system.

Vegetation: *Schizachyrium scoparium* and *Sorghastrum nutans* are the most frequent species with *Andropogon gerardii* as a possible associate, especially on Mollisols. *Tripsacum dactyloides* and *Panicum virgatum* are common associates on the Vertisols, especially on the gilgai microtopography. Heavy grazing has allowed species such as *Buchloe dactyloides* and *Bouteloua rigidisetata* to invade.

Dynamics: Fire and grazing constitute the major natural dynamics influencing this system. Infrequent, but intense, fires prevent woody species from establishing. Fire suppression and over grazing have allowed woody species to invade. Heavy grazing has also altered the floristic composition by allowing species such as *Buchloe dactyloides* and *Bouteloua rigidisetata* to invade.

MEMBERSHIP

Associations:

- *Schizachyrium scoparium* - *Andropogon gerardii* - *Sorghastrum nutans* - *Bifora americana* Mollisol Herbaceous Vegetation (CEGL004025, G1G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Andropogon gerardii* - *Bifora americana* Vertisol Herbaceous Vegetation (CEGL004027, G1G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Bifora americana* Alfisol Herbaceous Vegetation (CEGL004026, G1G2)
- *Sporobolus silveanus* - *Carex meadii* Herbaceous Vegetation (CEGL004521, G1)
- *Sporobolus silveanus* - *Tridens strictus* Herbaceous Vegetation (CEGL002216, G2)
- *Tripsacum dactyloides* - *Panicum virgatum* - *Sorghastrum nutans* - *Helianthus maximiliani* Herbaceous Vegetation (CEGL002217, G1)
- *Tripsacum dactyloides* - *Sporobolus compositus* var. *compositus* Herbaceous Vegetation (CEGL004036, G1)

Alliances:

- *Panicum virgatum* - *Tripsacum dactyloides* Herbaceous Alliance (A.1194)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Sporobolus silveanus* Herbaceous Alliance (A.1231)

DISTRIBUTION

Range: This system is restricted to the Blackland Prairie region, part of the Crosstimbers and Southern Tallgrass Prairie Ecoregion, in

Texas and possibly adjacent southern Oklahoma.

Divisions: 205:C

Nations: US

Subnations: OK?, TX

Map Zones: 32:C, 35:C, 36:C, 37:C

USFS Ecomap Regions: 255B:CC, 255C:CC, 315E:CC

TNC Ecoregions: 32:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722975#references

Description Author: S. Menard

Version: 04 Feb 2009

Concept Author: S. Menard

Stakeholders: Southeast

ClassifResp: Southeast

1428 WEST GULF COASTAL PLAIN NORTHERN CALCAREOUS PRAIRIE (CES203.377)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; West Gulf Coastal Plain; Circumneutral Soil; Deep Soil; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2428; ESLF 7141; ESP 1428

CONCEPT

Summary: This is one of two described calcareous prairie ecological systems which occur within the pine-dominated portions of the Coastal Plain west of the Mississippi River. This type is the more northerly ranging of the two [compare against West Gulf Coastal Plain Southern Calcareous Prairie (CES203.379)]. This system includes natural grassland vegetation and associated wooded vegetation in a relatively small natural region of the Upper West Gulf Coastal Plain of Arkansas and adjacent Oklahoma. Although other calcareous prairies are found west of the Mississippi River, this system represents some of the largest known and highest quality remaining examples. Plant communities in this system occur over relatively deep soils (as well as shallow soils over chalk and limestone) with circumneutral surface soil pH, which is unusual given the predominance of acidic, generally forested soils in the region. In most cases individual prairie openings are small and isolated from one another, but were formerly more extensive prior to European settlement, forming a mosaic of grassland and woodlands under frequent fire regimes. The flora has much in common with other prairie systems of the East Gulf Coastal Plains as well as classic Midwestern prairies.

Similar Ecological Systems:

- Southeastern Great Plains Tallgrass Prairie (CES205.685)
- Texas Blackland Tallgrass Prairie (CES205.684)
- West Gulf Coastal Plain Southern Calcareous Prairie (CES203.379)

DESCRIPTION

Environment: Plant communities in this system occur over relatively deep soils with circumneutral surface soil pH, which is unusual given the predominance of acidic, generally forested soils in the region. Some examples also occur on chalk deposits, as well as thin soils over limestone outcrops and rock fragments.

Vegetation: Dominant plants in stands of this system vary from example to example; there are several subtypes and associations with variability among these. Typical trees include *Quercus stellata*, *Quercus muehlenbergii*, *Quercus shumardii*, *Quercus pagoda*, *Quercus sinuata*, *Carya illinoensis*, *Carya myristiciformis*, *Juniperus virginiana* var. *virginiana*, and *Maclura pomifera*. Some typical shrubs include *Forestiera ligustrina*, *Symphoricarpos orbiculatus*, *Ilex decidua*, and *Rhus aromatica*. Herbs may include *Sorghastrum nutans*, *Bouteloua curtipendula*, *Andropogon glomeratus*, *Leersia virginica*, *Panicum anceps*, *Panicum flexile*, *Sporobolus compositus*, *Fimbristylis puberula* var. *puberula*, *Carex cherokeensis*, *Carex microdonta*, *Echinacea pallida*, *Liatris aspera*, *Marshallia caespitosa*, *Silphium integrifolium*, *Silphium laciniatum*, *Solidago auriculata*, *Symphyotrichum lanceolatum*, *Packera tampicana*, *Thelesperma filifolium*, *Nemastylis geminiflora*, *Dalea purpurea*, *Lythrum alatum*, *Allium canadense* var. *mobile*, and *Zigadenus nuttallii*.

Dynamics: In most cases individual prairie openings are small and isolated from one another but were formerly more extensive prior to European settlement, forming a mosaic of grassland and woodlands under frequent fire regimes.

MEMBERSHIP

Associations:

- *Juniperus virginiana* - *Maclura pomifera* / *Bouteloua curtipendula* - *Thelesperma filifolium* - *Packera tampicana* Wooded Herbaceous Vegetation (CEGL007812, G1?)
- *Lythrum alatum* - *Panicum anceps* - *Symphyotrichum lanceolatum* Wet-Mesic Blackland Prairie Temporarily Flooded Herbaceous Vegetation [Provisional] (CEGL007962, GH)
- *Quercus falcata* - *Carya illinoensis* / *Silphium integrifolium* - *Panicum anceps* - (*Carex cherokeensis*) Mesic Wooded Herbaceous Vegetation (CEGL007963, G1)
- *Quercus muehlenbergii* - *Quercus sinuata* / *Rhus aromatica* / *Liatris aspera* - *Allium canadense* var. *mobile* - *Schizachyrium scoparium* Woodland (CEGL007968, G2)
- *Quercus pagoda* - (*Carya illinoensis*) / *Ilex decidua* / *Carex cherokeensis* - *Leersia virginica* Mesic Blackland Forest [Provisional] (CEGL007964, G1?)
- *Quercus shumardii* - *Carya myristiciformis* - (*Quercus muehlenbergii*) / *Carex cherokeensis* - *Sorghastrum nutans* Woodland (CEGL007775, G1)
- *Quercus sinuata* / *Solidago auriculata* - *Zigadenus nuttallii* Mixed Herb Dry-mesic Blackland Ravine Woodland (CEGL007966, G1)
- *Quercus stellata* / *Forestiera ligustrina* - *Symphoricarpos orbiculatus* / *Carex cherokeensis* - *Schizachyrium scoparium* Woodland (CEGL007777, G1G2)

- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Echinacea pallida* - *Dalea purpurea* Herbaceous Vegetation (CEGL007769, G2G3)
- *Schizachyrium scoparium* - *Sporobolus compositus* - *Fimbristylis puberula* var. *puberula* Wooded Herbaceous Vegetation (CEGL007768, G1G2)
- *Sorghastrum nutans* - *Andropogon glomeratus* - *Silphium laciniatum* Herbaceous Vegetation (CEGL007774, G1?)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Panicum virgatum* - *Tripsacum dactyloides* Herbaceous Alliance (A.1194)
- *Quercus muehlenbergii* Woodland Alliance (A.621)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is known only from a relatively small natural region of the Upper West Gulf Coastal Plain of Arkansas and adjacent Oklahoma.

Divisions: 203:C

Nations: US

Subnations: AR, OK

Map Zones: 37:?, 44:C

USFS Ecomap Regions: 232E:CC

TNC Ecoregions: 40:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723139#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: T. Foti and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1429 WEST GULF COASTAL PLAIN SOUTHERN CALCAREOUS PRAIRIE (CES203.379)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; West Gulf Coastal Plain; Circumneutral Soil; Deep Soil; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2429; ESLF 7142; ESP 1429

CONCEPT

Summary: This is one of two described calcareous prairie ecological systems which occur within the pine-dominated portions of the Coastal Plain west of the Mississippi River. This type is the more southerly ranging of the two [compare against West Gulf Coastal Plain Northern Calcareous Prairie (CES203.377)]. Examples include natural grassland vegetation and adjacent wooded vegetation in a relatively small natural region of Louisiana and Texas. Although most examples are typically upland, some include small stream bottoms or riparian areas that bisect the prairies. This system is found primarily within the historical range of *Pinus palustris*, or TNC Ecoregion 41, but it extends somewhat beyond this area to the north. In addition, examples occurring west to the eastern edge of the Post Oak Savanna region of eastern Texas are also included here. Plant communities in this system occur over relatively deep soils with circumneutral surface soil pH. These conditions are unusual in the local landscape which is predominantly one of acidic, generally forested soils. In most cases individual prairie openings are small and isolated from one another. Although they were formerly more extensive prior to European settlement, they apparently were much smaller than examples of West Gulf Coastal Plain Northern Calcareous Prairie (CES203.377).

Similar Ecological Systems:

- West Gulf Coastal Plain Northern Calcareous Prairie (CES203.377)

Related Concepts:

- Cook Mountain Calcareous Prairie (LNHP 2004) Finer
- Fleming Calcareous Prairie (LNHP 2004) Finer
- Fleming Glade (LNHP 2004) Finer
- Jackson Calcareous Prairie (LNHP 2004) Finer
- Morse Clay Calcareous Prairie (LNHP 2004) Finer

DESCRIPTION

Environment: This system is best documented from the Fleming geologic formation, but is also known from the Cook Mountain Formation in Louisiana. Examples from the Jackson Group (in Louisiana) are also included here, as well as the Morse Clay Calcareous Prairie of northwestern Louisiana.

Vegetation: The flora has much in common with that of other prairie systems of the East Gulf Coastal Plain as well as that of classic Midwestern prairies, although there is variability among examples. Much of the typical flora are species uncommon in the rest of the Pineywoods region, such as *Dalea compacta* var. *compacta*, *Rudbeckia missouriensis*, *Acacia angustissima*, *Liatris mucronata*, *Eustoma exaltatum* ssp. *russellianum* (= *Eustoma russellianum*), *Grindelia lanceolata*, *Agalinis heterophylla*, *Stenosiphon linifolius*, *Carex microdonta*, *Carex cherokeensis*, *Neptunia lutea*, *Indigofera miniata* (= *Indigofera miniata* var. *leptosepala*), *Palafoxia reverchonii*, *Onosmodium molle* ssp. *occidentale* (= *Onosmodium occidentale*), and *Euphorbia bicolor*. Some of these species are found either most commonly or exclusively in the more western examples of this system when compared with those in Louisiana.

Dynamics: Examples historically formed a mosaic of grassland and open woodlands under frequent fire regimes. With fire suppression, trees invade from surrounding pine forests. As a result, some evidence suggests that soil properties are modified, especially the surface pH and nutrient dynamics.

MEMBERSHIP

Associations:

- *Celtis laevigata* - *Gleditsia triacanthos* - *Sapindus saponaria* var. *drummondii* / *Lithospermum tuberosum* - *Carex willdenowii* Forest (CEGL007318, G1)
- *Crataegus spathulata* - *Cornus drummondii* - *Berchemia scandens* Shrubland (CEGL003879, G2)
- *Juniperus virginiana* var. *virginiana* - *Pinus taeda* - *Quercus sinuata* var. *sinuata* Woodland (CEGL007799, G1)
- *Pinus palustris* / *Quercus marilandica* / *Schizachyrium tenerum* - *Muhlenbergia expansa* - *Bigelovia nuttallii* - *Packera obovata* Woodland (CEGL003597, G1)
- *Quercus shumardii* - *Fraxinus americana* - *Carya myristiciformis* / *Viburnum dentatum* / *Carex cherokeensis* Forest (CEGL007194, G1Q)
- *Quercus similis* - *Quercus pagoda* - *Carya (glabra, myristiciformis, ovata)* Temporarily Flooded Forest (CEGL007360, G1)
- *Quercus sinuata* var. *sinuata* - *Fraxinus americana* - *Quercus muehlenbergii* / *Rhus aromatica* - *Cornus drummondii* Forest (CEGL007256, G1)
- *Quercus stellata* / *Forestiera ligustrina* - *Symphoricarpos orbiculatus* / *Carex cherokeensis* - *Schizachyrium scoparium* Woodland

(CEGL007777, G1G2)

- *Schizachyrium scoparium* - *Marshallia caespitosa* - *Nemastylis geminiflora* Herbaceous Vegetation (CEGL004022, G1G2)
- *Schizachyrium scoparium* - *Panicum flexile* - *Carex microdonta* Herbaceous Vegetation (CEGL004021, G1)
- *Schizachyrium scoparium* - *Rudbeckia missouriensis* - *Grindelia lanceolata* - (*Liatris mucronata*) Herbaceous Vegetation (CEGL007930, G1)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Jackson Prairie Herbaceous Vegetation (CEGL004721, G1)

Alliances:

- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Crataegus spathulata* Shrubland Alliance (A.900)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Size: A very few extant examples may range into the large-patch size category, but most are small. Historical patch size is hard to estimate. Small patch is the best attribute for this system, fide Jason Singhurst (TPWD).

DISTRIBUTION

Range: This system is restricted to a relatively small natural region of Louisiana and Texas.

Divisions: 203:C

Nations: US

Subnations: AR?, LA, TX

Map Zones: 37:C

USFS Ecomap Regions: 231E:CC, 232F:CC

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Comer et al. 2003, Newton 1972, Smith pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723137#references

Description Author: R. Evans and T. Foti, mod. M. Pyne

Version: 05 Apr 2007

Concept Author: R. Evans and T. Foti

Stakeholders: Southeast

ClassifResp: Southeast

1147 WESTERN GREAT PLAINS FOOTHILL AND PIEDMONT GRASSLAND (CES303.817)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Toeslope/Valley Bottom; Clay Soil Texture; Aridic; Short Disturbance Interval [Periodicity/Irregular Disturbance]; F-Patch/Low Intensity; Graminoid

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Herbaceous; Temperate [Temperate Continental]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2147; ESLF 7120; ESP 1147

CONCEPT

Summary: This ecological system typically occurs between 1600 and 2200 m in elevation. It is best characterized as a mixedgrass to tallgrass prairie on mostly moderate to gentle slopes, usually at the base of foothill slopes, e.g., the hogbacks of the Rocky Mountain Front Range where it typically occurs as a relatively narrow elevational band between montane woodlands and shrublands and the shortgrass steppe and mixedgrass prairie, but extends east on the Front Range piedmont alongside the Chalk Bluffs near the Colorado-Wyoming border, out into the Great Plains on the Palmer Divide, and on piedmont slopes below mesas and foothills in northeastern New Mexico. A combination of increased precipitation from orographic rain, temperature, and soils limits this system to the lower elevation zone with approximately 40 cm of precipitation/year. It is maintained by frequent fire and associated with well-drained clay soils. Usually occurrences of this system have multiple plant associations that may be dominated by *Andropogon gerardii*, *Schizachyrium scoparium*, *Muhlenbergia montana*, *Nassella viridula*, *Pascopyrum smithii*, *Sporobolus cryptandrus*, *Bouteloua gracilis*, *Hesperostipa comata*, or *Hesperostipa neomexicana*. In Wyoming, typical grasses found in this system include *Pseudoroegneria spicata*, *Schizachyrium scoparium*, *Hesperostipa neomexicana*, *Hesperostipa comata*, and species of *Poa*. Typical adjacent ecological systems include foothill shrublands, ponderosa pine savannas, juniper savannas, as well as shortgrass prairie.

Classification Comments: Need to incorporate northern Rockies information. How does this differ from Northwestern Great Plains Mixedgrass Prairie (CES303.674) which seems pretty similar? In southeastern Wyoming, it is mostly in mapzone 33, along bluffs.

Related Concepts:

- Bluestem - Grama Prairie (604) (Shiflet 1994) Intersecting. This ecological system overlaps this SRM type along the Wyoming-Colorado-New Mexico eastern foothills of the Rocky Mtns.
- Grama - Feathergrass (716) (Shiflet 1994) Finer
- Sideoats Grama - New Mexico Feathergrass - Winterfat (724) (Shiflet 1994) Finer
- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Schizachyrium scoparium* Western Great Plains Herbaceous Vegetation (CEGL001463, G2?)
- *Andropogon gerardii* - *Sorghastrum nutans* Western Great Plains Herbaceous Vegetation (CEGL001464, G2)
- *Andropogon gerardii* - *Sporobolus heterolepis* Western Foothills Herbaceous Vegetation (CEGL001465, G2)
- *Bouteloua gracilis* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis* - *Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001756, G4)
- *Bouteloua gracilis* Herbaceous Vegetation (CEGL001760, G4Q)
- *Bouteloua hirsuta* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001764, G4)
- *Bouteloua hirsuta* - *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001766, GNRQ)
- *Hesperostipa comata* - *Achnatherum hymenoides* Herbaceous Vegetation (CEGL001703, G2?)
- *Hesperostipa comata* Colorado Front Range Herbaceous Vegetation (CEGL001702, G1G2)
- *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001708, G3)
- *Nassella viridula* Herbaceous Vegetation (CEGL001713, GU)
- *Poliomintha incana* / *Bouteloua gracilis* Shrubland (CEGL001339, G2?)
- *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675, G4)
- *Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation (CEGL001677, G4?)
- *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001660, G2)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Western Great Plains Herbaceous Vegetation (CEGL001594, G3)
- *Schizachyrium scoparium* - *Muhlenbergia cuspidata* Herbaceous Vegetation (CEGL001683, G3?)
- *Yucca glauca* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001499, G4Q)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)

- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Hesperostipa comata* - *Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Hesperostipa comata* Bunch Herbaceous Alliance (A.1270)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Nassella viridula* Herbaceous Alliance (A.1261)
- *Poliomintha incana* Shrubland Alliance (A.862)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

DISTRIBUTION

Range: This mixedgrass prairie ecological system occurs in the narrow to broad transition band between the Rocky Mountains and the Shortgrass Steppe where increased soil moisture from orographic lifting and local topography favor tall and mid-height grasses. The band is restricted to the Rocky Mountain foothills and piedmont and adjacent plains, extending farther east on the Palmer Divide, north alongside the Chalk Bluffs near the Colorado-Wyoming border, and south on and below mesas and escarpments in southeastern Colorado, northeastern New Mexico, and the panhandles of Oklahoma and Texas. These grassland also occur around the edges of the Black Hills uplift, where *Schizachyrium scoparium* is the dominant grass.

Divisions: 303:C; 306:C

Nations: US

Subnations: AZ?, CO, NM, OK, SD, TX, WY

Map Zones: 19:?, 21:?, 22:C, 24:?, 25:C, 26:P, 27:C, 28:C, 29:C, 30:P, 31:P, 33:C, 34:?

USFS Ecomap Regions: 315A:CC, 315B:CC, 315H:CC, 331B:CC, 331C:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 342F:CC, M313A:CP, M313B:CC, M331F:CC, M331G:CC, M331I:CC, M341A:CC

TNC Ecoregions: 10:C, 20:C, 21:C, 24:C, 25:P, 26:P, 27:C, 28:P

SOURCES

References: Anderson 1999a, Comer et al. 2003, Hess and Wasser 1982, Lauenroth and Milchunas 1992, Mast et al. 1997, Mast et al. 1998, Neely et al. 2001, Opler and Krizek 1984, Weaver and Albertson 1956

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722856#references

Description Author: NatureServe Western Ecology Team

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, Southeast, West

ClassifResp: West

1148 WESTERN GREAT PLAINS SAND PRAIRIE (CES303.670)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Sand Soil Texture; Ustic; G-Landscape/Low Intensity; W-Patch/High Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2148; ESLF 7121; ESP 1148

CONCEPT

Summary: The sand prairies constitute a very unique system within the western Great Plains. These sand prairies are often considered part of the tallgrass or mixedgrass regions in the western Great Plains but can contain elements from Western Great Plains Shortgrass Prairie (CES303.672), Central Mixedgrass Prairie (CES303.659), and Northwestern Great Plains Mixedgrass Prairie (CES303.674). The largest expanse of sand prairies (approximately 5 million ha) can be found in the Sandhills of north-central Nebraska and southwestern South Dakota. These areas are relatively intact. The primary use of this system has been grazing (not cultivation), and areas such as the Nebraska Sandhills can experience less degeneration than other prairie systems. Although greater than 90% of the Sandhills region is privately owned, the known fragility of the soils and the cautions used by ranchers to avoid poor grazing practices have allowed for fewer significant changes in the vegetation of the Sandhills compared to other grassland systems. The unifying and controlling feature for this system is that coarse-textured soils predominate and the dominant grasses are well-adapted to this condition. Soils in the sand prairies can be relatively undeveloped and are highly permeable. Soil texture and drainage along with a species' rooting morphology, photosynthetic physiology, and mechanisms to avoid transpiration loss are highly important in determining the composition of the sand prairies. In the northwestern portion of its range, stand size corresponds to the area of exposed caprock sandstone, and small patches predominate, but large patches are also found embedded in the encompassing Northwestern Great Plains Mixedgrass Prairie (CES303.674). Another important feature is their susceptibility to wind erosion. Blowouts and sand draws are some of the unique wind-driven disturbances in the sand prairies, particularly the Nebraska Sandhills. In most of eastern Montana, substrates supporting this system have weathered in place from sandstone caprock; thus the solum is relatively thin, and the wind-sculpted features present further east, particularly in Nebraska, do not develop. Graminoid species dominate the sand prairies, although relative dominance can change due to impacts of wind disturbance. *Andropogon hallii* and *Calamovilfa longifolia* are the most common species, but other grass and forb species such as *Hesperostipa comata*, *Carex inops* ssp. *heliophila*, and *Panicum virgatum* may be present. Apparently only *Calamovilfa longifolia* functions as a dominant throughout the range of the system. In the western extent, *Hesperostipa comata* becomes more dominant, and *Andropogon hallii* is less abundant but still present. Communities of *Artemisia cana* ssp. *cana* are included here in central and eastern Montana. Patches of *Quercus havardii* can also occur within this system in the southern Great Plains. Fire and grazing constitute the other major dynamic processes that can influence this system.

Classification Comments: This system was edited to expand the concept to include sandy portions of the mixedgrass prairie of the Montana plains. Although in terms of potentially dominant graminoids there is virtually a complete overlap between the eastern and western extremities of the system, there is a distinct shift from west to east from midgrass species dominance, most notably *Hesperostipa comata*, to tallgrass species dominance, including prominently *Andropogon gerardii* and *Andropogon hallii*. Prevailing patch size also shifts from smaller to larger moving west to east. Current thinking is to include this variation within this system, but with more information and input from other Great Plains ecologists in the U.S. and Canada, this concept is subject to change, including the possibility of creating a new system.

Similar Ecological Systems:

- Central Mixedgrass Prairie (CES303.659)
- Western Great Plains Sandhill Steppe (CES303.671)
- Western Great Plains Shortgrass Prairie (CES303.672)
- Western Great Plains Tallgrass Prairie (CES303.673)

Related Concepts:

- Blue Grama - Sideoats Grama - Black Grama (707) (Shiflet 1994) Intersecting
- Bluestem - Prairie Sandreed (602) (Shiflet 1994) Finer
- Bluestem - Dropseed (708) (Shiflet 1994) Broader
- Grama - Bluestem (714) (Shiflet 1994) Finer. soil texture ranges from sand to clay loam? Inclusions?
- Prairie Sandreed - Needlegrass (603) (Shiflet 1994) Finer. This SRM type is found in the more northerly and northwest portions of this ecological system (as far west as central Montana).
- Sand Bluestem - Little Bluestem Dunes (720) (Shiflet 1994) Finer
- Sand Bluestem - Little Bluestem Plains (721) (Shiflet 1994) Finer
- Wheatgrass - Grama - Needlegrass (608) (Shiflet 1994) Intersecting. Sandy portions of this SRM type are included in this ecological system.

DESCRIPTION

Environment: The distribution, species richness and productivity of plant species within the sand prairie ecological system are controlled primarily by environmental conditions, in particular the temporal and spatial distribution of soil moisture and topography. Soils in the sand prairies can be relatively undeveloped and are highly permeable. Soil texture and drainage along with a species' rooting morphology, photosynthetic physiology, and mechanisms to avoid transpiration loss are highly important in determining the composition and distribution of communities/associations within the sand prairies. Another important aspect of soils in the sand prairies is their susceptibility to wind erosion. Blowouts and sand draws are some of the unique wind-driven disturbances in the sand prairies, particularly the Nebraska Sandhills, which can profoundly impact vegetation composition and succession within this system. This tallgrass system is found primarily on sandy and sandy loam soils that can be relatively undeveloped and highly permeable as compared to Western Great Plains Tallgrass Prairie (CES303.673), which occurs on deeper loams. This system is usually found in areas with a rolling topography and can occur on ridges, midslopes and/or lowland areas within a region. It often occurs on moving sand dunes, especially within the Sandhills region of Nebraska and South Dakota. In Montana, occurrences are intimately associated with Northwestern Great Plains Mixedgrass Prairie (CES303.674), usually occupying higher positions in local landscapes due to the fact that sandy members of some formations (that are predominantly marine shales) constitute the highest (and most weathering-resistant) points in the landscape.

Vegetation: This system is distinguished by the dominance of graminoids such as *Andropogon hallii* and *Calamovilfa longifolia*. Other graminoids such as *Hesperostipa comata*, *Carex inops ssp. heliophila*, and *Panicum virgatum* may be present. Characteristic forbs differ by region, but species of *Psoraleidium* and *Pediemelum* are a common feature. *Penstemon haydenii* is endemic to the sand prairie system and of special conservation concern because of its probable decline due to grazing and fire suppression. Very diffuse patches of *Rhus trilobata* are found on shallow sandy soils, often associated with breaklands; other shrubs occasionally occurring include *Artemisia cana ssp. cana*, *Betula occidentalis*, *Juniperus horizontalis*, and *Yucca glauca*. Many of the warm-season graminoids extend at least to the Rocky Mountain Front as dominant components on appropriate sites or as a response to disturbance. All the characteristic species mentioned for Nebraska and South Dakota are also found in Montana stands (and possibly Wyoming and perhaps the rest of the states cited). Some of the communities cited as part of the concept in Nebraska and South Dakota are only marginally present in Montana, but others are found throughout Montana's Great Plains region. In the southern range of this system, patches of *Quercus havardii* can also occur.

Dynamics: The distribution, species richness and productivity of plant species within the sand prairie ecological system are controlled primarily by environmental conditions, in particular the temporal and spatial distribution of soil moisture and topography. Another important aspect of this system is its susceptibility to wind erosion. Blowouts and sand draws are some of the unique wind-driven disturbances in the sand prairies, particularly the Nebraska Sandhills, which can profoundly impact vegetation composition and succession within this system. Fire and grazing constitute the other major disturbances that can influence this system. Overgrazing, fire and trampling that leads to the removal of vegetation within those areas susceptible to blowouts can either instigate a blowout or perpetuate one already occurring. Overgrazing can also lead to significant erosion.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* Sandhills Herbaceous Vegetation (CEGL002023, G3?)
- *Andropogon hallii* - *Calamovilfa gigantea* Herbaceous Vegetation (CEGL004016, G2G3)
- *Andropogon hallii* - *Calamovilfa longifolia* Herbaceous Vegetation (CEGL001467, G4G5)
- *Andropogon hallii* - *Carex inops ssp. heliophila* Herbaceous Vegetation (CEGL001466, G3)
- *Artemisia cana ssp. cana* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001555, G3Q)
- *Artemisia cana ssp. cana* / *Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001553, G3)
- *Betula occidentalis* - *Juniperus horizontalis* / *Calamovilfa longifolia* Shrubland (CEGL002184, GNR)
- *Calamovilfa longifolia* - *Carex inops ssp. heliophila* Herbaceous Vegetation (CEGL001471, G3)
- *Calamovilfa longifolia* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001473, G3)
- *Carex interior* - *Eleocharis elliptica* - *Thelypteris palustris* Herbaceous Vegetation (CEGL002390, G1G2)
- *Hesperostipa comata* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (CEGL002037, G5)
- *Hesperostipa comata* - *Carex filifolia* Herbaceous Vegetation (CEGL001700, G4)
- *Pseudoroegneria spicata* - *Achnatherum hymenoides* Herbaceous Vegetation (CEGL001674, G3G4)
- *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Quercus havardii* / *Sporobolus cryptandrus* - *Schizachyrium scoparium* Shrubland (CEGL002171, G3)
- *Rhus trilobata* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001457, G3Q)
- *Rhus trilobata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001120, G4)
- *Schizachyrium scoparium* - *Aristida basiramea* - *Sporobolus cryptandrus* - *Eragrostis trichodes* Herbaceous Vegetation (CEGL005221, GNR)
- *Yucca glauca* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675, G4)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon hallii* Herbaceous Alliance (A.1193)
- *Artemisia cana ssp. cana* Shrub Herbaceous Alliance (A.2554)
- *Betula occidentalis* Shrubland Alliance (A.914)
- *Calamovilfa longifolia* Herbaceous Alliance (A.1201)

- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Hesperostipa comata* - *Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Quercus havardii* Shrubland Alliance (A.780)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)
- *Schizachyrium scoparium* - (*Sporobolus cryptandrus*) Herbaceous Alliance (A.1224)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)

DISTRIBUTION

Range: This system is found throughout the Western Great Plains Division. The largest and most intact example of this system is found within the Sandhills region of Nebraska and South Dakota. However, it is also common (though occurring in predominantly small patches) farther west into central and eastern Montana. Its western extent in Wyoming is still to be determined, but it does occur in mapzone 29 on weathered-in-place sandy soils, where *Calamovilfa longifolia* is found, along with *Artemisia cana*.

Divisions: 303:C

Nations: US

Subnations: CO, KS, MT, ND, NE, NM?, OK, SD, TX?, WY

Map Zones: 20:C, 27:P, 29:C, 30:C, 31:C, 33:C, 34:C, 38:C, 39:C, 40:C

USFS Ecomap Regions: 251F:CC, 251H:CC, 255A:PP, 315A:CC, 315B:CC, 315F:CC, 321A:??, 331B:CC, 331C:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CP, 331N:C?, 332C:CC, 332D:CC, 332E:CC, 332F:CC

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C, 34:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Tolstead 1942

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722988#references

Description Author: S. Menard and K. Kindscher, mod. M.S. Reid

Version: 27 Apr 2006

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

1149 WESTERN GREAT PLAINS SHORTGRASS PRAIRIE (CES303.672)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Herbaceous; Loam Soil Texture; Ustic; F-Landscape/Low Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2149; ESLF 7122; ESP 1149

CONCEPT

Summary: This system is found primarily in the western half of the Western Great Plains Division in the rainshadow of the Rocky Mountains and ranges from the Nebraska Panhandle south into Texas and New Mexico, although grazing-impacted examples may reach as far north as southern Canada where it grades into Northwestern Great Plains Mixedgrass Prairie (CES303.674). This system occurs primarily on flat to rolling uplands with loamy, ustic soils ranging from sandy to clayey. In much of its range, this system forms the matrix system with *Bouteloua gracilis* dominating this system. Associated graminoids may include *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua hirsuta*, *Buchloe dactyloides*, *Hesperostipa comata*, *Koeleria macrantha* (= *Koeleria cristata*), *Pascopyrum smithii* (= *Agropyron smithii*), *Pleuraphis jamesii*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Although mid-height grass species may be present, especially on more mesic land positions and soils, they are secondary in importance to the sod-forming short grasses. Sandy soils have higher cover of *Hesperostipa comata*, *Sporobolus cryptandrus*, and *Yucca elata*. Scattered shrub and dwarf-dwarf species such as *Artemisia filifolia*, *Artemisia frigida*, *Artemisia tridentata*, *Atriplex canescens*, *Eriogonum effusum*, *Gutierrezia sarothrae*, and *Lycium pallidum* may also be present. Also, because this system spans a wide range, there can be some differences in the relative dominance of some species from north to south and from east to west. Large-scale processes such as climate, fire and grazing influence this system. High variation in amount and timing of annual precipitation impacts the relative cover of cool- and warm-season herbaceous species.

In contrast to other prairie systems, fire is less important, especially in the western range of this system, because the often dry and xeric climate conditions can decrease the fuel load and thus the relative fire frequency within the system. However, historically, fires that did occur were often very expansive. Currently, fire suppression and more extensive grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. A large part of the range for this system (especially in the east and near rivers) has been converted to agriculture. Areas of the central and western range have been impacted by the unsuccessful attempts to develop dryland cultivation during the Dust Bowl of the 1930s. The short grasses that dominate this system are extremely drought- and grazing-tolerant. These species evolved with drought and large herbivores and, because of their stature, are relatively resistant to overgrazing. This system in combination with the associated wetland systems represents one of the richest areas for mammals and birds. Endemic bird species to the shortgrass system may constitute one of the fastest declining bird populations.

Classification Comments: In Texas, this system occurs on the Llano Estacado and ranges to but does not include the Stockton Plateau.

Similar Ecological Systems:

- Madrean Juniper Savanna (CES301.730)
- Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834)
- Western Great Plains Mesquite Woodland and Shrubland (CES303.668)
- Western Great Plains Sand Prairie (CES303.670)

Related Concepts:

- Black Grama - Alkali Sacaton (702) (Shiflet 1994) Finer
- Black Grama - Sideoats Grama (703) (Shiflet 1994) Finer
- Blue Grama - Buffalograss (611) (Shiflet 1994) Finer
- Blue Grama - Galleta (705) (Shiflet 1994) Finer
- Blue Grama - Sideoats Grama (706) (Shiflet 1994) Finer
- Blue Grama - Sideoats Grama - Black Grama (707) (Shiflet 1994) Finer
- Blue Grama - Western Wheatgrass (704) (Shiflet 1994) Finer
- Galleta - Alkali Sacaton (712) (Shiflet 1994) Finer
- Grama - Buffalograss (715) (Shiflet 1994) Finer
- Grama - Feathergrass (716) (Shiflet 1994) Finer
- Vine Mesquite - Alkali Sacaton (725) (Shiflet 1994) Intersecting
- Wheatgrass - Saltgrass - Grama (615) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This system is located on primarily flat to rolling uplands. Soils typically are loamy and ustic and range from sandy to clayey. Climate is continental with mean annual precipitation generally about 300 mm ranging to 500 mm to the south in Texas. Most

of the annual precipitation occurs during the growing season as thunderstorms. Precipitation events are mostly <10 cm with occasional larger events.

Vegetation: This system spans a wide range and thus there can be some differences in the relative dominance of some species from north to south and from east to west. This system is primarily dominated by *Bouteloua gracilis* throughout its range with various associated graminoid species depending on precipitation, soils and management. Associated graminoids may include *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua curtipendula*, *Bouteloua hirsuta*, *Buchloe dactyloides*, *Carex filifolia*, *Hesperostipa comata*, *Koeleria macrantha* (= *Koeleria cristata*), *Muhlenbergia torreyana*, *Pascopyrum smithii* (= *Agropyron smithii*), *Pleuraphis jamesii*, *Sporobolus airoides*, and *Sporobolus cryptandrus*. Although mid-height grass species may be present especially on more mesic land positions and soils, they are secondary in importance to the sod-forming short grasses. Sandy soils have higher cover of *Hesperostipa comata*, *Sporobolus cryptandrus*, and *Yucca elata*. Scattered shrub and dwarf-dwarf species such as *Artemisia filifolia*, *Artemisia frigida*, *Artemisia tridentata*, *Atriplex canescens*, *Eriogonum effusum*, *Gutierrezia sarothrae*, and *Lycium pallidum* may also be present. High annual variation in amount and timing of precipitation impacts relative cover of herbaceous species. Cover of cool-season grasses is dependant on winter and early spring precipitation.

Dynamics: Climate, fire and grazing constitute the primary processes impacting this system. Drought-tolerant shortgrass species have root systems that extend up near the soil surface where they can utilize low precipitation events (Sala and Lauenroth 1982). Fire is less important in this system compared to other Western Great Plains prairie systems, especially in the western portion of its range. Previous comments in the literature citing *Opuntia* spp. increasing with overgrazing may not be borne out by more recent research (R. Rondeau pers. comm.). Conversion to agriculture and pastureland with subsequent irrigation has degraded and extirpated this system in some areas of its range.

MEMBERSHIP

Associations:

- *Aristida purpurea* Herbaceous Vegetation (CEGL005800, GNR)
- *Bouteloua curtipendula* - *Bouteloua (eriopoda, gracilis)* Herbaceous Vegetation (CEGL002250, G4)
- *Bouteloua eriopoda* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001748, G2)
- *Bouteloua gracilis* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis* - *Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis* - *Buchloe dactyloides* - *Pleuraphis jamesii* Herbaceous Vegetation (CEGL002271, GNR)
- *Bouteloua gracilis* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001756, G4)
- *Bouteloua gracilis* - *Buchloe dactyloides* Xeric Soil Herbaceous Vegetation (CEGL002270, G3G5)
- *Bouteloua gracilis* - *Pleuraphis jamesii* Herbaceous Vegetation (CEGL001759, G2G4)
- *Bouteloua gracilis* Herbaceous Vegetation (CEGL001760, G4Q)
- *Bouteloua hirsuta* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001764, G4)
- *Bouteloua hirsuta* Herbaceous Vegetation [Placeholder] (CEGL002673, GNR)
- *Hesperostipa neomexicana* Mixed Prairie Herbaceous Vegetation (CEGL001711, GU)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Yucca glauca* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675, G4)

Alliances:

- *Aristida purpurea* Herbaceous Alliance (A.2570)
- *Bouteloua curtipendula* Herbaceous Alliance (A.1244)
- *Bouteloua eriopoda* Herbaceous Alliance (A.1284)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Western Great Plains Tallgrass Prairie (CES303.673)

Adjacent Ecological System Comments: Some examples may reach as far north as southern Canada where it grades into Northwestern Great Plains Mixedgrass Prairie (CES303.674).

DISTRIBUTION

Range: This system is found primarily in the western half of the Western Great Plains Division east of the Rocky Mountains and ranges from the Nebraska Panhandle south into the panhandles of Oklahoma and Texas and New Mexico, although some examples may reach as far north as southern Canada where it grades into Northwestern Great Plains Mixedgrass Prairie (CES303.674).

Divisions: 303:C

Nations: US

Subnations: CO, KS, NE, NM, OK, TX, WY

Map Zones: 22:C, 24:?, 25:C, 26:C, 27:C, 28:C, 29:C, 30:C, 31:P, 33:C, 34:C, 35:P, 38:P

USFS Ecomap Regions: 315A:CC, 315B:CC, 315F:CC, 321A:CC, 331B:CC, 331C:CC, 331F:CC, 331H:CC, 331I:CC, 332C:CC, 332E:CC, 332F:CC, M313B:CC, M331F:CC, M331I:CC

TNC Ecoregions: 26:P, 27:C, 28:C, 33:P

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Dick-Peddie 1993, Lauenroth and Milchunas 1992, Milchunas et al. 1989, Ricketts et al. 1999, Rondeau pers. comm., Sala and Lauenroth 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722986#references

Description Author: S. Menard and K. Kindscher

Version: 11 Nov 2003

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

1150 WESTERN GREAT PLAINS TALLGRASS PRAIRIE (CES303.673)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Herbaceous; Deep Soil; Loam Soil Texture; Ustic; F-Patch/Low Intensity; G-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2150; ESLF 7123; ESP 1150

CONCEPT

Summary: This system can be found throughout the Western Great Plains Division. It is found primarily in areas where soil characteristics allow for mesic conditions more typical of the Eastern Great Plains Division and thus are able to sustain tallgrass species. This system may be small patches interspersed within Northwestern Great Plains Mixedgrass Prairie (CES303.674) or Western Great Plains Shortgrass Prairie (CES303.672) and may also be associated with upland terraces above a floodplain system where these more mesic conditions persist. Soils are primarily loamy Mollisols that are moderately deep and rich. Those areas that contain more sandy soils should be considered part of Western Great Plains Sand Prairie (CES303.670). This system is dominated primarily by *Andropogon gerardii* and may also include *Sorghastrum nutans*, *Schizachyrium scoparium*, *Pascopyrum smithii*, *Hesperostipa spartea*, and *Sporobolus heterolepis*. *Andropogon gerardii* often dominates the lowland regions, although *Pascopyrum smithii* can be prolific if conditions are favorable. Forbs in varying density may also be present. The primary dynamics for this system include fire, climate and grazing. Fire suppression in these areas has allowed for the invasion of woody species such as *Juniperus virginiana* and *Prunus* spp. Grazing also has contributed to these changes and likewise led to a decrease of this system as overgrazing favors shortgrass and mixedgrass systems. Conversion to agriculture likewise has probably decreased the range of this system. Thus, this system likely only occurs in small patches and in scattered locations throughout the division. Large-patch occurrences are mostly isolated to slopes and swales of rolling uplands where either grazing or cultivation are more problematic.

Classification Comments: A granitic woodland association of the Wichita Mountains of Oklahoma (*Quercus fusiformis* - (*Quercus stellata*) / *Schizachyrium scoparium* Granite Woodland (CEGL004937)), formerly included here, now is included in Crosstimbers Oak Forest and Woodland (CES205.682).

Similar Ecological Systems:

- Western Great Plains Sand Prairie (CES303.670)
- Western Great Plains Sandhill Steppe (CES303.671)

Related Concepts:

- Bluestem - Grama (709) (Shiflet 1994) Broader
- Bluestem Prairie (601) (Shiflet 1994) Finer
- Bluestem Prairie (710) (Shiflet 1994) Finer
- Wheatgrass - Bluestem - Needlegrass (606) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This system is found primarily on loam, moderately deep, and rich Mollisols throughout the Western Great Plains Division. These soils tend to be more mesic and deep than the majority of soils within the Western Great Plains and are more typical of the Eastern Great Plains Division.

Vegetation: The mesic, deep soils of this system allow for dominance by *Andropogon gerardii*. Other species, such as *Sorghastrum nutans*, *Schizachyrium scoparium*, *Pascopyrum smithii*, *Hesperostipa spartea*, and *Sporobolus heterolepis*, can also be present. In more lowland areas, *Pascopyrum smithii* can become more prevalent. Fire suppression can lead to the invasion of these areas by woody species such as *Juniperus virginiana* and *Prunus* spp.

Dynamics: Fire, climate and grazing constitute the primary dynamic processes impacting this system. Fire suppression can allow for the invasion of woody species such as *Juniperus virginiana* and *Prunus* spp. into the prairie matrix. Overgrazing tends to favor shortgrass and mixedgrass species and can cause the conversion of this system to the Western Great Plains shortgrass or mixedgrass systems. Also, invasion by introduced species such as *Bromus inermis* can become more severe as grazing pressure increases. Likewise, conversion to agriculture has degraded or extirpated many examples of this system.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* - *Schizachyrium scoparium* - (*Tradescantia tharpaii*) Herbaceous Vegetation (CEGL005231, G3?)
- *Andropogon gerardii* - *Schizachyrium scoparium* Northern Plains Herbaceous Vegetation (CEGL002205, G3G5)
- *Andropogon gerardii* - *Schizachyrium scoparium* Western Great Plains Herbaceous Vegetation (CEGL001463, G2?)
- *Andropogon gerardii* - *Sorghastrum nutans* Western Great Plains Herbaceous Vegetation (CEGL001464, G2)
- *Andropogon gerardii* - *Sporobolus heterolepis* - *Schizachyrium scoparium* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL002376, G2)

- *Andropogon gerardii* - *Sporobolus heterolepis* Western Foothills Herbaceous Vegetation (CEGL001465, G2)
- *Cornus drummondii* - (*Rhus glabra*, *Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Western Great Plains Shortgrass Prairie (CES303.672)

Adjacent Ecological System Comments: This system may be small patches interspersed within Northwestern Great Plains Mixedgrass Prairie (CES303.674) or Western Great Plains Shortgrass Prairie (CES303.672) and may also be associated with upland terraces above a floodplain system where these more mesic conditions persist.

DISTRIBUTION

Range: This system occurs throughout the Western Great Plains Division, however, grazing and conversion to agriculture have likely decreased its natural range.

Divisions: 303:C

Nations: US

Subnations: CO, KS, MT, ND, NE, OK, TX?, WY

Map Zones: 29:C, 30:C, 31:C, 33:C, 34:C, 38:C, 39:C, 40:C

USFS Ecomap Regions: 331C:PP, 331H:PP

TNC Ecoregions: 26:C, 27:C, 28:?, 33:C, 34:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Weaver 1954

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722985#references

Description Author: S. Menard and K. Kindscher

Version: 05 Mar 2003

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

1416 WESTERN HIGHLAND RIM PRAIRIE AND BARRENS (CES202.352)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Deep Soil; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2416; ESLF 7129; ESP 1416

CONCEPT

Summary: This system includes open, fire-maintained vegetation (often called "barrens") on uplands in western middle Tennessee (USFS Subsection 223Eg and EPA Level IV Ecoregion 71f) (EPA 2004). Although parts of the region are highly dissected, extensive interfluvial areas formerly supported fire-adapted "barrens" vegetation. Haywood (1959) noted extensive prairie in the southern portion of Land Between the Lakes, and DeSelm (1988) noted the existence of barrens remnants in the region. These barrens occur, at least in part, on Cretaceous gravels which cap either Mississippian limestone strata on hills in the Tennessee counties of Dickson, Hickman, Lewis, and Lawrence. The general terrain is flat to gently sloping. Shanks (1958) also specifically refers to barrens on "cherty residuum, elsewhere characterized by Planosols with impeded drainage." Some proposed factors which have functioned to maintain the openness of this system include the droughty, gravelly soils and resulting stresses to vegetation, as well as fire. The same gravels are mapped in Land Between the Lakes, and this vegetation could be expected there (if all examples have not succeeded to woody vegetation due to lack of fire). There may be similar habitats in Kentucky, including relatively extensive areas of Tertiary age material in eastern Calloway and Marshall and southern Livingston counties. The areas are transitional between Highland Rim and Coastal Plain, but they are included in EPA 71f.

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353)
- Eastern Highland Rim Prairie and Barrens (CES202.354)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Southern Ridge and Valley Patch Prairie (CES202.453)

DESCRIPTION

Environment: As noted by Shanks (1958) and described by DeSelm (1989), these barrens occur, at least in part, on Cretaceous gravels which cap either Mississippian limestone strata on hills in the Tennessee counties of Dickson, Hickman, Lewis, and Lawrence (these mapped in Miller et al. (1966). The general terrain is flat to gently sloping. An example on slopes in northwestern Davidson County (Ridgetop Barrens) is also included here (DeSelm 1993). Shanks (1958) also specifically refers to barrens on "cherty residuum, elsewhere characterized by Planosols with impeded drainage." DeSelm (1988) describes the substrate for non-limestone barrens of the Western Highland Rim of Tennessee as "upland over loess... silty clay loam or silty clay soils."

Vegetation: Some stands may be in a woodland or fire-suppressed forest condition, dominated by dry-site oaks such as *Quercus marilandica*, *Quercus prinus*, and/or *Quercus stellata*. These trees would become more scattered under an appropriate fire regime. In the herbaceous layer of well-managed examples of this system, *Schizachyrium scoparium* is codominant along with a variable mixture of *Andropogon gyrans*, *Andropogon ternarius*, and/or *Andropogon virginicus*. Other dominant grasses may include *Dichanthelium aciculare* (= *Dichanthelium angustifolium*), *Gymnopogon brevifolius*, and *Dichanthelium dichotomum* var. *dichotomum* (= var. *ramulosum*). Other common species may include *Symphyotrichum dumosum* (= *Aster dumosus*), *Sericocarpus linifolius* (= *Aster solidagineus*), *Coreopsis major*, *Eupatorium hyssopifolium*, *Eupatorium rotundifolium*, *Helianthus angustifolius*, *Liatris microcephala*, *Liatris spicata*, *Packera anonyma* (= *Senecio anonymus*), *Solidago juncea*, *Solidago odora*, *Chamaecrista fasciculata*, *Chamaecrista nictitans*, *Stylosanthes biflora*, *Lobelia puberula*, *Diodia teres*, *Potentilla simplex*, *Aristida longispica*, *Calamagrostis coarctata*, *Dichanthelium dichotomum*, *Sorghastrum nutans*, *Pteridium aquilinum*, and *Smilax glauca*.

Dynamics: Some proposed factors which have functioned to maintain the openness of this system include the droughty, gravelly soils and resulting stresses to vegetation, as well as fire. Fralish et al. (1999) noted that both post oak and chestnut oak woodlands are essentially the result of fire suppression in the barrens and historic savannas. In some areas, where the soils are particularly harsh (droughty, nutrient-poor, rocky), stands may retain an open aspect in the absence of fire.

MEMBERSHIP

Associations:

- *Quercus marilandica* / *Schizachyrium scoparium* - (*Helianthus mollis*, *Silphium asteriscus*, *Liatris aspera*) Woodland (CEGL004756, G2)
- *Quercus prinus* / *Smilax* spp. Forest (CEGL005022, G4)

- *Quercus stellata* / *Viburnum rufidulum* / *Schizachyrium scoparium* - (*Sorghastrum nutans*, *Helianthus eggertii*) Woodland (CEGL004686, G2G3)
- *Schizachyrium scoparium* - *Andropogon* (*gyrans*, *ternarius*, *virginicus*) Herbaceous Vegetation (CEGL007707, G3?)

Alliances:

- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: This system is restricted to the Western Highland Rim of Tennessee and equivalent landforms in adjacent Alabama and Kentucky. Examples (good-condition examples are limited and of small size) are found in Dickson, Hickman, Lawrence, and Lewis counties of Tennessee (DeSelm 1988, NatureServe unpubl. data). These areas are scattered across Subsection 223Eg (USFS) and EPA Level IV Ecoregion 71f (EPA 2004).

Divisions: 202:C

Nations: US

Subnations: KY?, TN

Map Zones: 47:C, 48:C

USFS Ecomap Regions: 223E:CC

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, DeSelm 1988, DeSelm 1989a, DeSelm and Chester 1993, EPA 2004, Fralish et al. 1999, Haywood 1959, McDowell et al. 1981, Miller et al. 1966, NatureServe Ecology - Southeastern U.S. unpubl. data, Shanks 1958

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723160#references

Description Author: C. Nordman, R. Evans, M. Pyne

Version: 22 May 2008

Concept Author: C. Nordman, R. Evans, M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

WOODY WETLANDS AND RIPARIAN

ACADIAN MARITIME BOG (CES201.580)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Maritime Climate; Organic Peat (>40 cm); Dwarf-Shrub; Graminoid

Non-Diagnostic Classifiers: Oligotrophic Water; Acidic Water; Saturated Soil; >180-day hydroperiod; Moderate (100-500 yrs) Persistence; Shrubland (Shrub-dominated); Extensive Wet Flat; Depressional; Bryophyte

National Mapping Codes: ESLF 9301

CONCEPT

Summary: These ombrotrophic acidic peatlands occur along the north Atlantic Coast from downeast Maine east into the Canadian Maritimes. When these form in basins, they develop raised plateaus with undulating sedge and dwarf-shrub vegetation. *Trichophorum caespitosum* may form sedge lawns on the raised plateau. The system may also occur as "blanket bogs" over a sloping rocky substrate in extreme maritime settings; here, dwarf-shrubs and *Sphagnum* are the dominant cover. Species characteristic of this maritime setting include *Empetrum nigrum* and *Rubus chamaemorus*. Typical bog heaths such as *Kalmia angustifolia*, *Kalmia polifolia*, *Gaylussacia baccata*, *Ledum groenlandicum*, and *Gaylussacia dumosa* are also present. Morphological characteristics and certain coastal species distinguish these from more inland raised bogs. The distribution is primarily Canadian, and these peatlands are rare in the U.S.

Similar Ecological Systems:

- Boreal-Laurentian Bog (CES103.581)

MEMBERSHIP

Associations:

- *Empetrum nigrum* - *Gaylussacia dumosa* - *Rubus chamaemorus* / *Sphagnum* spp. Dwarf-shrubland (CEGL006248, G3G5)
- *Kalmia angustifolia* - *Chamaedaphne calyculata* - (*Picea mariana*) / *Cladina* spp. Dwarf-shrubland (CEGL006225, G5)
- *Picea mariana* / *Rubus chamaemorus* / *Sphagnum* spp. Woodland (CEGL006082, G3G5)
- *Trichophorum caespitosum* - *Gaylussacia dumosa* / *Sphagnum* (*fuscum*, *rubellum*, *magellanicum*) Herbaceous Vegetation (CEGL006260, GNR)

Alliances:

- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Empetrum nigrum* Saturated Dwarf-shrubland Alliance (A.1095)
- *Picea mariana* Saturated Woodland Alliance (A.585)
- *Trichophorum caespitosum* Saturated Shrub Herbaceous Alliance (A.1312)

DISTRIBUTION

Range: This system occurs near the coast from eastern Maine (Mount Desert Island) eastward into the Canadian Maritimes.

Divisions: 201:C

Nations: CA, US

Subnations: ME, NB

Map Zones: 66:C

USFS Ecomap Regions: 211Cb:CCC

TNC Ecoregions: 63:C

SOURCES

References: Comer et al. 2003, Damman and French 1987, Worley 1980

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723025#references

Description Author: S.C. Gawler

Version: 09 Jan 2003

Concept Author: S.C. Gawler

Stakeholders: Canada, East
ClassifResp: East

ACADIAN-APPALACHIAN CONIFER SEEPAGE FOREST (CES201.576)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Mesotrophic Water; Seepage-Fed Sloping; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*; *Thuja occidentalis* - *Fraxinus nigra*

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Saturated Soil; Moderate (100-500 yrs) Persistence; Forest and Woodland (Treed); Isolated Wetland [Partially Isolated]; Mineral: W/ A-Horizon >10 cm; Mineral: W/ A-Horizon <10 cm; Needle-Leaved Tree

National Mapping Codes: ESLF 9344

CONCEPT

Summary: These forests occur as large-patch landscape features near the southern periphery of the boreal forest in the northeastern U.S. and adjacent Canada. They are found on gentle to moderate slopes in the colder regions of the Northern Appalachians, often adjacent to (but above) drainage channels, in settings where groundwater seepage provides constant moisture. *Thuja occidentalis* and *Picea rubens* are the typical dominants; some areas may have a prominent deciduous component. The herbaceous and bryophyte flora is typically extensive. Because of their setting, these are often not mapped as wetlands.

Classification Comments: This system may have application in other parts of the Laurentian-Acadian Division, depending on how the break is made between "wet-mesic" lowland white-cedar forests (with subsurface gleyed soils) and the white-cedar seepage forests described here.

MEMBERSHIP

Associations:

- *Thuja occidentalis* - (*Picea rubens*) / *Tiarella cordifolia* Forest (CEGL006175, GNR)

Alliances:

- *Thuja occidentalis* Saturated Forest Alliance (A.200)

DISTRIBUTION

Range: Northernmost parts of New England, north and east into Canada.

Divisions: 201:C

Nations: CA, US

Subnations: ME, NB, NH, NY, QC, VT

Map Zones: 64:C, 66:C

TNC Ecoregions: 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723029#references

Description Author: S.C. Gawler

Version: 09 Jan 2003

Concept Author: S.C. Gawler

Stakeholders: Canada, East

ClassifResp: East

ATLANTIC COASTAL PLAIN BLACKWATER STREAM FLOODPLAIN FOREST (CES203.247)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Blackwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9322

CONCEPT

Summary: This Atlantic Coastal Plain system, which is apparently most abundant in the Carolinas, occurs in floodplains of small streams that carry little mineral sediment (blackwater streams). These streams have their headwaters in sandy portions of the Coastal Plain. The water is usually strongly stained by tannins but has little suspended clay and is not turbid. Depositional landforms may be absent or present only in limited variety and of small size. Soils are usually strongly acidic. Periodicity of flooding ranges from long (semipermanent) in the wettest portions to short in higher gradient streams. Some small blackwater streams have most of their flow from sandhill seepage and have limited fluctuation in water levels. Vegetation varies from north to south, but generally consists almost entirely of forests of wetland trees, but occasional, small shrubby sloughs may also be present. A variety of tree species may be present; wetter examples (especially toward the northern range limits of this system) are often strongly dominated by *Taxodium distichum* and *Nyssa biflora*. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods tolerant of blackwater conditions. Species richness ranges from low to moderate, but is lower than in comparable brownwater systems. Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration.

Classification Comments: The distinction between brownwater and blackwater streams is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater streams may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Small streams have small watersheds, which tend to lead to more irregular flooding. Depositional landforms are small enough that they do not differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains. The boundary between this system and the Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252) may be somewhat gradual. It should be based on the predominance of seepage influence over flooding influence, but vegetational differences may also be partly determined by fire regime. Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275) shares many characteristics with this system, but differs in having calcareous water and more steady flows.

Similar Ecological Systems:

- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Northern Atlantic Coastal Plain Stream and River (CES203.070)
- Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275)

DESCRIPTION

Environment: Occurs in floodplains of small streams of the Coastal Plain that carry little mineral sediment (blackwater streams). These streams have their headwaters in sandy portions of the Coastal Plain. The water is usually strongly stained by tannins but has little suspended clay and is not turbid. Depositional landforms may be absent or may be present in limited variety and of small size. Soils are generally sandy in drier portions of the floodplain, mucky in wetter portions, or may be uniform organic soils. Soils are usually strongly acidic, but spring-fed rivers may have calcareous water and non-acidic soils. Flooding ranges from semipermanent in the wettest floodplains to intermittent and short in higher gradient streams. Some small blackwater streams have most of their flow from sandhill seepage and have limited fluctuation in water levels.

Vegetation: Vegetation consists almost entirely of forests of wetland trees. Wetter examples are strongly dominated by *Taxodium distichum* and *Nyssa biflora*. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods tolerant of blackwater conditions. Except in the very wet examples, understory, shrub, and herb layers are generally well-developed, and woody vines are also prominent. Species richness ranges from low to moderate but is lower than in comparable brownwater systems.

Dynamics: Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration. It is unclear how important aquatic fauna are when the system is flooded, but they may be important. The small flows, low gradient, and binding of sediment by vegetation limit channel shifts and sediment movement, but floods may cause local disturbance by scouring. Most of these forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is probably more important than in larger river systems, because distances to

uplands are short and because stream channels and sloughs are smaller and less effective as firebreaks. However, most of the vegetation is not very flammable and usually will not carry fire. Some of these areas apparently were once canebrakes, which presumably were maintained by periodic fire.

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* - (*Liriodendron tulipifera*) / *Lyonia lucida* Forest (CEGL007563, G2)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Magnolia virginiana* - *Nyssa biflora* / *Carpinus caroliniana* / *Thelypteris noveboracensis* - *Athyrium filix-femina* Forest (CEGL004722, G3G4)
- *Nuphar lutea ssp. sagittifolia* Herbaceous Vegetation (CEGL004328, G3?)
- *Nyssa biflora* - (*Liquidambar styraciflua*) / *Itea virginica* / *Saururus cernuus* Forest (CEGL007847, G4?)
- *Nyssa biflora* - *Liriodendron tulipifera* - *Pinus (serotina, taeda)* / *Lyonia lucida* - *Ilex glabra* Forest (CEGL004734, G3?)
- *Nyssa biflora* - *Quercus nigra* - *Quercus laurifolia* - *Pinus taeda* / *Ilex opaca* - *Carpinus caroliniana* Forest (CEGL007350, G4?)
- *Orontium aquaticum* - *Schoenoplectus (etuberculatus, subterminalis)* - *Eriocaulon decangulare* - *Juncus trigonocarpus* Herbaceous Vegetation (CEGL007860, G2?)
- *Quercus laurifolia* / *Carpinus caroliniana* / *Justicia ovata* Forest (CEGL007348, G4?)
- *Quercus phellos* - *Quercus laurifolia* - *Nyssa biflora* - *Liquidambar styraciflua* / *Arundinaria gigantea ssp. tecta* - *Sabal minor* Forest (CEGL007846, G4?)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Taxodium ascendens* / (*Nyssa biflora*) / *Leucothoe racemosa* - *Lyonia lucida* - *Morella cerifera* Depression Forest (CEGL007420, G3)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa biflora* - *Acer rubrum* - *Magnolia virginiana* Saturated Forest (CEGL003804, G2G3)
- *Taxodium distichum* - *Nyssa biflora* / *Fraxinus caroliniana* / *Lyonia lucida* Forest (CEGL004733, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Orontium aquaticum* - (*Schoenoplectus subterminalis*) Permanently Flooded Herbaceous Alliance (A.1931)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* - *Nyssa biflora* - (*Nyssa aquatica*) Saturated Forest Alliance (A.355)

SPATIAL CHARACTERISTICS

Spatial Summary: Generally a small-patch system, with narrow bands or dendritic patches interspersed with other systems.

Size: Occurs in narrow bands, from a few hundred feet to possibly as much as a mile in width, and often several to many miles long. Natural limitations on development and conversion often result in contiguous patches that may be hundreds or even thousands of acres. However, because of relatively easy accessibility compared to larger floodplains, patches of mature vegetation are often small.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Adjacent Ecological System Comments: May be associated with a variety of systems, especially upland or wetland longleaf pine systems and Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252). Most naturally connect downstream to Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250) or to Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240).

DISTRIBUTION

Range: This system is potentially found throughout the Atlantic Coastal Plain north to about the James River in Virginia, but it is most abundant in North Carolina and South Carolina.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232A:CC, 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 55:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723238#references

Description Author: M. Schafale and R. Evans

Version: 19 Dec 2005

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN BROWNWATER STREAM FLOODPLAIN FOREST (CES203.248)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9320

CONCEPT

Summary: This Atlantic Coastal Plain system ranges from southern Virginia (south of the James River) to Georgia on floodplains of smaller streams that carry significant mineral sediment (brownwater or redwater streams). These streams have their headwaters in the Piedmont, Blue Ridge, or other interior regions, or in portions of the Coastal Plain where fine-textured sediment predominates. The water generally carries substantial amounts of silt and clay. Depositional landforms, at least a natural levee, are often distinctly present but are fairly small relative to the scale of communities and help create some variation in duration of flooding and nutrient input. Soils are generally fertile and not strongly acidic. Flooding is generally seasonal but may range to nearly semipermanent. Vegetation consists almost entirely of forests of wetland trees. Wetter examples are strongly dominated by *Taxodium distichum* and *Nyssa* spp. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods. Except in the very wet examples, understory, shrub and herb layers are generally well-developed and woody vines are also prominent. Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration.

Classification Comments: The distinction between brownwater and blackwater streams is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater streams may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Small streams have small watersheds, which tend to lead to more irregular flooding. Depositional landforms are small enough that they do not differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains.

This system as defined covers a large geographic range. There are some significant biogeographic differences across this range, leading to a large number of associations. However, more plant species are shared across the region in this system than in most other systems in the region.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Stream and River (CES203.070)
- Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

DESCRIPTION

Environment: Occurs on floodplains of smaller streams that carry significant mineral sediment (brownwater or redwater streams). These streams have their headwaters in the Piedmont, Blue Ridge, Interior Plateaus, or in portions of the Coastal Plain where fine-textured sediment predominates. The water generally carries substantial amounts of silt and clay. Depositional landforms, at least a natural levee, are often distinctly present but are fairly small relative to the scale of communities. They create some variation in duration of flooding and nutrient input. Soil texture varies from sandy to clayey, often in a fine mosaic. Soils are generally fertile and not strongly acidic. Flooding is generally seasonal, but may range to nearly semipermanent.

Vegetation: Vegetation consists almost entirely of forests of wetland trees. Wetter examples are strongly dominated by *Taxodium distichum* and *Nyssa* spp. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods. Except in the very wet examples, understory, shrub, and herb layers are generally well-developed, and woody vines are also prominent. Some canopy trees may include *Acer rubrum*, *Acer saccharinum*, *Betula nigra*, *Carya illinoensis*, *Celtis laevigata*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Nyssa aquatica*, *Nyssa biflora*, *Pinus taeda*, *Platanus occidentalis*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus phellos*, *Salix caroliniana*, and *Taxodium distichum*. Some shrubs and small trees may include *Alnus serrulata*, *Arundinaria gigantea ssp. tecta*, *Carpinus caroliniana*, *Fraxinus caroliniana*, *Ilex opaca*, *Itea virginica*, *Leucothoe racemosa*, *Sabal minor*, and *Serenoa repens*. Herbs may include *Boehmeria cylindrica*, *Commelina virginica*, *Leersia lenticularis*, and *Onoclea sensibilis*.

Dynamics: Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration. It is unclear how important aquatic fauna are when the system is flooded, but they may be important. The small flows, low gradient, and binding of sediment by vegetation limit channel shifts and sediment movement, but floods may cause local disturbance by scouring. Most of these forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is probably more important than in larger river systems, because distances to uplands are short and because stream channels and sloughs are smaller and less effective as firebreaks. However, most of the

vegetation is not very flammable and usually will not carry fire. Some of these areas apparently were once canebrakes, which presumably were maintained by periodic fire.

MEMBERSHIP

Associations:

- *Acer saccharinum* / *Leersia lenticularis* - *Commelina virginica* Forest (CEGL007727, G3?)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Quercus (phellos, palustris, michauxii)* - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)
- *Quercus michauxii* / *Carpinus caroliniana* - *Ilex opaca* / *Leucothoe racemosa* Forest (CEGL007737, G2G3)
- *Quercus pagoda* - *Quercus nigra* / *Halesia diptera* - *Ilex decidua* / *Chasmanthium sessiliflorum* - *Dicliptera brachiata* Forest (CEGL007354, G4?)
- *Quercus phellos* - *Quercus laurifolia* - *Nyssa biflora* - *Liquidambar styraciflua* / *Arundinaria gigantea ssp. tecta* - *Sabal minor* Forest (CEGL007846, G4?)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Forest (CEGL007373, G4)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)

Alliances:

- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Forest Alliance (A.296)

SPATIAL CHARACTERISTICS

Spatial Summary: Generally a linear system, with narrow bands or dendritic patches interspersed with other systems.

Size: Occurs in narrow bands, from a few hundred feet to possibly as much as a mile in width, and often several to many miles long. Natural limitations on development and conversion often result in contiguous patches that may be hundreds or even thousands of acres. However, because of relatively easy accessibility compared to larger floodplains, patches of mature vegetation are often small.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)

Adjacent Ecological System Comments: May be associated with a variety of systems, especially upland hardwood forests and upland or wetland longleaf pine systems. Most naturally connect downstream to Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250) or to Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240).

DISTRIBUTION

Range: This system is found throughout the Atlantic Coastal Plain, from southeastern Virginia to southeastern Georgia.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232A:CC, 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723237#references

Description Author: M. Schafale and R. Evans

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1459 ATLANTIC COASTAL PLAIN CLAY-BASED CAROLINA BAY WETLAND (CES203.245)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Depression; Graminoid

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2459; ESLF 9128; ESP 1459

CONCEPT

Summary: This system consists of wetlands associated with ovoid, shallow depressions with nearly flat bottoms in parts of the Atlantic Coastal Plain. Often called Carolina bays, these areas are most numerous and extensive in South Carolina but are also present in adjacent Georgia and the Inner Coastal Plain of North Carolina. The depressions have mineral soils with clay hardpans that trap and retain water from a combination of rainfall and exposure of a high regional water table. Some examples are essentially permanently flooded, while others support water levels that vary substantially from year to year and over longer climatic cycles. Vegetation includes a series of primarily herbaceous and woodland associations. The wettest sites have open water and floating-leaved aquatic vegetation, or marsh vegetation of tall graminoids. Drier sites often have an open canopy of *Taxodium ascendens*, with a dense, often fairly species-rich herbaceous layer beneath. A few occurrences are shrubby, but none contain the dense shrub layers of characteristic pocosin species that occur in the bays with organic soils. Vegetational composition often varies substantially from year to year, in response to differences in water levels and drawdown times. Variation in hydroperiod is the most important dynamic, causing rapid major changes in the herbaceous vegetation. Unlike the steeper-sided solution depressions, where many different hydroperiods are present within a short distance and vegetation zones simply shift, the flat-bottomed Carolina bays experience drastic yearly changes in hydroperiod over most of their extent. Fire periodically spreads into the bays from adjacent uplands when conditions are dry, helps prevent invasion by less water-tolerant trees during dry periods, and interacts with flooding to affect vegetational composition. Where fire is removed, *Pinus taeda* often invades the bays. Fire may also be important in preventing buildup of organic matter on the soil surface.

Classification Comments: The distinction between the central concepts of this system and Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) is well marked, with basin morphology, geographic range, and prevailing communities differing. However, there is a common set of plant species, including some rare ones, that occur in both systems. Thus, there may be difficulty in defining the local boundary, and some atypical depressions may have to be placed in one system or the other based on the preponderance of evidence. This system is related to Northern Atlantic Coastal Plain Pond (CES203.518) which occurs farther north in the Coastal Plain, and to some of the flat-bottomed basin wetlands of Florida which occur outside the range of this system to the south.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- Northern Atlantic Coastal Plain Pond (CES203.518)
- Southeastern Coastal Plain Natural Lakeshore (CES203.044)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Related Concepts:

- Cypress Savanna (Schafale and Weakley 1990) Intersecting
- Depression Meadows (Bennett and Nelson 1991) Finer
- Non-Alluvial Swamp (Bennett and Nelson 1991) Finer
- Pond Cypress Pond (Bennett and Nelson 1991) Finer
- Pond Cypress Savanna (Bennett and Nelson 1991) Finer

DESCRIPTION

Environment: Occurs in Carolina bays with mineral soils and with seasonal to permanent standing water. Carolina bays are oriented, oval, shallow depressions with nearly flat bottoms, which range from North Carolina through South Carolina, and into adjacent Georgia. Most Carolina bays in the Outer Coastal Plain occur in sandy sediments and are filled with peat, while most Carolina bays in the Inner Coastal Plain occur in loamy sediments and have mineral soils with clay hardpans. These depressions hold water, due to a combination of rainfall and exposure of a high regional water table. Some are essentially permanently flooded. Others contain water well into the growing season in most years, but water levels vary substantially from year to year and over longer climatic cycles. Fire is an important natural influence in dry times.

Vegetation: Vegetation includes a series of primarily herbaceous and woodland associations. The wettest sites have open water and floating-leaved aquatic vegetation, or marsh vegetation of tall graminoids. Drier sites often have an open canopy of *Taxodium ascendens*, with a dense, often fairly species-rich herbaceous layer beneath. A large number of annual species are present. Showy, characteristic plants include species of *Symphitrichum*, *Boltonia*, *Xyris*, *Ludwigia*, and *Solidago* (Bennett and Nelson 1991). Some

sites have similar herbaceous vegetation without trees. A few occurrences are shrubby, but none contain the dense shrub layers of characteristic pocosin species that occur in the bays with organic soils. Vegetational composition often varies substantially from year to year, in response to differences in water levels and drawdown times. Seed banking plays an important role in component communities. The system is also important as amphibian breeding habitat and may support a distinctive aquatic invertebrate community.

Dynamics: Variation in hydroperiod is the most important dynamic, causing rapid major changes in the herbaceous vegetation. Unlike the steeper-sided solution depressions, where many different hydroperiods are present within a short distance and vegetation zones simply shift, the flat-bottomed Carolina bays experience drastic yearly changes in hydroperiod over most of their extent. Many plants persist in seed banks for periods of years when conditions are not suitable. Fire is also an important process, spreading into the bays from adjacent uplands when conditions are dry. Fire prevents invasion by less water-tolerant trees during dry periods, and interacts with flooding to affect vegetational composition. Where fire is removed, *Pinus taeda* often invades the bays. Fire may also be important in preventing buildup of organic matter on the soil surface.

MEMBERSHIP

Associations:

- *Taxodium ascendens* / *Cyrilla racemiflora* - *Zenobia pulverulenta* Woodland (CEGL003734, G2)
- *Taxodium ascendens* / *Panicum hemitomom* - *Polygala cymosa* Woodland (CEGL003733, G2G3)
- *Taxodium ascendens* / *Woodwardia virginica* Woodland (CEGL004441, G2?)

Alliances:

- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, occurring alone or in closely associated complexes.

Size: Most clay-based Carolina bays are \hat{A} ½ mile or less long. Some are isolated, while in places several bays may be close enough together to be considered part of the same occurrence.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Adjacent Ecological System Comments: Most occurrences were naturally associated with or embedded within Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) and Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281). Most are now surrounded by heavily altered systems.

DISTRIBUTION

Range: This system is found in the Inner to Middle Coastal Plain, from southern North Carolina, through South Carolina, and into adjacent Georgia. It is most numerous and extensive in South Carolina.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232C:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Bennett and Nelson 1991, Comer et al. 2003, EPA 2004, M. Elliott pers. comm., Sharitz 2003, Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723240#references

Description Author: M. Schafale and R. Evans

Version: 23 May 2008

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN NORTHERN BOG (CES203.893)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Acidic Water; Shrubland (Shrub-dominated); Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9189

CONCEPT

Summary: This system is comprised of dwarf-shrub sphagnum bogs dominated by *Chamaedaphne calyculata* occurring on Cape Cod (Massachusetts), Long Island (New York), and the Coastal Plain and near-coastal areas of northern New Jersey. North of the glacial border, this system typically occurs in isolated glacial kettleholes and in New Jersey in similar isolated basins, generally in regions of deep sands. The system is characterized by acidic, tannic water supporting a floating or grounded *Sphagnum* mat over which *Chamaedaphne calyculata*, *Gaylussacia dumosa*, and other dwarf-shrubs have rooted. Taller shrubs such as *Vaccinium corymbosum* may occur at the periphery of the bog, and *Decodon verticillatus* often forms a distinct zone adjacent to open water. Scattered individuals of *Pinus rigida*, *Pinus strobus*, or less often *Chamaecyparis thyoides* or *Picea mariana* may form a partial and stunted tree layer. Rooted hydromorphic plants such as *Nymphaea odorata* occur in open water.

Similar Ecological Systems:

- North-Central Interior and Appalachian Acidic Peatland (CES202.606)--occurs inland from the Coastal Plain.
- Northern Atlantic Coastal Plain Pitch Pine Lowland (CES203.374)--may be similar in some instances, but is restricted to the New Jersey Pine Barrens region southward to Maryland, where the bogs occur in a contiguous pine barrens landscape.

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* / *Chamaedaphne calyculata* Woodland (CEGL006321, G3G4)
- *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Dwarf-shrubland (CEGL006008, G5)
- *Myrica gale* - *Chamaedaphne calyculata* / *Carex exilis* Shrub Herbaceous Vegetation (CEGL006392, GNR)
- *Nuphar lutea ssp. advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Pinus rigida* / *Chamaedaphne calyculata* / *Sphagnum* spp. Woodland (CEGL006194, G3G5)
- *Sphagnum cuspidatum* Nonvascular Vegetation (CEGL004384, G2?)

Alliances:

- *Chamaecyparis thyoides* Saturated Woodland Alliance (A.575)
- *Chamaedaphne calyculata* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1557)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Sphagnum cuspidatum* Seasonally Flooded Nonvascular Alliance (A.1821)

DISTRIBUTION

Range: This system occurs on Cape Cod (Massachusetts), Long Island (New York), and possibly on the Coastal Plain of New Jersey north of the Pine Barrens region.

Divisions: 203:C

Nations: US

Subnations: MA, NJ, NY

Map Zones: 60:C, 65:C, 66:C

TNC Ecoregions: 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722787#references

Description Author: L. Sneddon, mod. S.C. Gawler

Version: 05 May 2008

Concept Author: L. Sneddon

Stakeholders: East
ClassifResp: East

1452 ATLANTIC COASTAL PLAIN PEATLAND POCOSIN AND CANEBRAKE (CES203.267)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Extensive Wet Flat

Non-Diagnostic Classifiers: Organic Peat (>40 cm)

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2452; ESLF 9121; ESP 1452

CONCEPT

Summary: This system includes wetlands of organic soils, occurring on broad flats or gentle basins, primarily on the outer terraces of the Atlantic Coastal Plain of the Carolinas and southeastern Virginia. Under current conditions, the vegetation is predominantly dense shrubland and very shrubby open woodlands. A characteristic suite of primarily evergreen shrubs, greenbriars, and *Pinus serotina* dominates. These shrubs include *Ilex glabra*, *Lyonia lucida*, *Lyonia mariana*, *Cyrilla racemiflora*, *Ilex coriacea*, and *Zenobia pulverulenta*, along with *Smilax laurifolia*. *Pinus serotina* is the characteristic tree, along with *Gordonia lasianthus*, *Magnolia virginiana*, and *Persea palustris*. Herbs are scarce and largely limited to small open patches. Under pre-European settlement fire regimes, stands of *Arundinaria gigantea ssp. tecta* (canebrakes) would have been more common and extensive. Soil saturation, sheet flow, and peat depth create a distinct zonation, with the highest stature woody vegetation on the edges and lowest in the center. Catastrophic fires are important in this system, naturally occurring at moderate frequency. Fires generally kill all above-ground vegetation in large patches, creating a shifting mosaic. Vegetation structure and biomass recover rapidly in most of the burned areas, primarily by sprouting.

Classification Comments: Related vegetation occurs in Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252), which may share many plant species but which has hydrology driven by seepage. This system ((CES203.267) has three recognizable landscape patterns within it: domed peatlands, peat-filled Carolina bays, and small swales. Vegetational and ecological differences between these have not been demonstrated but may warrant further investigation. There are differences in landscape pattern among them. The "small swale" manifestation of this exists in smaller patches.

Similar Ecological Systems:

- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)

Related Concepts:

- Bay Forest (Bennett and Nelson 1991) Finer
- Pocosin (Bennett and Nelson 1991) Finer
- Pond Pine Woodland (Bennett and Nelson 1991) Finer

DESCRIPTION

Environment: This system occurs on broad interfluvial flats and in small to large, very gentle basins and swales, largely on the outermost terraces of the Outer Coastal Plain. Some occurrences are in large to small peat-filled Carolina bays (Bennett and Nelson 1991). Smaller patches occur in shallow swales associated with relict coastal dune system or other irregular sandy surfaces. Soils range from wet mineral soils with mucky surface layers to peats several meters deep. Most of the largest occurrences are domed peatlands with the deepest peat associated with topographic highs in the center, but deep peats are also associated with buried drainage channels. Hydrology is driven by rainfall and sheet flow. The low hydraulic conductivity of the organic material limits interaction with the groundwater. The raised center of domed peatlands is fed only by rainwater and is therefore a true ombrotrophic bog. More peripheral portions are fed by sheet flow from the center, and so receive only acidic water low in nutrients. Occurrences in Carolina bays and other basins appear to be similarly isolated from surface or groundwater inflow from adjacent areas. Soils are normally saturated throughout the winter and well into the growing season, though the organic material may dry enough to burn during droughts. Standing water is limited to local depressions and disturbed areas. Soil saturation and peat depth, with its corresponding nutrient limitation, are the primary drivers of vegetational zonation as well as the distinction between this system and adjacent ones, but their effect may be modified by drainage patterns.

Vegetation: Vegetation is a series of distinctive associations known as pocosins. Under current conditions, the vegetation is predominantly dense shrubland and very shrubby open woodlands, ranging to nearly closed forests. Herbaceous associations are present only as small patches. Vegetation is typically zoned. The lowest stature vegetation occurs in the center of the system, with woodlands on the edges and in the smaller occurrences. The communities have in common a dense shrub layer of wetland shrubs tolerant of the organic soils, low nutrient conditions, and fire. *Ilex glabra*, *Lyonia lucida*, *Lyonia mariana*, *Cyrilla racemiflora*, *Ilex coriacea*, and *Zenobia pulverulenta* are characteristic and usually dominant in some combination, along with *Smilax laurifolia*. *Pinus serotina* is the characteristic tree, and it along with a set of evergreen hardwoods, including *Gordonia lasianthus*, *Magnolia virginiana*, and *Persea palustris*, are generally the only trees present. Under pre-European settlement fire regimes, stands of *Arundinaria gigantea ssp. tecta* (canebrakes) would have been more common and extensive. Component communities tend to be low

in plant species richness, and woody species richness exceeds herbaceous in most associations, with herbs being limited to small open patches. These areas would have formerly been more extensive under pre-European settlement fire regimes. The dominance of pond pine and evergreen shrubs as opposed to a canopy of deciduous hardwoods distinguishes this system from nonriverine swamp forests (CES203.304).

Dynamics: Fire is an important factor in these systems, with the pre-settlement fire regime probably being very different from that observed under current conditions. Natural fire-return intervals are not well known, but are probably on the order of a decade or two in the wettest areas. Peripheral areas may be subject to fire as often as the surrounding vegetation burns, which may naturally have been an average of 3 years. Fires are typically intense due to density and flammability of the vegetation, killing all above-ground vegetation. They are followed by vigorous root sprouting by shrubs and hardwoods, leading to recovery of standing biomass within a few years. *Pinus serotina* recovers by epicormic sprouting or by regeneration from seeds released from serotinous cones. Fires during droughts may ignite peat, forming holes that take longer to recover. Herb-dominated openings in pocosins may depend on peat fires, though this is not well documented. Natural fires occur in large patches, creating a shifting patch structure in the system that interacts with the vegetational zonation created by peat depth. The intensity of fire in these systems makes fire control difficult; prescribed burning is seldom done, and wild fires continue to be a significant influence. The larger peatlands are believed to have been created by paludification following natural blocking of drainage (Otte 1981). Peat buildup raises the water table in the center, creating the domed structure of the largest peatlands and allowing the wetland to spread out as wetness is increased at the edges. Most deeper pocosin peats contain fossil logs that indicate dominance by a swamp forest in past millennia. Otte (1981) noted that peat fires likely limit the height to which the peat can accumulate, in proportion to how high it can raise the local water table.

MEMBERSHIP

Associations:

- *Arundinaria gigantea ssp. tecta* Shrubland (CEGL003843, G1)
- *Chamaedaphne calyculata* - *Vaccinium macrocarpon* / *Carex striata* var. *striata* - *Woodwardia areolata* Dwarf-shrubland (CEGL004165, G1)
- *Chamaedaphne calyculata* / *Carex striata* var. *striata* - *Sarracenia (flava, purpurea, rubra ssp. rubra)* Dwarf-shrubland (CEGL004164, G1)
- *Chamaedaphne calyculata* / *Carex striata* var. *striata* - *Woodwardia virginica* Dwarf-shrubland (CEGL004163, G1G2)
- *Cyrilla racemiflora* - *Persea palustris* - *Magnolia virginiana* Shrubland (CEGL004449, G2)
- *Cyrilla racemiflora* - *Zenobia pulverulenta* Shrubland (CEGL003943, G2G3)
- *Gordonia lasianthus* - *Magnolia virginiana* - *Persea palustris* / *Sphagnum* spp. Forest (CEGL007044, G4)
- *Ilex glabra* - *Lyonia lucida* - *Zenobia pulverulenta* Shrubland (CEGL003944, G2)
- *Magnolia virginiana* - *Persea palustris* / *Lyonia lucida* Forest (CEGL007049, G3?)
- *Pinus serotina* - *Gordonia lasianthus* / *Lyonia lucida* Woodland (CEGL003671, G3)
- *Pinus serotina* / *Arundinaria gigantea ssp. tecta* Wooded Shrubland (CEGL003851, G1)
- *Pinus serotina* / *Arundinaria gigantea ssp. tecta* Woodland (CEGL004433, G1)
- *Pinus serotina* / *Cyrilla racemiflora* - *Lyonia lucida* - *Ilex glabra* Woodland (CEGL003670, G3)
- *Pinus serotina* / *Ilex glabra* / *Woodwardia virginica* Woodland (CEGL004652, G2?)
- *Pinus serotina* / *Lyonia lucida* - *Ilex glabra* - (*Cyrilla racemiflora*) Shrubland (CEGL003846, G3)
- *Pinus serotina* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Woodland (CEGL003669, G2?)
- *Pinus serotina* / *Zenobia pulverulenta* - *Cyrilla racemiflora* - *Lyonia lucida* Wooded Shrubland (CEGL004458, G2?)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Arundinaria gigantea* Saturated Wooded Shrubland Alliance (A.804)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Lyonia lucida* - *Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Zenobia pulverulenta* - *Cyrilla racemiflora* Saturated Wooded Shrubland Alliance (A.1055)
- *Zenobia pulverulenta* - *Lyonia lucida* - *Ilex (coriacea, glabra)* Saturated Shrubland Alliance (A.1054)

SPATIAL CHARACTERISTICS

Spatial Summary: This system occurs both as large patches in domed peatlands and large Carolina bays, and as complexes or isolated individual small patches in swales. Large patches tend to be homogeneous systems, while small patches often occur in mosaics with other systems. Large patches are usually zoned, with large patches of different associations.

Size: Occurs as both large patches, a few up to 10,000 acres or more, and also as small patches. Small patches are often in complexes, with many in close proximity.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)

- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) and Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536) may be the most adjacent systems in the southern part of the range, and in swale and Carolina bay occurrences. Nonriverine swamp systems are the most frequently associated in the northern half of the range.

DISTRIBUTION

Range: This systems is found primarily in North Carolina, extending into northern South Carolina and southeastern Virginia.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232I:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Bennett and Nelson 1991, Comer et al. 2003, Otte 1981, Richardson 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723219#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN SMALL BLACKWATER RIVER FLOODPLAIN FOREST (CES203.249)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Blackwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9318

CONCEPT

Summary: This system encompasses the floodplains of small to medium blackwater rivers, intermediate between the smaller streams and the largest rivers, in the Atlantic Coastal Plain. Blackwater rivers originate in the sandy areas of the Coastal Plain and have less well-developed depositional alluvial landforms. Soils are sandy or mucky, acidic, and infertile. Vegetation is a mosaic of cypress and gum swamps and bottomland hardwoods of a limited set of oaks and other species. In general vegetation is low in species richness.

Classification Comments: The distinction between brownwater and blackwater rivers is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater rivers may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Smaller streams have smaller watersheds, which tend to lead to more variable water levels and irregular flooding. Depositional landforms are small enough that they do not differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains. Large rivers have greater variation in water levels and have flood regimes that integrate the effects of very large watersheds. Depositional landforms are larger, and communities can be more segregated.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Stream and River (CES203.070)
- Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting

DESCRIPTION

Environment: Occurs in floodplains of medium to small Coastal Plain rivers that carry little mineral sediment (blackwater rivers). These rivers have their headwaters in sandy portions of the Coastal Plain. The water is usually strongly stained by tannins but has little suspended clay and is not turbid. Depositional landforms such as natural levees and backswamps are usually not well-developed, but point bars, ridge-and-swale systems (scrollwork), and sloughs caused by river meandering may be prominent. Soils are generally sandy in drier portions of the floodplain, mucky in wetter portions, and are very acidic. Spring-fed rivers may have calcareous water and non-acidic soils. Flooding ranges from semipermanent in the wettest areas to intermittent and short on the higher portions of the floodplain. The sandy soils may make some higher areas within the floodplain well-drained and dry when not flooded. The highest terraces may no longer flood at all and belong to a different system.

Vegetation: Vegetation consists largely of forests dominated by wetland trees species. Non-forested vegetation is present only on recently deposited bars and in oxbow lakes. The lowest, wettest areas have some combination of *Taxodium distichum*, *Taxodium ascendens*, and *Nyssa biflora*. *Nyssa aquatica* is generally scarce or absent. Higher portions of the floodplain have forests with combinations of a small set of wetland oaks and other species, including *Quercus laurifolia*, *Quercus lyrata*, *Quercus nigra*, *Liquidambar styraciflua*, *Pinus taeda*, *Magnolia virginiana*, and other species. Overall canopy species richness in a given site and over the system as a whole is lower than in comparable brownwater river systems. The distinctive levee assemblage of trees in brownwater river systems is largely lacking, though *Betula nigra*, *Salix nigra*, *Salix caroliniana*, and *Planera aquatica* may dominate banks and bars. The wettest forests are sometimes simple in structure, with an understory but little shrub or herb layer, but the other communities tend to have well-developed understories, shrub, and herb layers. Woody vines are usually prominent.

Dynamics: Flooding is the most important ecological factor in this system. Frequency and duration of flooding determine the occurrences of different associations and separate the system from other kinds of wetlands. Flooding brings nutrients and excludes non-flood-tolerant species. When flooded, the system may have a substantial aquatic faunal component, with high densities of invertebrates, and may play an important role in the life cycle of fish in the associated river. Unusually long or deep floods may stress vegetation or act as a disturbance for some species. Larger floods cause local disturbance by scouring and depositing sediment along channels, and occasionally causing channel shifts. However, the low gradient and binding of sediment by vegetation generally makes these processes much slower and less frequent than in river systems of most other regions. Except for primary successional communities such as bars, most forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is not believed to be important, due to low flammability of much of the vegetation, wetness, and abundance of natural firebreaks. However, some areas of bottomlands apparently were once canebrakes, which

presumably were maintained by periodic fire.

MEMBERSHIP

Associations:

- *Betula nigra* - *Quercus laurifolia* - *Taxodium (distichum, ascendens)* / *Crataegus aestivalis* Forest (CEGL004282, G2G3)
- *Eragrostis hypnoides* - *Micranthemum umbrosum* - *Lipocarpha micrantha* - (*Juncus repens*) Herbaceous Vegetation (CEGL004341, G2)
- *Fraxinus caroliniana* - *Sabal palmetto* - *Ulmus americana* / *Cephalanthus occidentalis* Forest (CEGL008592, G3?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Hydrocotyle ranunculoides* - (*Sacciolepis striata*) Floating Herbaceous Vegetation (CEGL004307, G3G4?)
- *Nuphar lutea ssp. sagittifolia* Herbaceous Vegetation (CEGL004328, G3?)
- *Panicum rigidulum* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004273, G2G3)
- *Pinus glabra* - *Quercus virginiana* - *Carya glabra* / *Carpinus caroliniana* / *Serenoa repens* Forest (CEGL004676, G2G3)
- *Pinus taeda* - *Quercus laurifolia* - *Chamaecyparis thyoides* - (*Quercus virginiana*) / *Vaccinium elliottii* Forest (CEGL007548, G2?)
- *Pinus taeda* - *Quercus laurifolia* / *Vaccinium elliottii* - *Arundinaria gigantea* Forest (CEGL004736, G3G4)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Quercus laurifolia* - *Quercus lyrata* / *Carpinus caroliniana* - *Persea palustris* / *Vaccinium elliottii* Forest (CEGL004737, G4?)
- *Quercus lyrata* - *Quercus laurifolia* - *Taxodium distichum* / *Saururus cernuus* Forest (CEGL004735, G3G5)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Taxodium ascendens* / *Fraxinus caroliniana* - *Cephalanthus occidentalis* - (*Planera aquatica*) Woodland (CEGL004289, G2G3)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa biflora* / *Fraxinus caroliniana* / *Lyonia lucida* Forest (CEGL004733, G3G4)

Alliances:

- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Eragrostis hypnoides* - *Lipocarpha micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Fraxinus caroliniana* Seasonally Flooded Forest Alliance (A.344)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system, often contiguous over thousands of acres. Could potentially be regarded as matrix.

Size: This system occurs in broad linear bodies that are usually at least a mile wide, sometimes several miles wide, and may be dozens of miles long. The natural limitations on development and conversion often result in contiguous patches of tens of thousands of acres in natural or semi-natural condition. Areas of vegetation in good condition are more likely to be hundreds of acres, bordered by young forests, clearcut areas, or pine plantations.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: Generally bordered by upland hardwood systems on bluffs, by longleaf pine or Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267). Riverine aquatic systems are closely associated.

DISTRIBUTION

Range: This system is potentially found throughout the Atlantic Coastal Plain north to about the James River in Virginia, but it is most abundant in North Carolina and South Carolina.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC

Map Zones: 55:C, 58:C, 60:P

USFS Ecomap Regions: 232A:CC, 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723236#references

Description Author: M. Schafale and R. Evans

Version: 23 Sep 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN SMALL BROWNWATER RIVER FLOODPLAIN FOREST (CES203.250)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9315

CONCEPT

Summary: This system encompasses the floodplains of small to medium brownwater rivers of the Atlantic Coastal Plain which are intermediate between the smaller streams and the largest rivers. Brownwater rivers originate in clayey areas and carry substantial amounts of mineral sediment, creating well-developed deposition alluvial landforms and fertile soils. Vegetation is a mosaic of cypress and gum swamps, oak-dominated bottomland hardwoods, and mixed levee forests, with only local non-forested communities. **Classification Comments:** The distinction between brownwater and blackwater rivers is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater rivers may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Smaller streams have smaller watersheds, which tend to lead to more variable water levels and irregular flooding. Depositional landforms are small enough that they don't differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains. Large rivers have greater variation in water levels and have flood regimes that integrate the effects of very large watersheds. Depositional landforms are larger, and communities can be more segregated.

This system as defined covers a large geographic range. There are some significant biogeographic differences across this range, leading to a large number of associations. However, more plant species are shared across the region in this system than in most other systems in the region.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Stream and River (CES203.070)
- Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)

DESCRIPTION

Environment: Occurs in floodplains of medium to small Coastal Plain rivers that carry significant mineral sediment (brownwater or redwater rivers). These rivers have their headwaters in the Piedmont, Blue Ridge, Interior Plateaus, or in portions of the Coastal Plain where fine-textured sediment predominates. The water generally carries substantial amounts of silt, clay, and sometimes sand. Depositional landforms such as point bars, natural levees, backswamps, and ridge-and-swale systems (scrollwork) are well-developed and form patterns of significant variation in flooding duration and nutrient input. Soil texture varies from sandy to clayey. Soils are generally fertile and not strongly acidic. Flooding ranges from semipermanent in the wettest areas to intermittent and short on the higher portions of the floodplain. The highest terraces may no longer flood at all and belong to a different system.

Vegetation: Vegetation consists largely of forests dominated by wetland tree species. Non-forested vegetation is present only on recently deposited bars and in oxbow lakes. Three distinct groups of associations can be recognized. The lowest, wettest areas have some combination of *Taxodium distichum* and *Nyssa aquatica* dominating. Natural levees and riverfronts have a diverse mixture of trees that typically includes *Platanus occidentalis*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Acer negundo*, and other species that benefit from the high light levels and heavy alluvial deposition of these sites. Moderate to high parts of the floodplain away from the levee are usually dominated by bottomland hardwoods, various mixtures of wetland oaks, including *Quercus laurifolia*, *Quercus michauxii*, *Quercus pagoda*, and sometimes a number of other oak species, along with *Liquidambar styraciflua*, but other species are sometimes codominant. The wettest forests are sometimes simple in structure, with an understory but little shrub or herb layer, but the other communities tend to have well-developed understories, shrub, and herb layers. Woody vines are usually prominent.

Dynamics: Flooding is the most important ecological factor in this system. Frequency and duration of flooding determines the occurrences of different associations and separates the system from other kinds of wetlands. Flooding brings nutrients and excludes non-flood-tolerant species. When flooded, the system has a substantial aquatic faunal component, with high densities of invertebrates, and may play an important role in the life cycle of fish in the associated river. Unusually long or deep floods may stress vegetation or act as a disturbance for some species. Larger floods cause local disturbance by scouring and depositing sediment along channels, and occasionally causing channel shifts. However, the low gradient and binding of sediment by vegetation generally makes these processes much slower and less frequent than in river systems of most other regions. Except for primary successional communities such as bars, most forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is not believed to be important, due to low flammability of much of the vegetation, wetness, and abundance of natural firebreaks. However, some areas of bottomlands apparently were once canebrakes, which presumably were maintained by periodic fire.

MEMBERSHIP

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

Associations:

- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Celtis laevigata* - *Fraxinus pennsylvanica* - *Acer negundo* - (*Juglans nigra*) / *Asimina triloba* / *Carex grayi* Forest (CEGL004740, G3G5)
- *Fagus grandifolia* - *Liquidambar styraciflua* - *Quercus (michauxii, nigra)* Forest (CEGL007866, G3?)
- *Fraxinus pennsylvanica* - *Quercus laurifolia* - *Quercus lyrata* - *Carya aquatica* Forest (CEGL004695, G3G4)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Carpinus caroliniana* / *Boehmeria cylindrica* Forest (CEGL007806, G4?)
- *Fraxinus pennsylvanica* / *Cornus foemina* / *Carex bromoides* Forest (CEGL007742, G3G4)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - *Liquidambar styraciflua* / *Glyceria septentrionalis* - *Hydrocotyle ranunculoides* Forest (CEGL007743, G3G4)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* / *Carpinus caroliniana ssp. caroliniana* / *Sabal minor* Forest (CEGL007544, G3G4)
- *Pinus glabra* - *Quercus virginiana* - *Carya glabra* / *Carpinus caroliniana* / *Serenoa repens* Forest (CEGL004676, G2G3)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Platanus occidentalis* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Lindera benzoin* - *Ilex decidua* / *Carex retroflexa* Forest (CEGL007730, G4?)
- *Populus deltoides* - *Salix caroliniana* Forest (CEGL007343, G4G5)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Populus deltoides* / *Acer negundo* / *Boehmeria cylindrica* Forest (CEGL007731, G3G5)
- *Quercus (phellos, palustris, michauxii)* - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus lyrata* - *Carya aquatica* Forest (CEGL007397, G4G5)
- *Quercus pagoda* - *Quercus nigra* / *Halesia diptera* - *Ilex decidua* / *Chasmanthium sessiliflorum* - *Dicliptera brachiata* Forest (CEGL007354, G4?)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor, Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix nigra* - *Fraxinus pennsylvanica* Forest (CEGL007734, G3G4)
- *Salix nigra* / (*Clethra alnifolia, Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera, Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* Temporarily Flooded Forest Alliance (A.431)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

SPATIAL CHARACTERISTICS

Spatial Summary: Linear system, often contiguous over thousands of acres. Could potentially be regarded as matrix.

Size: This system occurs in broad linear bodies that are usually several miles wide and may be hundreds of miles long. The natural limitations on development and conversion often result in contiguous patches of tens of thousands of acres in natural or semi-natural condition. Areas of vegetation in good condition are more likely to be hundreds to possibly thousands of acres, bordered by young forests, clearcut areas, or pine plantations.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Adjacent Ecological System Comments: Generally bordered by upland hardwood systems on bluffs or adjacent high terraces. Riverine aquatic systems are closely associated.

DISTRIBUTION

Range: This ranges throughout the Atlantic Coastal Plain from Georgia, north to about the James River in Virginia.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232A:CC, 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723235#references

Description Author: M. Schafale and R. Evans

Version: 23 Sep 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1468 ATLANTIC COASTAL PLAIN STREAMHEAD SEEPAGE SWAMP, POCOSIN, AND BAYGALL (CES203.252)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2468; ESLF 9137; ESP 1468

CONCEPT

Summary: This system encompasses seepage-fed wetlands in dissected Coastal Plain landscapes, from southeastern Virginia to northeastern Florida. Examples are usually associated with ravines or along headwater streams. Overbank flooding is a negligible influence. Fire may be an important force in some associations and not in others. Vegetation consists of open to closed forest of acid-tolerant wetland hardwoods or pine. Generally there is a dense shrub layer consisting primarily of species shared with Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267).

Classification Comments: This system is very heterogeneous in vegetation and in the role of fire, as well as extensive in geographic range. It might be appropriate to split it into two or even three systems. The streamhead pocosins of the Fall-line Sandhills region of North Carolina and northern South Carolina (EPA 65c), as well as related areas of Georgia, Florida, and southern Virginia are distinctive in being strongly fire-dominated, having pine as a major canopy dominant, and having a flora consisting largely of pocosin species. The closely related white-cedar- and cane-dominated associations would also fit into this system. A second set of associations ranging from South Carolina through the Gulf Coastal Plain has vegetation that suggests less influence by fire, including hardwood canopies and shrub layers that are primarily pocosin species but share some other wetland species. A third set, from a wider variety of topographic settings throughout the region, has hardwood canopies and shrub and herb layers with less peatland affinities, more closely related to floodplain communities. Their flora suggests a minor role for fire.

This system is distinguished from Atlantic Coastal Plain Sandhill Seep (CES203.253) by the predominance of woody vegetation indicative of less frequent fire. Where the two co-occur, it occurs in larger and topographically lower patches. This system is distinguished from Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267), which may have fairly similar flora, by having seepage-dominated hydrology and occurring in dissected landscapes.

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Piedmont Seepage Wetland (CES202.298)

Related Concepts:

- Baygall (FNAI 1990) Undetermined
- Streamhead pocosins (Fleming et al. 2005) Finer

DESCRIPTION

Environment: This system occurs in dissected Coastal Plain terrain on sites saturated by seepage of shallow groundwater. Seasonal to permanent saturation combined with fire of only moderate to low frequency and woody vegetation are the unifying characteristics of this system. A stream is often present draining the site, but it is small, and overbank flooding is a negligible influence. Most examples are in bottoms of ravines, but some are on sideslopes or flats at the base of slopes. Most examples are in sandy areas where rapid soil drainage in the surrounding landscape supplies the seepage. Soils within the system itself are generally mucky sands or clay, or deeper organic soils. This system occurs in landscapes that had frequent fire under natural conditions, but the wetness sometimes limited fire spread, creating a less frequent fire-return interval. Natural fire intensity varies among associations, with some readily producing intense fire when they burn, while others probably experience only low-intensity fires because of low flammability.

Vegetation: Vegetation is dominated by woody plants. An open to closed tree canopy is usually present and consists of a mixture of acidic-tolerant wetland trees such as *Nyssa biflora*, *Acer rubrum*, *Pinus serotina*, *Magnolia virginiana*, *Liriodendron tulipifera*, and *Chamaecyparis thyoides*. There is generally a dense shrub layer that is dominated by species shared with pocosins or baygalls, such as *Cyrilla racemiflora*, *Leucothoe axillaris*, *Lyonia lucida*, *Lyonia ligustrina*, *Clethra alnifolia*, *Cliftonia monophylla*, *Ilex glabra*, and *Arundinaria gigantea ssp. tecta*, but includes some species of other saturated wetlands, such as *Toxicodendron vernix*, *Morella caroliniensis*, *Persea palustris*, and *Viburnum nudum*. *Smilax laurifolia* may be abundant. The herb layer, if well-developed at all, generally consists of large wetland ferns, such as *Osmunda cinnamomea*, *Osmunda regalis var. spectabilis*, *Woodwardia virginica*, and *Woodwardia areolata*, with *Carex* spp. Some examples (canebrakes) are dominated by *Arundinaria gigantea ssp. tecta*.

Dynamics: Seepage is the most important ecological factor determining this system, but probably varies relatively little. Fire is the most important dynamic process in many examples. Fire frequency and intensity vary among associations, from moderately frequent intense fires to infrequent low-intensity fires.

MEMBERSHIP

Associations:

- *Arundinaria gigantea ssp. tecta* Shrubland (CEGL003843, G1)
- *Chamaecyparis thyoides* - (*Liriodendron tulipifera*) / *Lyonia lucida* Forest (CEGL007563, G2)
- *Cyrilla racemiflora* - *Cliftonia monophylla* Shrubland (CEGL003847, G4)
- *Gordonia lasianthus* / *Woodwardia virginica* - *Osmunda regalis var. spectabilis* Forest (CEGL004410, G2G3)
- *Ilex coriacea* - *Lyonia lucida* - *Smilax laurifolia* Shrubland (CEGL004666, G3G4)
- *Magnolia virginiana* - *Nyssa biflora* / *Carpinus caroliniana* / *Thelypteris noveboracensis* - *Athyrium filix-femina* Forest (CEGL004722, G3G4)
- *Nyssa biflora* - (*Acer rubrum*) / *Ilex opaca* / *Leucothoe axillaris* / *Carex atlantica ssp. capillacea* Forest (CEGL004427, G2G3)
- *Nyssa biflora* - *Acer rubrum var. trilobum* - *Liriodendron tulipifera* / *Ilex coriacea* - *Lyonia lucida* Forest (CEGL004645, G3)
- *Pinus serotina* - (*Liriodendron tulipifera*) / *Lyonia lucida* - *Clethra alnifolia* - *Ilex glabra* Woodland (CEGL004435, GNR)
- *Pinus serotina* / *Gordonia lasianthus* - *Persea palustris* Saturated Woodland (CEGL007996, G3?Q)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Pinus serotina* Saturated Woodland Alliance (A.581)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as large patches or as long narrow bodies following ravines, often in dendritic networks interfingering with upland systems.

Size: Most occurrences are in narrow bodies that may be very local or may be long and connected in dendritic networks. Networks may contain hundreds of contiguous acres but with few areas very far from an edge.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Sandhill Seep (CES203.253)

Adjacent Ecological System Comments: Most frequently associated with Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254) in the northern part of the range. Potentially associated with a variety of upland systems in the southern part of the range. Many examples will grade downstream to small or large floodplain systems.

DISTRIBUTION

Range: Primarily in the Fall-line Sandhills region of the Atlantic Coastal Plain; rarely in dissected terrain in the Outer Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 59:C, 60:C

USFS Ecomap Regions: 232C:CC, 232H:CC, 232I:CC, 232Ja:CCC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723233#references

Description Author: M. Schafale and R. Evans

Version: 04 Feb 2009

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

BOREAL DEPRESSIONAL BOG (CES103.871)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Depressional [Lakeshore]; Depressional [Sinkhole]; Organic Peat (>40 cm); Sphagnum spp.

Non-Diagnostic Classifiers: Boreal Fen; Boreal [Boreal Continental]; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9175

CONCEPT

Summary: These wetlands are found at higher temperate and boreal latitudes of Canada, extending south into the Pacific Maritime and Rocky Mountain Divisions. They form where the rate of sphagnum peat accumulation exceeds its decomposition, resulting in ombrotrophic and acidic peatlands in which the bog surface is raised above the water table. These peatlands are typically formed as lake-filled basins or depressions. The surface morphology of the peatland may be more-or-less level, domed, or eccentric. The vegetation is dominated by low ericaceous shrubs (including *Kalmia polifolia*, *Ledum groenlandicum*, *Betula glandulosa*, *Myrica gale*, *Empetrum nigrum*, and *Chamaedaphne calyculata*), and with patches of graminoids and bryophyte lawns. *Sphagnum* species, including *Sphagnum magellanicum*, *Sphagnum fuscum*, and *Sphagnum cuspidatum* may be characteristic. Conifer trees sometimes codominate, especially late in succession. Secondary bog pools may be present. While the raised portion defines these bogs, boreal fen systems may occupy some portion of the same basin, due to localized groundwater input. Soils are saturated throughout the growing season from groundwater upwelling.

Classification Comments: It's unclear where this system occurs, but for now it is assumed to not occur in Alaska. More information is needed to solidify its concept and distribution differences from the several peatland systems defined for Alaska.

Similar Ecological Systems:

- North Pacific Bog and Fen (CES204.063)

Related Concepts:

- Lodgepole Pine: 218 (Eyre 1980) Intersecting
- Non-forested bog (BWBSdk1/31) (Banner et al. 1993) Intersecting
- Non-forested bog (BWBSdk1/31) (MacKinnon et al. 1990) Intersecting
- Non-forested bog (BWBSdk2/31) (Banner et al. 1993) Intersecting
- Scheuchzeria - Peat-moss (ICHmc2/Wb12) (Banner et al. 1993) Intersecting
- Scheuchzeria - Peat-moss (ICHmk3/Wb12) (Steen and Coupe 1997) Intersecting
- Scheuchzeria - Peat-moss (SBSdw3/Wb12) (DeLong et al. 1993) Intersecting
- Scheuchzeria - Peat-moss (SBSdw3/Wb12) (Banner et al. 1993) Intersecting
- Scheuchzeria - Peat-moss (SBSmc2/Wb12) (DeLong et al. 1993) Intersecting
- Scheuchzeria - Peat-moss (SBSmc2/Wb12) (Banner et al. 1993) Intersecting
- Scheuchzeria - Peat-moss (SBSvk/Wb12) (DeLong 2003) Intersecting
- Shore sedge - Buckbean - Peat-moss (CWHws1/Wb13) (Banner et al. 1993) Intersecting
- Shore sedge - Buckbean - Peat-moss (CWHws2/Wb13) (Banner et al. 1993) Intersecting
- Shore sedge - Buckbean - Peat-moss (ICHmc1/Wb13) (Banner et al. 1993) Intersecting
- Shore sedge - Buckbean - Peat-moss (ICHmc1/Wb13) (Meidinger et al. 1988) Intersecting
- Shore sedge - Buckbean - Peat-moss (ICHvc/Wb13) (Banner et al. 1993) Intersecting
- Shore sedge - Buckbean - Peat-moss (ICHwk2/Wb13) (Steen and Coupe 1997) Intersecting
- Shore sedge - Buckbean - Peat-moss (SBSmk1/Wb13) (DeLong et al. 1993) Intersecting

MEMBERSHIP

Associations:

- *Carex exsiccata* Herbaceous Vegetation [Provisional] (CEGL003312, G2G3)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation (CEGL001831, G3)
- *Eriophorum chamissonis* / *Sphagnum* spp. Herbaceous Vegetation (CEGL003333, G4)
- *Kalmia microphylla* - *Ledum groenlandicum* / *Xerophyllum tenax* Shrubland (CEGL003359, G1)
- *Ledum groenlandicum* - *Kalmia microphylla* / *Sphagnum* spp. Shrubland (CEGL003414, G4)
- *Ledum groenlandicum* - *Myrica gale* / *Sphagnum* spp. Shrubland (CEGL003335, G2)
- *Malus fusca* Shrubland (CEGL003385, G3)
- *Pinus contorta* - (*Chamaecyparis nootkatensis*) / *Gaultheria shallon* Woodland (CEGL003205, G4G5)
- *Pinus contorta* / *Carex aquatilis* var. *dives* Woodland (CEGL003203, G3)
- *Pinus contorta* / *Empetrum nigrum* Woodland (CEGL003202, G5)
- *Pinus contorta* / *Trichophorum caespitosum* Woodland (CEGL003204, G4G5)

- *Pinus contorta* / *Vaccinium ovalifolium* Woodland (CEGL003206, G3)
- *Pinus contorta* var. *contorta* / *Ledum groenlandicum* / *Sphagnum* spp. Woodland (CEGL003337, G3)
- *Pinus monticola* / *Ledum groenlandicum* / *Sphagnum* spp. Woodland (CEGL003360, G1)
- *Rhynchospora alba* - (*Vaccinium oxycoccos*) / *Sphagnum tenellum* Herbaceous Vegetation [Provisional] (CEGL003338, G3)
- *Spiraea douglasii* / *Sphagnum* spp. Shrubland (CEGL003416, G3)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Ledum groenlandicum* / *Sphagnum* spp. Forest (CEGL003339, G3)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Sphagnum* spp. Forest (CEGL003417, G1)

Alliances:

- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Eriophorum* spp. Saturated Herbaceous Alliance (A.2624)
- *Ledum groenlandicum* Saturated Shrubland Alliance (A.2626)
- *Malus fusca* Seasonally Flooded Shrubland Alliance (A.2577)
- *Pinus contorta* Saturated Woodland Alliance (A.577)
- *Pinus monticola* Saturated Woodland Alliance (A.2593)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)
- *Tsuga heterophylla* Saturated Forest Alliance (A.203)

DISTRIBUTION

Range: This system is found at higher temperate and boreal latitudes of Canada, extending south into the Pacific Maritime and Rocky Mountain divisions, but not west of the coastal mountain ranges of Alaska, British Columbia and Washington.

Divisions: 103:C; 105:C; 204:P

Nations: CA, US

Subnations: AK?, BC, ID, MT, OR, WA?

Map Zones: 10:P

USFS Ecomap Regions: M242D:??, M333A:??, M333B:??

SOURCES

References: Banner et al. 1993, Bursik and Moseley 1995, Comer et al. 2003, DeLong 2003, DeLong et al. 1993, Green and Klinka 1994, MacKinnon et al. 1990, Meidinger et al. 1988, Steen and Coupe 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722804#references

Description Author: G. Kittel and P. Comer

Version: 21 Nov 2003

Concept Author: G. Kittel and P. Comer

Stakeholders: Canada, West

ClassifResp: West

BOREAL-LAURENTIAN BOG (CES103.581)

CLASSIFIERS

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Oligotrophic Water; Organic Peat (>40 cm); Dwarf-Shrub; Graminoid

Non-Diagnostic Classifiers: Saturated Soil; >180-day hydroperiod; Moderate (100-500 yrs) Persistence; Shrubland (Shrub-dominated); Depressional; Isolated Wetland [Partially Isolated]; Bryophyte; *Picea mariana* - *Larix laricina*

National Mapping Codes: ESLF 9354

CONCEPT

Summary: These raised peatlands are found at the higher temperate and near-boreal latitudes of the northeastern and north-central United States and adjacent Canada, where climate allows the rate of peat accumulation to exceed its decomposition, resulting in acidic peatlands. Most are ombrotrophic, at least over part of their area, though some examples may be weakly minerotrophic (poor fen), especially around the margins. The surface morphology of the bog may be more-or-less level, domed, or eccentric, but typically is over the water table. The vegetation is either semi-treed and dominated by low ericaceous shrubs (including *Kalmia angustifolia*, *Kalmia polifolia*, *Ledum groenlandicum*, and *Chamaedaphne calyculata*), with patches of conifers, graminoids and bryophyte lawns, or more open forest, where trees form a partial to moderate cover over parts of the peatland. In the latter situation, stunted *Picea mariana* and *Larix laricina* are the dominant trees, and dwarf-shrubs (*Chamaedaphne calyculata*, *Ledum groenlandicum*) and sedges are common in the understory.

Secondary bog pools (schlenke) may be present. While the raised portion defines these bogs, fen vegetation is often present along the perimeter.

This broadly defined peatland system can be subdivided based on the geomorphology of the peatland. A variety of approaches have been taken - in Maine, see Davis and Anderson (2001); in Canada, see National Wetlands Working Group (1988), and in Minnesota see Glaser (1992). In Canada, bog and fen peatlands each have their own set of forms. In Minnesota, Glaser treats bogs and fens together as part of larger patterned peatland complexes (mire complexes).

Classification Comments: This system corresponds to Glaser and Janssens' (1986) forested and "semi-forested continental bogs," but this system is somewhat broader in scope as it includes both the raised bogs and the flat bogs in the system type. Thus it extends further southward into the central Great Lakes and northeastern United States. Eastward, it extends roughly to the Acadian region, where it is replaced by Acadian Maritime Bog (CES201.580). Northwestward in northern Ontario, continental non-forested bogs are common (Glaser and Janssens 1986, fig. 2).

These bogs may overlap in common terminology with that of "muskeg," a flat bog peatland with scattered trees and a fairly dense shrub layer on hummocky peat. But muskeg could include poor fens and acid swamps as well as bogs.

Similar Ecological Systems:

- Acadian Maritime Bog (CES201.580)
- Boreal-Laurentian Conifer Acidic Swamp (CES103.724)
- North-Central Interior and Appalachian Acidic Peatland (CES202.606)

Related Concepts:

- Muskeg (Kost et al. 2007) Broader

MEMBERSHIP

Associations:

- *Alnus incana* ssp. *rugosa* - *Nemopanthus mucronatus* / *Sphagnum* spp. Shrubland (CEGL006158, G5)
- *Carex (oligosperma, exilis)* - *Chamaedaphne calyculata* Shrub Herbaceous Vegetation (CEGL006524, GNR)
- *Carex lasiocarpa* - *Rhynchospora alba* - *Scheuchzeria palustris* Herbaceous Vegetation (CEGL002501, G2?)
- *Carex limosa* - *Rhynchospora alba* / *Sphagnum pulchrum* - *Cladopodiella* sp. Herbaceous Vegetation (CEGL006522, GNR)
- *Carex oligosperma* - *Carex pauciflora* - *Eriophorum vaginatum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL005256, G4G5)
- *Chamaedaphne calyculata* - *Ledum groenlandicum* - *Kalmia polifolia* Bog Dwarf-shrubland (CEGL005278, G5)
- *Chamaedaphne calyculata* / *Carex oligosperma* / *Sphagnum* spp. Poor Fen Dwarf-shrubland (CEGL005277, G5)
- *Kalmia angustifolia* - *Chamaedaphne calyculata* - (*Picea mariana*) / *Cladina* spp. Dwarf-shrubland (CEGL006225, G5)
- *Picea mariana* - (*Larix laricina*) / *Ledum groenlandicum* / *Sphagnum* spp. Forest (CEGL005271, G5)
- *Picea mariana* / (*Vaccinium corymbosum*, *Gaylussacia baccata*) / *Sphagnum* sp. Woodland (CEGL006098, G3G5)
- *Picea mariana* / *Chamaedaphne calyculata* / *Sphagnum* spp. Dwarf-shrubland (CEGL005218, G4G5)
- *Picea mariana* / *Ledum groenlandicum* / *Carex trisperma* / *Sphagnum* spp. Forest (CEGL002485, G5)
- *Rhododendron canadense* - *Chamaedaphne calyculata* Dwarf-shrubland (CEGL006514, GNR)
- *Sphagnum (cuspidatum, torreyanum)* - *Vaccinium macrocarpon* Nonvascular Vegetation (CEGL006394, GNR)
- *Sphagnum rubellum* - *Vaccinium oxycoccus* Nonvascular Vegetation (CEGL006135, GNR)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Chamaedaphne calyculata* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1557)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Picea mariana* Saturated Forest Alliance (A.197)
- *Picea mariana* Saturated Woodland Alliance (A.585)
- *Sphagnum cuspidatum* - *Cladopodiella fluitans* Saturated Nonvascular Alliance (A.3006)

DISTRIBUTION

Range: This system occurs in central and eastern Canada, extending into northern New England and the Great Lakes region, particularly in northern Minnesota. Very few examples occur south of the Laurentian-Acadian Division.

Divisions: 103:C; 201:C; 202:C

Nations: CA, US

Subnations: MB, ME, MI, MN, NB, NS, NY, ON, PE?, QC, VT, WI

Map Zones: 41:C, 50:C, 51:C, 64:C, 66:C

USFS Ecomap Regions: 211Aa:CCC, 211Ab:CCC, 211Ba:CCC, 211Bb:CCC, 211Ca:CCC, 211Cb:CCC, 211Da:CCC, 211Dc:CCC, 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 221Ai:CCP, 221Ak:CCC, M211Aa:CCC, M211Ab:CCC, M211Ae:CCC, M211Af:CCC, M211Ba:CCP, M211Ca:CCP, M211Da:CCP, M211Dc:CCP

TNC Ecoregions: 47:C, 48:C, 61:C, 63:C

SOURCES

References: Comer et al. 2003, Damman and French 1987, Davis and Anderson 2001, Glaser 1992a, Glaser and Janssens 1986, Harris et al. 1996, National Wetlands Working Group 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723024#references

Description Author: S.C. Gawler and D. Faber-Langendoen

Version: 04 Mar 2004

Concept Author: S.C. Gawler and D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: East

BOREAL-LAURENTIAN CONIFER ACIDIC SWAMP (CES103.724)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9177

CONCEPT

Summary: This is a forested peatland where the trees form a partial to full cover over most or all of the peatland. Stunted or well-developed *Picea mariana* and *Larix laricina* are the dominant trees. The system is primarily weakly to moderately minerotrophic (poor fen), though some stands may approach ombrotrophic (bog) conditions. Heaths and sedges are common in the understory, but the dwarf-shrub layer is less well-developed than in open acidic peatlands, though it may be prominent in more open parts of the system. *Chamaedaphne calyculata* and *Ledum groenlandicum* are the dominant dwarf-shrubs.

Classification Comments: This forested system is most common in poorly drained basins, with some minerotrophic influence. It is sometimes referred to as "muskeg," a flat bog peatland with scattered trees and a fairly dense shrub layer on mounded or hummocky peat, though this system is not, technically, an ombrotrophic bog [see Boreal-Laurentian Bog (CES103.581)]. Muskeg is probably a complex of bogs and acidic swamps. Black spruce swamps in northeastern Vermont, northern New Hampshire, Adirondack region of New York, and Maine are included here. There appears to be no need for a true Boreal alkaline swamp system, but further review is needed. In Acadia and the Northern Appalachian regions, this system is mostly replaced by the sub-boreal Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574).

Similar Ecological Systems:

- Boreal Jack Pine-Black Spruce Forest (CES103.022)
- Boreal-Laurentian Bog (CES103.581)--only partly wooded, if at all.
- Boreal-Laurentian-Acadian Acidic Basin Fen (CES201.583)
- North-Central Interior and Appalachian Acidic Peatland (CES202.606)
- Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574)--characterized by *Picea rubens* rather than *Picea mariana*.

Related Concepts:

- Muskeg (Kost et al. 2007) Intersecting
- Poor Conifer Swamp (Kost et al. 2007) Intersecting

MEMBERSHIP

Associations:

- *Carex lasiocarpa* - *Carex oligosperma* / *Sphagnum* spp. Herbaceous Vegetation (CEGL002265, G3G4)
- *Chamaedaphne calyculata* / *Carex oligosperma* / *Sphagnum* spp. Poor Fen Dwarf-shrubland (CEGL005277, G5)
- *Larix laricina* / *Chamaedaphne calyculata* / *Carex lasiocarpa* Shrubland (CEGL005226, G4G5)
- *Picea mariana* - (*Larix laricina*) / *Ledum groenlandicum* / *Sphagnum* spp. Forest (CEGL005271, G5)
- *Picea mariana* / *Alnus incana* / *Sphagnum* spp. Forest (CEGL002452, G5)
- *Picea mariana* / *Ledum groenlandicum* / *Carex trisperma* / *Sphagnum* spp. Forest (CEGL002485, G5)
- *Pinus banksiana* - (*Picea mariana*) - Mixed Hardwoods / *Sphagnum* spp. Forest (CEGL005166, GNRQ)

Alliances:

- *Betula pumila* - (*Salix* spp.) Saturated Shrubland Alliance (A.1021)
- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Picea mariana* Saturated Forest Alliance (A.197)

DISTRIBUTION

Range: This system is found in central and eastern Canada, extending into northern New England and the Great Lakes region, particularly in northern Minnesota.

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: MB, ME, MI, MN, NB, NH, NS, NY, ON, PE?, VT, WI

Map Zones: 41:C, 50:C, 51:C, 64:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 47:C, 48:C, 63:C

SOURCES

References: Comer et al. 2003, Glaser and Janssens 1986, Harris et al. 1996

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722947#references

Description Author: D. Faber-Langendoen

Version: 11 Apr 2007

Concept Author: D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

BOREAL-LAURENTIAN-ACADIAN ACIDIC BASIN FEN (CES201.583)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Acidic Water; Depressional; Organic Peat (>40 cm); Broad-Leaved Shrub; Dwarf-Shrub; Graminoid; *Picea mariana* - *Larix laricina*

Non-Diagnostic Classifiers: Oligotrophic Water; Shallow (<15 cm) Water; Moderate (100-500 yrs) Persistence; Shrubland (Shrub-dominated); Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9353

CONCEPT

Summary: This peatland system ranges over a broad geographic area across the glaciated Northeast to the Great Lakes and upper Midwest. The fens have developed in open or closed, relatively shallow basins with nutrient-poor and acidic conditions. Many occur in association with larger lakes or streams. Some occur as kettlehole fens (usually called kettlehole "bogs") associated with eskers or other glacial deposits. The substrate is *Sphagnum*, and vegetation typically includes areas of graminoid dominance and dwarf-shrub dominance. *Chamaedaphne calyculata* is usually present and often dominant. Scattered stunted trees may be present. These fens often develop adjacent to open water and may form a floating mat over water.

Particularly distinctive are the ribbed bogs or fens in which a pattern of narrow (2- to 3-m wide), low (less than 1 m deep) ridges are oriented at right angles to the direction of the drainage (National Wetlands Working Group 1988). Wet pools or depressions occur between the ridges. These patterned peatlands may include string bog, Atlantic ribbed fen, or northern ribbed fen (National Wetlands Working Group 1988). They develop almost entirely north of 46 degrees N latitude in east-central Canada and the adjacent U.S. They are minerotrophic peatlands in which the vegetation has developed into a pattern of strings (raised, usually linear features) and flarks (wet depressions separating the strings). The substrate chemistry is entirely acidic in some peatlands; in others, where bedrock or other substrate influence creates circumneutral to calcareous conditions, peatland chemistry may be entirely calcareous or vary from acidic to calcareous within the same peatland. In acidic portions, typical bog heaths predominate mixed with sedges. *Dasiphora fruticosa* ssp. *floribunda* is diagnostic of circumneutral to calcareous conditions. These peatlands usually develop in open basins and flat plains, and the patterned portion may occupy only a fraction of the entire peatland. The edge of the basin may be shallow to deep peat over a sloping substrate, where seepage waters provide nutrients.

Classification Comments: Need to clarify the conceptual boundaries between this and the boreal fens in central and eastern Canada. This system is also similar to acidic peatlands in the southern edge of the glaciated region, which are treated under North-central Interior and Appalachian Acidic Peatland (CES202.606); those often tend to be smaller-patch landscape elements. USFS sections are used to differentiate the ranges.

Similar Ecological Systems:

- Boreal-Laurentian Conifer Acidic Swamp (CES103.724)
- North-Central Interior and Appalachian Acidic Peatland (CES202.606)

MEMBERSHIP

Associations:

- *Acer rubrum* / *Alnus incana* - *Ilex verticillata* / *Osmunda regalis* Woodland (CEGL006395, GNR)
- *Betula pumila* / *Chamaedaphne calyculata* / *Carex lasiocarpa* Shrubland (CEGL002494, G4G5)
- *Carex (oligosperma, exilis)* - *Chamaedaphne calyculata* Shrub Herbaceous Vegetation (CEGL006524, GNR)
- *Carex lasiocarpa* - *Carex oligosperma* / *Sphagnum* spp. Herbaceous Vegetation (CEGL002265, G3G4)
- *Carex limosa* - *Rhynchospora alba* / *Sphagnum pulchrum* - *Cladopodiella* sp. Herbaceous Vegetation (CEGL006522, GNR)
- *Chamaedaphne calyculata* / *Carex oligosperma* / *Sphagnum* spp. Poor Fen Dwarf-shrubland (CEGL005277, G5)
- *Larix laricina* / *Chamaedaphne calyculata* / *Carex lasiocarpa* Shrubland (CEGL005226, G4G5)
- *Myrica gale* - *Chamaedaphne calyculata* / *Carex (lasiocarpa, utriculata)* - *Utricularia* spp. Shrub Herbaceous Vegetation (CEGL006302, G4G5)
- *Myrica gale* - *Spiraea alba* - *Chamaedaphne calyculata* Shrubland (CEGL006512, GNR)
- *Thuja occidentalis* - *Abies balsamea* / *Ledum groenlandicum* / *Carex trisperma* Woodland (CEGL006507, GNR)
- *Vaccinium corymbosum* / *Sphagnum* spp. Shrubland (CEGL006190, G3G5)

Alliances:

- *Acer rubrum* Saturated Woodland Alliance (A.657)
- *Betula pumila* - (*Salix* spp.) Saturated Shrubland Alliance (A.1021)
- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Chamaedaphne calyculata* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1557)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)

- *Myrica gale* Saturated Shrubland Alliance (A.1022)
- *Thuja occidentalis* Saturated Woodland Alliance (A.583)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

DISTRIBUTION

Range: This system is found in New England and adjacent Canada west to the Great Lakes and Minnesota, north of the glacial boundary.

Divisions: 103:C; 201:C; 202:C

Nations: CA, US

Subnations: MA, ME, MI, MN, NB?, NH, NS?, NY, QC, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:P, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 211E:CC, 212Ha:CCP, 212Hb:CCP, 212Hc:CCP, 212Hd:CCP, 212He:CCP, 212Hf:CCC, 212Hg:CCC, 212Hh:CCP, 212Hi:CCP, 212Hj:CCP, 212Hk:CCC, 212Hl:CCP, 212Hm:CCP, 212J:CP, 212Lb:CCP, 212Ra:CCC, 212Rb:CCC, 212Rc:CCP, 212Rd:CCP, 212Re:CCC, 212S:CP, 212T:CP, 212X:CP, 212Ya:CCP, M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 47:C, 48:P, 61:C, 63:C

SOURCES

References: Comer et al. 2003, Damman and French 1987

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723023#references

Description Author: S.C. Gawler

Version: 05 Jun 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: East

CALIFORNIA CENTRAL VALLEY ALKALI SINK (CES206.954)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Playa Mosaic; Lowland [Lowland]; Mediterranean [Mediterranean Xeric-Oceanic]; Depressional

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9181

CONCEPT

Summary: These strongly saline/alkaline playa-like depressions are limited to the San Joaquin Valley and typically occur in a matrix of mixed salt desert scrub. These areas are seasonally to intermittently flooded. They are not flooded every year and respond to localized thunderstorms. Soils typically are fine-textured with an impermeable caliche layer or clay pan. Salt encrustations are often deposited on the surface as the playa dries. Species are salt-tolerant and halophytic species such as *Allenrolfea occidentalis*, *Suaeda moquinii*, *Distichlis spicata*, and *Salicornia rubra*. During exceptionally wet years, an increase in precipitation can dilute the salt concentration in the soils of some of examples of this system which may allow for less salt-tolerant species to occur.

Related Concepts:

- Wetlands (217) (Shiflet 1994) Broader. Many wetland systems are related to this very broad SRM type.

DISTRIBUTION

Range: Limited to the San Joaquin Valley.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 5:C

USFS Ecomap Regions: 262A:CC, M261C:??, M261F:??

TNC Ecoregions: 13:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722727#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 14 Dec 2004

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1449 CENTRAL ATLANTIC COASTAL PLAIN WET LONGLEAF PINE SAVANNA AND FLATWOODS (CES203.265)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Short Disturbance Interval; Needle-Leaved Tree

Non-Diagnostic Classifiers: Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2449; ESLF 9118; ESP 1449

CONCEPT

Summary: This system of wet *Pinus palustris*-dominated savannas and flatwoods ranges from southern Virginia to southern South Carolina. It was once one of the most extensive systems in the coastward part of its range. Examples and associations share the common features of wet, seasonally saturated, mineral soils and exposure to frequent fire. They occur on a wide range of soil textures, which is an important factor in distinguishing different associations. The vegetation is naturally dominated by *Pinus palustris* or, less frequently, other wetland pines. There is a dense ground cover of herbs and low shrubs; grasses dominate but there is often a large diversity of other herbs. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system is distinguished from Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536) because of substantial biogeographic differences. The break is placed at the northern range limit of *Aristida beyrichiana*, which is a keystone species in the communities where it occurs. This corresponds roughly with the geographic break in the upland longleaf pine systems. This system is distinguished from Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) because of its more upland character. However, the two systems have much in common, including frequent fire and the same primary dominant tree and many herbaceous species. They can also occur in the same landscapes. However, floristic differences are well marked, and no associations are shared. This system occurs primarily in the Outer Coastal Plain, but small patches may occur in atypical landforms in the Fall-line Sandhills. Sandhills examples are not treated as a separate system, as the upland longleaf pine systems are, because they are confined to sites that more resemble the Outer Coastal Plain. They are distinguished in the Sandhills from Atlantic Coastal Plain Sandhill Seep (CES203.253) by landform and apparent hydrology that is driven by seasonal high water table rather than seepage.

Similar Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)

DESCRIPTION

Environment: This system occurs on wet mineral soil sites, primarily in the Middle and Outer Coastal Plain but occasionally in the Fall-line Sandhills. Landforms include low areas in relict beach ridge systems and eolian sand deposits, and poorly drained clayey, loamy, or sandy flats. They occasionally occur on river terraces above current flood levels. Soils range from clayey to sandy, with no accumulated organic surface layer. Soils are seasonally saturated, due to high water table or poor soil drainage. The unifying feature of this system is wet mineral soils associated with a high frequency of fire. Variation in soil texture appears to be a primary driver of differences between associations within the system, with biogeography also important.

Vegetation: Vegetation is a set of associations that are naturally woodlands or savannas dominated by *Pinus palustris* or, less frequently, by *Pinus serotina*, *Pinus elliottii*, or some combination. Hardwoods are present in any abundance only in examples altered by fire suppression. The ground cover is a dense combination of herbs and low shrubs. A variety of ericaceous shrubs and hollies is common, with density determined by fire history. Grasses naturally dominate the ground cover. *Aristida stricta* often dominates within its range, but *Ctenium aromaticum*, *Sporobolus pinetorum*, *Sporobolus teretifolius*, or other grasses may dominate. A great diversity of other herbs is often present, including composites, sedges, insectivorous plants, and variety of showy forbs. Communities in this system are often very high in species richness, with some of the highest values measured anywhere at the 1/10-hectare, 1/100-hectare, and 1-square-meter levels. However, some associations are naturally low to moderate in species richness.

Dynamics: Frequent fire is the predominant natural force in this system and is crucial in determining its structure and even its identity. Communities naturally burned every few years, many averaging as often as every 3 years. Fires are naturally low to moderate in intensity. They burn above-ground parts of herbs and shrubs but have little effect on the fire-tolerant trees. Vegetation recovers very quickly from fire, with live herbaceous biomass often restored in just a few weeks. Many plants have their flowering triggered by burning. In the absence of fire, the shrubs increase and hardwoods may invade the system. Herb layer density and diversity decline after just a couple of years without fire. In time, unburned examples will become nearly indistinguishable from the drier associations of Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267).

Canopies are believed to naturally be many-aged, consisting of a fine mosaic of small even-aged groves driven by gap-phase regeneration. Longleaf pine is shade-intolerant and slow to reach reproductive age but is very long-lived. Most plants in this system

appear to be conservative, living a long time and only rarely sexually reproducing or colonizing new sites. Similar conservatism is shown by some of the vertebrates, such as *Picoides borealis*. Different dynamics occur in insect populations, whose individuals are not resilient to fire. Insect populations must recolonize burned areas from nearby unburned patches.

MEMBERSHIP

Associations:

- *Hypericum reductum* / *Aristida stricta* Dwarf-shrubland (CEGL003954, G1G2Q)
- *Pinus palustris* - (*Pinus serotina*) / *Ilex glabra* - *Gaylussacia frondosa* - (*Kalmia carolina*) Woodland (CEGL003647, G2)
- *Pinus palustris* - *Pinus (serotina, taeda)* / *Sporobolus curtissii* - *Muhlenbergia expansa* Woodland (CEGL004085, G1)
- *Pinus palustris* - *Pinus serotina* / *Aristida palustris* - *Sarracenia flava* Woodland (CEGL004498, G1)
- *Pinus palustris* - *Pinus serotina* / *Ctenium aromaticum* - *Muhlenbergia expansa* - *Carphephorus odoratissimus* Woodland (CEGL003658, G3)
- *Pinus palustris* - *Pinus serotina* / *Ctenium aromaticum* - *Muhlenbergia expansa* - *Rhynchospora latifolia* Woodland (CEGL003660, G1)
- *Pinus palustris* - *Pinus serotina* / *Ctenium aromaticum* - *Scleria pauciflora* - *Sarracenia flava* Woodland (CEGL004499, G1)
- *Pinus palustris* - *Pinus serotina* / *Magnolia virginiana* / *Sporobolus teretifolius* - *Carex striata* Woodland (CEGL004500, G1)
- *Pinus palustris* - *Pinus serotina* / *Pilea tenuifolia* - *Aristida stricta* Woodland (CEGL003661, G1)
- *Pinus palustris* - *Pinus serotina* / *Sporobolus pinetorum* - (*Aristida stricta*) - *Eryngium integrifolium* Woodland (CEGL004501, G2)
- *Pinus palustris* - *Pinus serotina* / *Sporobolus pinetorum* - *Ctenium aromaticum* - *Eriocaulon decangulare* var. *decangulare* Woodland (CEGL004502, G1)
- *Pinus palustris* - *Pinus taeda* - *Pinus serotina* / *Quercus marilandica* / (*Quercus pumila*) / *Aristida stricta* Woodland (CEGL003664, G1)
- *Pinus palustris* / *Arundinaria gigantea* ssp. *tecta* - *Liquidambar styraciflua* / *Andropogon glomeratus* - *Sarracenia minor* Woodland (CEGL004495, G1)
- *Pinus palustris* / *Clethra alnifolia* - *Gaylussacia frondosa* - *Quercus pumila* / *Schizachyrium scoparium* Woodland (CEGL004496, G1)
- *Pinus palustris* / *Ilex glabra* / *Aristida stricta* Woodland (CEGL003648, G3)
- *Pinus palustris* / *Leiophyllum buxifolium* / *Aristida stricta* Woodland (CEGL003649, G2?)
- *Pinus palustris* / *Schizachyrium scoparium* - *Muhlenbergia expansa* - *Arnoglossum ovatum* Woodland (CEGL004086, G1?)
- *Pinus palustris* / *Serenoa repens* - *Ilex glabra* Woodland (CEGL003653, G2G3)

Alliances:

- *Hypericum reductum* Temporarily Flooded Dwarf-shrubland Alliance (A.1088)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)

SPATIAL CHARACTERISTICS

Spatial Summary: This system naturally occurs as large to small patches, sometimes part of extensive matrix mosaics with other systems. It was naturally one of the most abundant systems on the lower terraces of the Outer Coastal Plain.

Size: Ranges from large to small patch, which may form a matrix mosaic with other systems. Many remaining examples are naturally bounded islands.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)
- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

Adjacent Ecological System Comments: Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) and Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267) are the most frequently associated systems. Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) patches may be embedded, and Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249), Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250), and Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242) may adjoin.

DISTRIBUTION

Range: This system ranges from southern Virginia to southern South Carolina. To the south, the equivalent system is Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536), the range of which includes Georgia.

Divisions: 203:C

Nations: US

Subnations: NC, SC, VA

Map Zones: 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723221#references

Description Author: M. Schafale and R. Evans

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Lowland]; Depressional [Pond]; Depressional [Sinkhole]; Muck; Mineral: W/ A-Horizon >10 cm

Non-Diagnostic Classifiers: Alkaline Water; Circumneutral Water; Forest and Woodland (Treed); Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9160

CONCEPT

Summary: This system of ponds and wetlands is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions, and ranges north from the southern and central Appalachians to the northern Piedmont regions. Stands occur in basins of sinkholes or other isolated depressions on uplands. Soils are very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry. Water depth may vary greatly on a seasonal basis and may be a meter deep or more in the winter. Some examples become dry in the summer. Soils may be deep (100 cm or more), consisting of peat or muck, with parent material of peat, muck or alluvium. Ponds vary from open water to herb-, shrub-, or tree-dominated. Tree-dominated examples typically contain *Quercus* species, *Platanus occidentalis*, *Fraxinus pennsylvanica*, *Acer saccharinum*, or *Nyssa* species, or a combination of these. In addition, *Liquidambar styraciflua* may be present in southern examples. *Cephalanthus occidentalis* is a typical shrub component. The herbaceous layer is widely variable depending on geography.

Classification Comments: Many of these ponds have their geologic origin as a more-or-less complete karst collapse feature. Some of them may display this geologic origin in a more explicit manner, with definite walls and exposed limestone or dolomite at the surface ("sinkholes"). Others are more subtle, and exist as more gentle depressions, with no exposed surface geology ("depression ponds"). This includes the "sagponds" of northwestern Georgia and adjacent Alabama. Rare examples in the Ridge and Valley of Georgia (Coosa Valley) are included here. These occur on limestones or dolomites of the Chickamauga Group. Matt Elliott (pers. comm.): "I would put Ridge and Valley sagponds in with Interior Highlands ponds rather than Piedmont, as they are essentially karst features. R&V sagponds are generally pretty rare but are common in parts of Bartow County, Georgia, and a few other places. The shallower ones are dominated by willow oak, the deeper ones *Nyssa biflora*. On the Cumberland Plateau, the ones I have seen usually have sweetgum and *Nyssa sylvatica*, but I think willow oak and possibly *Nyssa biflora* might occur in some of the deeper ones. A lot of the plateau ponds seem more like swales than deep ponds, but they still may be related to underlying karst features. The Ridge and Valley sagponds may be somewhat different from those on the plateau - often deeper and with even more Coastal Plain elements." It also includes sinkhole ponds of northern New Jersey (K. Strakosch-Walz pers. comm.) and ponds of the Ridge and Valley in Pennsylvania. These are very similar to Shenandoah sinkhole ponds of Virginia and are in Maryland as well (L. Sneddon pers. comm.).

Similar Ecological Systems:

- Piedmont Upland Depression Swamp (CES202.336)

Related Concepts:

- Depression Swamp (Evans 1991) Finer
- Sagponds (Wharton 1978) Finer
- Sinkhole/Depression Marsh (Evans 1991) Finer
- Sinkhole/Depression Pond (Evans 1991) Finer

DESCRIPTION

Environment: Examples of this system occur in basins of sinkholes or other isolated depressions on uplands. Soils are very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry. Water depth may vary greatly on a seasonal basis, and may be a meter deep or more in the winter. Some examples become dry in the summer. Soils may be deep (100 cm or more), consisting of peat or muck, with parent material of peat, muck or alluvium.

Vegetation: Ponds vary from open water to herb-, shrub-, or tree-dominated types. Tree-dominated examples typically contain *Quercus* species, *Platanus occidentalis*, *Fraxinus pennsylvanica*, *Acer saccharinum*, or *Nyssa* species, or a combination of these. In addition, *Liquidambar styraciflua* may be present in southern examples. *Cephalanthus occidentalis* is a typical shrub component. The herbaceous layer is widely variable depending on geography.

Dynamics: Water depth may vary greatly on a seasonal basis, and may be a meter deep or more in the winter. Some examples become dry in the summer.

MEMBERSHIP

Associations:

- *Acer (rubrum, saccharinum) - Fraxinus pennsylvanica / Ilex verticillata / Osmunda regalis* Forest (CEGL006630, GNR)
- *Boltonia asteroides var. asteroides - Symphyotrichum racemosum - Mentha arvensis* Herbaceous Vegetation (CEGL006900, G1G2)

- *Brasenia schreberi* Herbaceous Vegetation (CEGL004527, G4?)
- *Carex aquatilis* - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL008542, G1?)
- *Carex barrattii* Herbaceous Vegetation (CEGL007857, G1)
- *Carex comosa* - *Carex decomposita* - *Dulichium arundinaceum* - *Lycopus rubellus* Herbaceous Vegetation (CEGL002413, G3G4)
- *Cephalanthus occidentalis* - (*Salix nigra*, *Quercus lyrata*) Karst Depression Shrubland (CEGL008439, G1Q)
- *Cephalanthus occidentalis* / *Dulichium arundinaceum* Shrubland (CEGL007854, G1)
- *Cephalanthus occidentalis* / *Hibiscus moscheutos* ssp. *moscheutos* Depression Pond Shrubland (CEGL004742, G3?)
- *Cephalanthus occidentalis* / *Torreyochloa pallida* Shrubland (CEGL007855, G1?)
- *Ceratophyllum demersum* - *Stuckenia pectinata* Herbaceous Vegetation (CEGL004528, G4G5)
- *Dasiphora fruticosa* ssp. *floribunda* / *Rhynchospora capillacea* - *Scleria verticillata* Shrub Herbaceous Vegetation (CEGL006356, G1)
- *Eleocharis microcarpa* - *Juncus repens* - *Rhynchospora corniculata* - (*Mecardonia acuminata*, *Proserpinaca* spp.) Herbaceous Vegetation (CEGL004748, G2G3)
- *Fraxinus pennsylvanica* - *Acer saccharinum* - *Quercus bicolor* / *Boehmeria cylindrica* Forest (CEGL006634, GNR)
- *Leersia oryzoides* - *Boehmeria cylindrica* - *Ranunculus flabellaris* Herbaceous Vegetation (CEGL006903, GNR)
- *Liquidambar styraciflua* - *Acer rubrum* / *Carex* spp. - *Sphagnum* spp. Forest (CEGL007388, G2G3Q)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nyssa aquatica* / *Cephalanthus occidentalis* Pond Forest (CEGL004712, G1?)
- *Nyssa biflora* / *Cephalanthus occidentalis* - *Lyonia lucida* Sagpond Forest (CEGL004116, G1G2)
- *Orontium aquaticum* - *Schoenoplectus subterminalis* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL007859, G1)
- *Panicum hemitomon* - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL004126, G1)
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044, GNA)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Ulmus americana* / *Cornus sericea* Forest (CEGL006901, G2G3)
- *Pontederia cordata* - *Sagittaria graminea* - *Sagittaria latifolia* Semipermanently Flooded Herbaceous Vegetation (CEGL004986, G1G2Q)
- *Quercus alba* - *Nyssa sylvatica* Sandstone Ridgetop Depression Forest (CEGL008440, G2Q)
- *Quercus alba* - *Nyssa sylvatica* Seasonally Flooded Forest [Provisional] (CEGL008473, GNR)
- *Quercus bicolor* - *Fraxinus pennsylvanica* / *Carex* spp. Forest (CEGL004422, G1G2)
- *Quercus lyrata* - *Quercus (palustris, phellos)* - *Liquidambar styraciflua* - (*Populus heterophylla*) Forest (CEGL004421, G2G3)
- *Quercus lyrata* / *Betula nigra* / *Pleopeltis polypodioides* ssp. *michauxiana* Forest (CEGL004975, G1)
- *Quercus lyrata* Pond Forest (CEGL004642, G1G3)
- *Quercus palustris* - (*Quercus bicolor*) / *Carex crinita* / *Sphagnum* spp. Forest (CEGL002406, G3?)
- *Quercus palustris* - *Quercus bicolor* - (*Liquidambar styraciflua*) Mixed Hardwood Forest (CEGL002432, G3G4)
- *Quercus palustris* / *Panicum rigidulum* var. *rigidulum* - *Panicum verrucosum* - *Eleocharis acicularis* Herbaceous Vegetation (CEGL007858, G1)
- *Quercus palustris* Pond Forest (CEGL007809, G2)
- *Quercus phellos* - *Liquidambar styraciflua* / *Chasmanthium laxum* Cumberland / Southern Ridge and Valley Forest (CEGL008441, G3)
- *Quercus phellos* Seasonally Flooded Ozark Pond Forest [Provisional] (CEGL007402, GNR)
- *Saccharum baldwinii* - *Calamagrostis coarctata* - *Panicum rigidulum* - *Rhynchospora capitellata* Herbaceous Vegetation (CEGL004750, G2G3)
- *Salix nigra* - *Acer (rubrum, saccharinum)* / *Alnus serrulata* - *Cephalanthus occidentalis* Forest (CEGL007703, G5)
- *Scirpus cyperinus* - *Dulichium arundinaceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL004134, G1Q)
- *Scirpus cyperinus* - *Panicum rigidulum* - *Rhynchospora corniculata* - (*Dulichium arundinaceum*) Herbaceous Vegetation (CEGL004719, G2G3)
- *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510, G2G3)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Vaccinium oxycoccos* - (*Vaccinium macrocarpon*) / *Rhynchospora alba* - *Drosera rotundifolia* / *Sphagnum* spp. Dwarf-shrubland (CEGL007856, G2)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Boltonia asteroides* Seasonally Flooded Herbaceous Alliance (A.3027)
- *Brasenia schreberi* Permanently Flooded Herbaceous Alliance (A.1742)
- *Carex (flava, hystericina, interior, sterilis)* Saturated Shrub Herbaceous Alliance (A.1561)
- *Carex barrattii* Seasonally Flooded Herbaceous Alliance (A.1930)
- *Carex comosa* - (*Carex decomposita*) Semipermanently Flooded Herbaceous Alliance (A.1439)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)

- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Juncus repens* - *Eleocharis microcarpa* Seasonally Flooded Herbaceous Alliance (A.1376)
- *Leersia oryzoides* - *Glyceria striata* Seasonally Flooded Herbaceous Alliance (A.1399)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Orontium aquaticum* - (*Schoenoplectus subterminalis*) Permanently Flooded Herbaceous Alliance (A.1931)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Quercus alba* - (*Nyssa sylvatica*) Seasonally Flooded Forest Alliance (A.1996)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Sparganium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Vaccinium macrocarpon* Saturated Dwarf-shrubland Alliance (A.1094)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Eastern Highland Rim Prairie and Barrens (CES202.354)

DISTRIBUTION

Range: This system is found from the Ozark and Ouachita mountains east to the southern and central Appalachians and the northern Piedmont regions (?), including the unglaciated Interior Low Plateau and Ridge and Valley. It ranges from Missouri, West Virginia, Pennsylvania, and Delaware south to Arkansas, Alabama and Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, AR, DE, GA, IL, IN, KY, MD, MO, NC, NJ, OH, PA, TN, VA, WV

Map Zones: 44:C, 47:C, 48:C, 49:C, 53:C, 57:C, 61:C, 62:P, 64:P

USFS Ecomap Regions: 221F:CC, 221H:CC, 221J:CC, 223A:CC, 223D:CC, 223E:CC, 223F:CC, 231C:CC, 231D:CC, M221A:CC, M223A:CC, M231A:CC

TNC Ecoregions: 38:C, 39:C, 44:C, 50:C, 59:C, 61:C

SOURCES

References: Comer et al. 2003, M. Elliott pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722687#references

Description Author: M. Pyne, S. Menard, D. Faber-Langendoen

Version: 26 Jan 2006

Concept Author: M. Pyne, S. Menard, D. Faber-Langendoen

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

COLUMBIA BASIN FOOTHILL RIPARIAN WOODLAND AND SHRUBLAND (CES304.768)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence; Montane [Lower Montane]; Lowland [Foothill]; Riverine / Alluvial

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Unconsolidated; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Broad-Leaved Deciduous Shrub

National Mapping Codes: ESLF 9170

CONCEPT

Summary: This is a low-elevation riparian system found on the periphery of the mountains surrounding the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations. This is the riparian system associated with all streams at and below lower treeline, including permanent, intermittent and ephemeral streams with woody riparian vegetation. These forests and woodlands require flooding and some gravels for reestablishment. They are found in low-elevation canyons and draws, on floodplains, or in steep-sided canyons, or narrow V-shaped valleys with rocky substrates. Sites are subject to temporary flooding during spring runoff. Underlying gravels may keep the water table just below the ground surface and are favored substrates for cottonwood. Large bottomlands may have large occurrences, but most have been cut over or cleared for agriculture. Rafted ice and logs in freshets may cause considerable damage to tree boles. Beavers crop younger cottonwood and willows and frequently dam side channels occurring in these stands. In steep-sided canyons, streams typically have perennial flow on mid to high gradients. Important and diagnostic trees include *Populus balsamifera ssp. trichocarpa*, *Alnus rhombifolia*, *Populus tremuloides*, *Celtis laevigata var. reticulata*, *Betula occidentalis*, or *Pinus ponderosa*. Important shrubs include *Crataegus douglasii*, *Philadelphus lewisii*, *Cornus sericea*, *Salix lucida ssp. lasiandra*, *Salix eriocephala*, *Rosa nutkana*, *Rosa woodsii*, *Amelanchier alnifolia*, *Prunus virginiana*, and *Symphoricarpos albus*. Grazing is a major influence in altering structure, composition, and function of the community.

Similar Ecological Systems:

- Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

Related Concepts:

- AC Trembling Aspen Copse (Ecosystems Working Group 1998) Broader
- Black Cottonwood - Willow: 222 (Eyre 1980) Intersecting
- Cottonwood - Willow: 235 (Eyre 1980) Broader
- CR Black Cottonwood Riparian Habitat Class (Ecosystems Working Group 1998) Broader

MEMBERSHIP

Associations:

- (*Populus tremuloides*) / *Crataegus douglasii* / *Heracleum maximum* Shrubland (CEGL001094, G1)
- (*Populus tremuloides*) / *Crataegus douglasii* / *Symphoricarpos albus* Shrubland (CEGL001096, G3)
- *Alnus rhombifolia* - *Abies grandis* Forest (CEGL000630, G2?)
- *Alnus rhombifolia* / *Amelanchier alnifolia* Forest (CEGL000631, G3)
- *Alnus rhombifolia* / *Betula occidentalis* Forest (CEGL000632, G1)
- *Alnus rhombifolia* / *Celtis laevigata var. reticulata* Forest (CEGL000633, G1?)
- *Alnus rhombifolia* / *Philadelphus lewisii* Forest (CEGL000634, G1)
- *Alnus rhombifolia* / *Prunus virginiana* Forest (CEGL000635, G1?)
- *Alnus rhombifolia* / *Rosa woodsii* Forest (CEGL000636, G1)
- *Alnus rhombifolia* / *Sambucus caerulea* Forest (CEGL000637, G2?)
- *Alnus rhombifolia* Forest [Placeholder] (CEGL000629, G2Q)
- *Alnus rubra* / *Adiantum pedatum* Forest (CEGL002600, G1)
- *Alnus rubra* / *Athyrium filix-femina* - *Asarum caudatum* Forest (CEGL000008, G1)
- *Alnus rubra* / *Physocarpus capitatus* - *Philadelphus lewisii* Forest (CEGL000002, G1)
- *Alnus viridis ssp. sinuata* / Mesic Forbs Shrubland (CEGL002633, G3G4)
- *Alnus viridis ssp. sinuata* / *Rubus (lasiococcus, parviflorus)* Shrubland (CEGL002602, G4)
- *Betula occidentalis* - *Celtis laevigata var. reticulata* Shrubland (CEGL003450, G2)
- *Betula occidentalis* / *Crataegus douglasii* Shrubland (CEGL001081, G1)
- *Betula occidentalis* / *Philadelphus lewisii* - *Symphoricarpos albus* Shrubland (CEGL000489, G1G2)
- *Betula occidentalis* / *Philadelphus lewisii* Shrubland (CEGL002668, G2)
- *Betula occidentalis* Shrubland (CEGL001080, G3G4)
- *Celtis laevigata var. reticulata* / *Philadelphus lewisii* Woodland (CEGL000792, G1)
- *Celtis laevigata var. reticulata* / *Pseudoroegneria spicata* Woodland (CEGL001085, G2G3)

- *Celtis laevigata* var. *reticulata* / *Toxicodendron rydbergii* Woodland (CEGL003451, G2)
- *Cornus sericea* / *Heracleum maximum* Shrubland (CEGL001167, G3)
- *Crataegus douglasii* / *Rosa woodsii* Shrubland (CEGL001095, G2)
- *Philadelphus lewisii* / *Symphoricarpos albus* Shrubland (CEGL000875, G1G2)
- *Philadelphus lewisii* Intermittently Flooded Shrubland (CEGL001170, G2)
- *Pinus monticola* / *Deschampsia caespitosa* Forest (CEGL003441, G1)
- *Pinus ponderosa* / *Symphoricarpos albus* Temporarily Flooded Woodland (CEGL000866, G2)
- *Populus balsamifera* (ssp. *trichocarpa*, ssp. *balsamifera*) / *Symphoricarpos* (*albus*, *oreophilus*, *occidentalis*) Forest (CEGL000677, G2)
- *Populus balsamifera* ssp. *trichocarpa* / *Alnus incana* Forest (CEGL000667, G3)
- *Populus balsamifera* ssp. *trichocarpa* / *Cicuta douglasii* Forest (CEGL000671, G1)
- *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* Forest (CEGL000672, G3G4)
- *Populus balsamifera* ssp. *trichocarpa* / *Crataegus douglasii* Forest (CEGL000673, G1)
- *Populus balsamifera* ssp. *trichocarpa* / Mixed Herbs Forest (CEGL000675, G3?)
- *Populus balsamifera* ssp. *trichocarpa* / *Salix exigua* Forest (CEGL000676, G1)
- *Populus balsamifera* ssp. *trichocarpa* / *Salix lucida* ssp. *caudata* Woodland (CEGL003431, G2)
- *Populus tremuloides* / *Alnus incana* / *Betula nana* - *Ribes* spp. Forest (CEGL001149, G1)
- *Populus tremuloides* / *Carex pellita* Forest (CEGL000577, G2)
- *Salix amygdaloides* / *Salix exigua* Woodland (CEGL000948, G1Q)

Alliances:

- *Abies grandis* - *Alnus rhombifolia* Forest Alliance (A.429)
- *Alnus rhombifolia* Temporarily Flooded Forest Alliance (A.306)
- *Alnus rubra* Temporarily Flooded Forest Alliance (A.305)
- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Betula occidentalis* Intermittently Flooded Shrubland Alliance (A.936)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Celtis laevigata* var. *reticulata* Woodland Alliance (A.632)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Crataegus douglasii* Intermittently Flooded Shrubland Alliance (A.937)
- *Crataegus douglasii* Shrubland Alliance (A.917)
- *Philadelphus lewisii* Intermittently Flooded Shrubland Alliance (A.939)
- *Pinus monticola* Seasonally Flooded Forest Alliance (A.2590)
- *Pinus ponderosa* Temporarily Flooded Woodland Alliance (A.565)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Woodland Alliance (A.635)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Salix amygdaloides* Temporarily Flooded Woodland Alliance (A.645)

DISTRIBUTION

Range: Found on the periphery of the northern Rockies in the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: BC, CA, ID, MT?, NV, OR, UT, WA

Map Zones: 1:C, 7:C, 8:C, 9:C, 10:C, 16:?, 17:?, 18:C, 21:?

USFS Ecomap Regions: 331A:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, M242C:P?, M242D:PP, M261G:PP, M331A:P?, M331D:PP, M332A:CC, M332E:C?, M332F:CP, M332G:CC, M333A:CC, M333B:CC, M333D:CC

TNC Ecoregions: 6:C, 7:C, 68:C

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Johnson and Simon 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722904#references

Description Author: NatureServe Western Ecology Team

Version: 09 Feb 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West
ClassifResp: West

COLUMBIA PLATEAU SILVER SAGEBRUSH SEASONALLY FLOODED SHRUB-STEPPE (CES304.084)

CLASSIFIERS

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Impermeable Layer; Intermittent Flooding; Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Lowland]; Playa; Temperate [Temperate Xeric]; Depressional

National Mapping Codes: ESLF 9321

CONCEPT

Summary: This ecological system includes sagebrush communities occurring at lowland and montane elevations in the Columbia Plateau-northern Great Basin region, east almost to the Great Plains. These are generally depressional wetlands or non-alkaline playas, occurring as small- or occasionally large-patch communities, in a sagebrush or montane forest matrix. Climate is generally semi-arid, although it can be cool in montane areas. This system occurs in poorly drained depressional wetlands, the largest characterized as playas, the smaller as vernal pools, or along seasonal stream channels in valley bottoms or mountain meadows. *Artemisia cana* ssp. *bolanderi* or *Artemisia cana* ssp. *viscidula* are dominant, with *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*, or *Artemisia tridentata* ssp. *vaseyana* occasionally codominant; *Dasiphora fruticosa* ssp. *floribunda* can also be codominant. Understory graminoids and forbs are characteristic, with *Poa secunda* (= *Poa nevadensis*), *Poa cusickii*, *Festuca idahoensis*, *Muhlenbergia filiformis*, *Muhlenbergia richardsonis*, and *Leymus cinereus* dominant at the drier sites; *Eleocharis palustris*, *Deschampsia caespitosa*, and *Carex* species dominate at wetter or higher-elevation sites.

Related Concepts:

- Other Sagebrush Types (408) (Shiflet 1994) Intersecting. *Artemisia cana* ssp. *viscidula* shrublands are included in this ecological system.

MEMBERSHIP

Associations:

- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) - *Artemisia tridentata* ssp. *vaseyana* / *Poa cusickii* Shrub Herbaceous Vegetation [Provisional] (CEGL001549, G2)
- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) / *Leymus cinereus* Shrubland (CEGL001460, G1)
- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) / *Poa fendleriana* ssp. *fendleriana* Shrub Herbaceous Vegetation (CEGL001551, G2)
- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) / *Poa pratensis* Semi-natural Shrubland (CEGL002988, GNA)
- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) / *Poa secunda* Shrubland (CEGL001548, G2)
- *Artemisia cana* ssp. *bolanderi* / *Eleocharis palustris* Shrubland (CEGL002987, GU)
- *Artemisia cana* ssp. *bolanderi* / *Iris missouriensis* - *Juncus balticus* Shrubland (CEGL003475, GNR)
- *Artemisia cana* ssp. *bolanderi* / *Muhlenbergia richardsonis* Shrub Herbaceous Vegetation (CEGL001743, G3)
- *Artemisia cana* ssp. *viscidula* - (*Salix* spp.) / *Festuca idahoensis* Shrubland (CEGL001075, G3)
- *Artemisia cana* ssp. *viscidula* / *Deschampsia caespitosa* Shrubland (CEGL001074, G2G3)
- *Artemisia cana* ssp. *viscidula* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001552, G3?)
- *Artemisia cana* ssp. *viscidula* / *Festuca ovina* Shrubland (CEGL001076, G4G5)
- *Artemisia cana* ssp. *viscidula* / *Festuca thurberi* Shrubland (CEGL001071, G2G3)
- *Artemisia cana* ssp. *viscidula* / *Purshia tridentata* Shrubland (CEGL001073, G3)

Alliances:

- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) Shrub Herbaceous Alliance (A.1531)
- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) Shrubland Alliance (A.2557)

DISTRIBUTION

Range: This ecological system includes sagebrush communities occurring at lowland and montane elevations in the Columbia Plateau-northern Great Basin region, east almost to the Great Plains.

Divisions: 304:C; 306:C

Nations: US

Subnations: CA, CO?, ID, MT, NV, OR, UT?, WA?, WY

Map Zones: 7:C, 8:C, 9:C, 12:?, 18:P, 21:?, 22:?

USFS Ecomap Regions: 331A:??, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M261D:CC, M261G:CC, M331A:??, M332A:C?, M332E:C?, M332F:C?, M332G:CC, M333A:PP, M341A:??

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.740193#references

Description Author: J. Kagan, mod. M.S. Reid

Version: 28 Sep 2007

Concept Author: J. Kagan

Stakeholders: West
ClassifResp: West

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Central Interior and Appalachian (202)**Land Cover Class:** Woody Wetland**Spatial Scale & Pattern:** Linear**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Short (<5 yrs) Flooding Interval; Riparian Mosaic; Riverine / Alluvial; Graminoid**Non-Diagnostic Classifiers:** Lowland [Foothill]; Woody-Herbaceous; Broad-Leaved Deciduous Tree; Broad-Leaved Deciduous Shrub**National Mapping Codes:** ESLF 9164**CONCEPT**

Summary: Examples of this riverscour-influenced system may occur on high-gradient and very high-gradient streams in the gorges of the Cumberland Plateau, the Cumberland Mountains, and the more rugged parts of the Ridge and Valley in Kentucky, Tennessee, and Alabama, and possibly in Georgia. The succession of woody plants (particularly trees) is retarded by the force of "flashy," high-velocity water traveling down the stream channels. This system may occur on flood-scoured acidic or calcareous bedrock, cobble, pebble, or sandbar substrates of sandstone, limestone, dolomite, and possibly other sedimentary and weakly metamorphosed geologies. The most distinctive parts of the system are dominated by shrubs, perennial grasses, and forbs. In some areas, a riparian woodland composed of *Betula nigra* and *Platanus occidentalis* may be a component association. Some common shrubs include *Alnus serrulata*, *Betula nigra*, *Cephalanthus occidentalis*, *Cornus amomum*, *Fothergilla major*, *Itea virginica*, *Salix caroliniana*, *Rhododendron arborescens*, *Toxicodendron radicans*, and *Juniperus virginiana* var. *virginiana*. Some grasses (typical of prairies) include *Andropogon gerardii*, *Sorghastrum nutans*, *Schizachyrium scoparium*, *Chasmanthium latifolium*, *Tripsacum dactyloides*, and/or *Panicum virgatum*. Forbs are diverse and variable from occurrence to occurrence. This system is affected by flood-scouring in some areas and deposition in others. There is typically a gradient from dry, nutrient-poor conditions upslope to moist and relatively enriched conditions downslope. A variety of these conditions may exist at any one site. Some areas are prone to severe drought periods that may stress or kill some (particularly woody) vegetation. Flood-scouring is a powerful and ecologically important abrasive force along the riverbanks where this system is found.

Classification Comments: Examples of the system are sometimes called "scoured riverbank prairies," "riverside prairies," "linear prairies," "rivershore grasslands," or "scoured riverine bluff prairie." River systems where it is found include the Cumberland and its tributaries, the Obed, the Obey, Chickasaw Creek (Tennessee), the Cahaba (Alabama), the Red River Gorge (Kentucky), Rockcastle River (Kentucky), the Big South Fork of the Cumberland (Kentucky/Tennessee) and its tributaries, and others.

Similar Ecological Systems:

- Central Appalachian Stream and Riparian (CES202.609)--occurs to the north and east.
- South-Central Interior Small Stream and Riparian (CES202.706)

DESCRIPTION

Environment: Examples may occur on high-gradient and very high-gradient streams in the gorges of the Cumberland Plateau, the Cumberland Mountains, and rugged parts of the Ridge and Valley, in Kentucky, Tennessee, and Alabama, and possibly in Georgia. The succession of woody plants (particularly trees) is retarded by the force of "flashy," high-velocity water traveling down the stream channels. This system may occur on flood-scoured acidic or calcareous bedrock, cobble, pebble, or sandbar substrates of sandstone, limestone, dolomite, and possibly other sedimentary and weakly metamorphosed geologies. It is presumably more extensive and better developed in materials derived from sandstone, where the erodibility creates more material circulating in the stream to create the sandbar/gravelbar areas where the system may occur in extensive patches, and where the extremely well-drained qualities of the coarse sediments further help to retard woody plant succession.

Vegetation: Examples of this system are typically dominated by shrubs, perennial grasses, and forbs. In some areas, a riparian woodland composed of *Betula nigra* and *Platanus occidentalis* may be a component association. Some common shrub component species include *Alnus serrulata*, *Betula nigra*, *Cephalanthus occidentalis*, *Cornus amomum*, *Fothergilla major*, *Itea virginica*, *Salix caroliniana*, *Rhododendron arborescens*, *Toxicodendron radicans*, and *Juniperus virginiana* var. *virginiana*. More southern examples may contain *Hydrangea quercifolia*, *Hypericum densiflorum*, and *Morella cerifera* (= *Myrica cerifera* var. *cerifera*). Some grasses and forbs include *Andropogon gerardii*, *Sorghastrum nutans*, *Schizachyrium scoparium*, *Chasmanthium latifolium*, *Tripsacum dactyloides*, *Panicum virgatum*, *Baptisia australis*, *Conoclinium coelestinum* (= *Eupatorium coelestinum*), *Coreopsis pubescens*, *Coreopsis tripteris*, *Elephantopus carolinianus*, *Helenium autumnale*, *Hydrocotyle* sp., *Ludwigia leptocarpa*, *Lycopus* spp., *Orontium aquaticum*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Phlox carolina*, *Pityopsis graminifolia* var. *latifolia*, *Rhynchospora colorata* (= *Dichromena colorata*), *Rudbeckia laciniata*, and *Vernonia gigantea*. Patches of *Carex torta* may be present in some examples. Distinctive shoals with *Hymenocallis coronaria* and *Justicia americana* may be present as well. Some of these species are typical of prairies, and thrive in the well-lit environment.

Dynamics: This system is prone to flooding in the upper regions and deposition in the topographically lower areas. There is typically a gradient from dry acidic conditions higher on the bank to moist, fairly enriched conditions lower down may exist at any one site. It is prone to severe drought periods that may stress or kill some vegetation. Flood scouring is a powerful and ecologically important

abrasive force along the riverbanks where this system is found. Soils in sandstone areas are rapidly drained Psamments, and may be restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. Within the system the various species are distributed patchily probably due to microsite conditions.

MEMBERSHIP

Associations:

- (*Salix caroliniana*, *Rhododendron arborescens*) - *Andropogon gerardii* - *Baptisia australis* - (*Solidago simplex* var. *randii*) Herbaceous Vegetation (CEGL008471, G2?)
- *Alnus serrulata* - *Xanthorhiza simplicissima* Shrubland (CEGL003895, G3G4)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Hymenocallis coronaria* - *Justicia americana* Herbaceous Vegetation (CEGL004285, G1)
- *Hypericum densiflorum* - *Alnus serrulata* / *Jamesianthus alabamensis* - *Xyris tennesseensis* Shrubland (CEGL008494, G1G2)
- *Hypericum densiflorum* - *Alnus serrulata* / *Tripsacum dactyloides* Shrubland (CEGL008495, G1G2)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Osmunda regalis* var. *spectabilis* Seepage Scour Herbaceous Vegetation (CEGL008404, G3?)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Vallisneria americana* - (*Heteranthera dubia*) Riverine Herbaceous Vegetation (CEGL004333, G3G4)

Alliances:

- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Osmunda* (*cinnamomea*, *regalis*) Saturated Herbaceous Alliance (A.1692)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Vallisneria americana* Permanently Flooded Temperate Herbaceous Alliance (A.1757)

DISTRIBUTION

Range: This system is found in the Cumberland Plateau, the Cumberland Mountains, and the more rugged parts of the Ridge and Valley, in Kentucky, Tennessee, and Alabama, and possibly in Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, GA?, KY, TN

Map Zones: 48:C, 53:C

USFS Ecomap Regions: 211E:CC, 221H:CC, 231C:CC, M221C:CC

TNC Ecoregions: 50:C

SOURCES

References: Bailey and Coe 2001, Comer et al. 2003, NatureServe Ecology - Southeastern U.S. unpubl. data

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722671#references

Description Author: R. Evans, M. Pyne

Version: 17 Apr 2006

Concept Author: R. Evans, M. Pyne

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

CUMBERLAND SEEPAGE FOREST (CES202.361)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping [Mineral]; Broad-Leaved Tree

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9316

CONCEPT

Summary: This system of seepage-influenced, primarily forested wetlands is found in the Cumberland Plateau and Ridge and Valley regions of Alabama, Tennessee, West Virginia, and Kentucky. It is also found on the flat metasedimentary upland surfaces of Chilhowee Mountain, Tennessee. This area is part of the Southern Blue Ridge (TNC Ecoregion 51), but its ecological communities are similar to those of the Cumberlands. Examples most often occur in streamhead swales or on broad sandstone ridges where soils are sandy and saturated due to a combination of perched water table and seepage flow. Examples range in condition from open woodlands to forests, and some may lack a canopy and then will be dominated by shrubs or herbs. Typical woody species, when present, include *Acer rubrum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Ilex opaca* var. *opaca*, *Oxydendrum arboreum*, and *Kalmia latifolia*.

Classification Comments: Examples range in condition from open woodlands to forests, and some may lack a canopy and then will be dominated by shrubs or herbs.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)

DESCRIPTION

Environment: Examples occur in streamhead swales or on broad sandstone ridges. Soils are sandy and saturated due to a combination of perched water table and seepage flow.

Vegetation: Typical woody species, when present, include *Acer rubrum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Ilex opaca* var. *opaca*, *Oxydendrum arboreum*, and *Kalmia latifolia*. Some extreme southerly examples may contain *Nyssa biflora*. Some stands are more open due to fire frequency, windthrow, or other disturbance. These are more likely to contain noteworthy herbaceous plant species (e.g., *Platanthera* spp.).

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest (CEGL007443, G3?)
- *Acer rubrum* var. *trilobum* / *Alnus serrulata* / *Calamagrostis coarctata* Saturated Woodland (CEGL003737, G2G3)
- *Alnus serrulata* - *Salix sericea* - *Rhododendron (catawbiense, maximum)* Saturated Shrubland [Placeholder] (CEGL004972, G4?)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Saturated Woodland Alliance (A.657)
- *Alnus serrulata* - *Salix sericea* - *Rhododendron (catawbiense, maximum)* Saturated Shrubland Alliance (A.1880)

DISTRIBUTION

Range: This systems is found in the Cumberland Plateau and Ridge and Valley regions of Alabama, Tennessee, West Virginia, and Kentucky. Related stands in the Interior Low Plateau of Kentucky ("Shawnee Hills") need to be provided for here or in a separate system.

Divisions: 202:C

Nations: US

Subnations: AL, KY, TN, WV

Map Zones: 48:C, 53:C, 57:C

TNC Ecoregions: 50:C, 51:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723153#references

Description Author: R. Evans and M. Pyne

Version: 17 Apr 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: East, Southeast
ClassifResp: Southeast

EAST GULF COASTAL PLAIN INTERIOR SHRUB BOG (CES203.385)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Seepage-Fed Sloping

National Mapping Codes: ESLF 9341

CONCEPT

Summary: This ecological system includes wet, shrub-dominated seepage communities in the Upper East Gulf Coastal Plain of Alabama, adjacent Georgia, and possibly Mississippi. These wetlands generally occur in small patches on slopes within a matrix of longleaf pine-dominated vegetation. Wetland conditions are maintained by seepage flow from adjacent uplands. Examples of this system can vary between densely shrubby and fairly open and herbaceous, depending on frequency of fire and amount of elapsed time since the previous fires. However, this system tends to be much shrubbier due to topographic isolation than related seepage bog system of the Outer Coastal Plain such as Southern Coastal Plain Herbaceous Seep and Bog (CES203.078). The globally rare pitcher plant *Sarracenia rubra ssp. alabamensis* may be present in some examples of this system.

Similar Ecological Systems:

- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Southern Coastal Plain Herbaceous Seep and Bog (CES203.078)

DESCRIPTION

Environment: Examples may be found along steep to gentle slopes in the historically longleaf pine-dominated landscape of the Upper East Gulf Coastal Plain.

Vegetation: The physiognomy is variable, depending on fire history, and can vary from densely shrubby to herbaceous. In current condition, most examples are shrubby. Dominant species include *Morella cerifera* (= *Myrica cerifera* var. *cerifera*), *Kalmia latifolia*, *Symplocos tinctoria*, *Ilex coriacea*, *Ilex glabra*, *Arundinaria gigantea ssp. tecta*, and *Cyrilla racemiflora*. A number of other shrubs may also be present. Some stands, or portions of them, are strongly dominated by *Arundinaria gigantea ssp. tecta*. A fairly rich herb layer is present that may include *Osmunda cinnamomea* (dominant), *Eupatorium album*, *Xyris caroliniana*, *Aletris farinosa*, *Aristida purpurascens*, *Dichanthelium dichotomum* var. *ensifolium*, *Epigaea repens*, *Eupatorium pilosum*, *Eupatorium rotundifolium*, *Helianthus angustifolius*, *Lachnocaulon anceps*, *Polygala nana*, *Pteridium aquilinum* var. *pseudocaudatum*, *Rhexia alifanus*, *Rhexia petiolata*, *Rhynchospora plumosa*, *Sarracenia rubra ssp. alabamensis*, *Schizachyrium scoparium*, *Solidago odora* var. *odora*, and *Xyris ambigua*.

MEMBERSHIP

Associations:

- *Arundinaria gigantea ssp. tecta* Shrubland (CEGL003843, G1)
- *Ilex (coriacea, glabra) / Osmunda cinnamomea - Rhexia petiolata* Herbaceous Vegetation (CEGL008550, G2?)
- *Ilex coriacea - Lyonia lucida - Smilax laurifolia* Shrubland (CEGL004666, G3G4)
- *Morella cerifera - Kalmia latifolia - Symplocos tinctoria / Osmunda cinnamomea* Herbaceous Vegetation (CEGL008548, G2?)
- *Pinus serotina / Lyonia lucida - Ilex glabra - (Cyrilla racemiflora)* Shrubland (CEGL003846, G3)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Cyrilla racemiflora - Ilex coriacea - (Cliftonia monophylla)* Saturated Shrubland Alliance (A.802)
- *Lyonia lucida - Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Rhynchospora oligantha - Sarracenia spp. - (Aristida beyrichiana, Ctenium aromaticum) - Osmunda cinnamomea / Sphagnum spp.* Saturated Herbaceous Alliance (A.1463)

DISTRIBUTION

Range: This system is found in the Upper East Gulf Coastal Plain of Alabama, adjacent Georgia, and possibly Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, GA, MS?

Map Zones: 46:C, 55:C, 99:P

TNC Ecoregions: 43:C, 53:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723131#references

Description Author: A. Schotz and R. Evans, mod. M. Pyne

Version: 27 Sep 2005
Concept Author: A. Schotz and R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

EAST GULF COASTAL PLAIN LARGE RIVER FLOODPLAIN FOREST (CES203.489)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]

National Mapping Codes: ESLF 9199

CONCEPT

Summary: This system represents a geographic subset of Kuchler's (1964) Southern Floodplain Forest. Examples may be found along large rivers of the East and Upper East Gulf Coastal Plain, especially the Apalachicola, Alabama/Cahaba, Tombigbee, Pascagoula, and Pearl rivers, all of which ultimately drain into the Gulf of Mexico. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphologic features present within the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993). Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding. However, herbaceous and shrub vegetation may be present in certain areas as well.

Classification Comments: In the Upper East Gulf Plain of Kentucky, this system is represented in the Ecoregions of Kentucky map (Woods et al. 2002) by the lower part of the Wabash-Ohio bottomlands (72a). In the lower Gulf Coastal Plain, this includes at least EPA (Omernik) Level IV ecoregions 65p and 75i (EPA 2004).

Similar Ecological Systems:

- East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)
- Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting
- Gravel/Cobble Bar (Evans 1991) Finer

DESCRIPTION

Environment: Examples of this system are generally forested with stands of bottomland hardwood species and other trees tolerant of flooding. Local composition varies depending upon actual position within the floodplain, disturbance history, and underlying soils and geology. Although most examples of this system may be thought of as acidic, some examples of this system flow through regions with sufficient calcareous influence to effect vegetation composition.

MEMBERSHIP

Associations:

- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Betula nigra* / *Salix nigra* / *Hypericum prolificum* - *Ampelopsis arborea* Forest (CEGL007794, G3?)
- *Brunnichia ovata* Vine-Shrubland (CEGL008446, G4?)
- *Catalpa bignonioides* - *Salix nigra* / *Brunnichia ovata* / *Eupatorium serotinum* Forest (CEGL008547, G2G3)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Forestiera acuminata* - (*Planera aquatica*, *Cephalanthus occidentalis*) Shrubland (CEGL003911, G3?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Carpinus caroliniana* / *Boehmeria cylindrica* Forest (CEGL007806, G4?)
- *Gleditsia aquatica* - *Carya aquatica* Forest (CEGL007426, G3?)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Quercus pagoda* - *Carya* spp. / *Carpinus caroliniana* / *Carex* spp. Forest (CEGL007353, G3G4)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nyssa aquatica* - *Fraxinus pennsylvanica* - *Taxodium distichum* / *Sabal minor* Forest (CEGL008463, GNR)

- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - *Acer rubrum* var. *rubrum* / *Lyonia lucida* Forest (CEGL007864, G3G4)
- *Nyssa biflora* - *Taxodium ascendens* / *Ludwigia pilosa* - *Bacopa caroliniana* Woodland (CEGL003735, G1?)
- *Nyssa biflora* / *Itea virginica* - *Cephalanthus occidentalis* Depression Forest (CEGL007434, G3G4)
- *Nyssa ogeche* - (*Nyssa biflora*, *Taxodium ascendens*) Forest (CEGL007392, G4)
- *Nyssa ogeche* - *Nyssa aquatica* Forest (CEGL007393, G3)
- *Platanus occidentalis* - *Liquidambar styraciflua* - (*Ulmus americana*) / (*Crataegus viridis*) Forest (CEGL007335, G3G4)
- *Polygonum* spp. - *Phanopyrum gymnocarpon* Seasonally Flooded Herbaceous Vegetation (CEGL008555, G4)
- *Populus deltoides* - *Salix caroliniana* Forest (CEGL007343, G4G5)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Populus deltoides* / *Acer negundo* / *Boehmeria cylindrica* Forest (CEGL007731, G3G5)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus lyrata* - *Carya aquatica* Forest (CEGL007397, G4G5)
- *Quercus lyrata* - *Liquidambar styraciflua* Forest (CEGL008583, G3G4)
- *Quercus michauxii* - *Quercus shumardii* - *Liquidambar styraciflua* / *Arundinaria gigantea* Forest (CEGL002099, G3G4)
- *Quercus nigra* - *Quercus pagoda* - *Carya myristiciformis* / *Cercis canadensis* Forest (CEGL004770, G3?)
- *Quercus pagoda* - *Quercus nigra* / *Halesia diptera* - *Ilex decidua* / *Chasmanthium sessiliflorum* - *Dicliptera brachiata* Forest (CEGL007354, G4?)
- *Quercus phellos* - *Quercus nigra* - *Liquidambar styraciflua* Mississippi River Alluvial Plain Forest (CEGL007915, G4G5)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)
- *Quercus texana* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* - (*Gleditsia triacanthos*) Forest (CEGL004619, G4G5)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* / (*Clethra alnifolia*, *Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)
- *Salix nigra* Forest (CEGL002103, G4)
- *Salix nigra* Large River Floodplain Forest (CEGL007410, G3G5)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Zizaniopsis miliacea* Coastal Plain Slough Herbaceous Vegetation (CEGL004139, G4?)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Brunnichia ovata* Temporarily Flooded Vine-Shrubland Alliance (A.2002)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Forestiera acuminata* Semipermanently Flooded Shrubland Alliance (A.1012)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Nyssa biflora* - *Taxodium ascendens* Semipermanently Flooded Woodland Alliance (A.655)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizaniopsis miliacea* Seasonally Flooded Temperate Herbaceous Alliance (A.1395)

DISTRIBUTION

Range: East and Upper East Gulf Coastal Plain, especially the Apalachicola, Alabama, Tombigbee, Pascagoula, and Pearl rivers, all of which ultimately drain into the Gulf of Mexico.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, KY, MS, TN

Map Zones: 46:C, 47:C, 55:C, 99:C

USFS Ecomap Regions: 231B:CC, 232B:CC, 232J:CC, 232L:CC

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Comer et al. 2003, EPA 2004, Kuchler 1964, Sharitz and Mitsch 1993, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723097#references

Description Author: R. Evans and A. Schotz

Version: 27 Sep 2005

Concept Author: R. Evans and A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN NORTHERN SEEPAGE SWAMP (CES203.554)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9351

CONCEPT

Summary: This wetland system of the Upper East Gulf Coastal Plain consists of forested wetlands in acidic, seepage-influenced habitats. These are mostly deciduous forests (and less commonly herbaceous communities) generally found at the base of slopes or other habitats where seepage flow is concentrated. Resulting moisture conditions are saturated or even inundated. The vegetation is characterized by *Nyssa sylvatica*, *Nyssa biflora*, and *Acer rubrum*. Examples occur in portions of the Coastal Plain north of the range of *Persea palustris* and *Magnolia grandiflora*. *Magnolia virginiana* is of less value as a differential species. To the south this system grades into Southern Coastal Plain Seepage Swamp and Baygall (CES203.505), where evergreen species are of much greater importance in the canopy and understory. Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water and tend to occur on highly acidic, nutrient-poor soils.

Classification Comments: Some authors have treated *Persea palustris* (of wetlands) and *Persea borbonia* (of uplands) as one taxon under a broadly conceived *Persea borbonia*. We recognize two distinct taxa, following Kartesz (1999) and Weakley (2005).

Similar Ecological Systems:

- Cumberland Seepage Forest (CES202.361)
- Piedmont Seepage Wetland (CES202.298)
- Southern Coastal Plain Seepage Swamp and Baygall (CES203.505)

DESCRIPTION

Vegetation: The vegetation is characterized by *Nyssa sylvatica*, *Nyssa biflora*, and *Acer rubrum*. The canopies of stands are primarily deciduous-dominated. Stands in the southern part of the system's range may contain *Magnolia virginiana*, particularly in the understory. This system occurs north of the range of *Persea palustris* and *Magnolia grandiflora*, and these species will be lacking from stands.

Dynamics: Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water and tend to occur on highly acidic, nutrient-poor soils.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425, G2G3)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Herbaceous Vegetation (CEGL002263, G2G3)
- *Magnolia virginiana* - *Nyssa biflora* / *Oxydendrum arboreum* / *Viburnum nudum* var. *nudum* Forest (CEGL008552, G3?)
- *Nyssa biflora* - *Liquidambar styraciflua* / *Magnolia virginiana* / *Hamamelis virginiana* - *Viburnum nudum* Forest (CEGL008477, G2G3)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain portions of western Kentucky (Funk 1975) and Tennessee, northern Mississippi, northwestern and central Alabama, and southern Illinois.

Divisions: 203:C

Nations: US

Subnations: AL, IL, KY, MS, TN

Map Zones: 46:C, 47:C, 49:?

USFS Ecomap Regions: 231B:CC, 231H:CC

TNC Ecoregions: 43:C

SOURCES

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

References: Comer et al. 2003, Funk 1975, Kartesz 1999, Weakley 2005

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723050#references

Description Author: R. Evans and M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN SMALL STREAM AND RIVER FLOODPLAIN FOREST (CES203.559)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermittent Flooding; Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]

National Mapping Codes: ESLF 9339

CONCEPT

Summary: This is a predominantly forested system of the East Gulf Coastal Plain associated with small brownwater rivers and creeks. In contrast to East Gulf Coastal Plain Large River Floodplain Forest (CES203.489), it has fewer major geomorphic floodplain features typically associated with large river floodplains. Those features that are present tend to be smaller and more closely intermixed with one another, resulting in less obvious vegetational zonation. Bottomland hardwood tree species are typically important and diagnostic, although mesic hardwood species are also present in areas with less inundation, such as upper terraces and possibly second bottoms. As a whole, flooding occurs annually, but the water table usually is well below the soil surface throughout most of the growing season. Areas impacted by beaver impoundments are also included in this system.

Classification Comments: This is primarily a linear system, with some variability as to the size type of the associations included within it. Most are temporarily flooded, with the possible addition of smaller-scale seasonally flooded features such as beaver-created herbaceous wetlands and shrub-dominated features. It is confined to floodplains or terraces of streams and creeks. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. These landscapes usually encompass a variety of habitats resulting from natural hydrological spatial patterns (i.e., meander scars, sloughs, old depressions, and/or oxbows are present).

Similar Ecological Systems:

- East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)
- East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting
- Gravel/Cobble Bar (Evans 1991) Intersecting
- Riparian Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: This system is associated with small brownwater rivers and creeks of the East Gulf Coastal Plain. It is confined to floodplains or terraces of streams and creeks. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. These landscapes usually encompass a variety of habitats resulting from natural hydrological spatial patterns (i.e., meander scars, sloughs, gravel bars, old depressions, and/or oxbows are present). Most component associations are temporarily flooded, with the possible addition of smaller-scale seasonally flooded features such as beaver-created herbaceous wetlands and shrub-dominated features. Some larger examples of this system include the Escambia, the Yellow (Alabama, Florida), the Choctawhatchee, the Chattahoochee, and the Flint rivers.

Vegetation: Examples of this system may include a number of different plant communities, each with distinctive floristic compositions. Drew et al. (1998) described vegetation attributable to this systems as including the following species: *Carya glabra*, *Magnolia grandiflora*, *Quercus virginiana*, *Liquidambar styraciflua*, *Acer barbatum*, *Fraxinus americana*, *Fraxinus caroliniana*, *Celtis laevigata*, *Sabal minor*, *Sebastiania fruticosa*, *Serenoa repens*, and *Itea virginica*. Smaller-scale features may be dominated by shrubs (*Cephalanthus occidentalis*, *Decodon verticillatus*) and/or perennial and annual herbs.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425, G2G3)
- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Alnus serrulata* Southeastern Seasonally Flooded Shrubland (CEGL008474, G4)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)

- *Betula nigra* / *Salix nigra* / *Hypericum prolificum* - *Ampelopsis arborea* Forest (CEGL007794, G3?)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Chamaecyparis thyoides* / *Magnolia virginiana* - *Cliftonia monophylla* / *Orontium aquaticum* - *Sphagnum* spp. Forest (CEGL007151, G2G3)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Fagus grandifolia* - *Carya* spp. / (*Acer negundo*, *Magnolia macrophylla*, *Tilia americana* var. *heterophylla*) Temporarily Flooded Forest (CEGL004745, G3G4)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Quercus michauxii* - *Quercus nigra* / *Rhododendron canescens* Forest (CEGL004965, G2G3)
- *Glottidium vesicarium* - *Lindernia dubia* Sandbar Herbaceous Vegetation (CEGL008498, G3G4)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Liquidambar styraciflua* - *Quercus pagoda* - *Carya* spp. / *Carpinus caroliniana* / *Carex* spp. Forest (CEGL007353, G3G4)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Myriophyllum heterophyllum* Herbaceous Vegetation (CEGL008457, G4)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Pallavicinia lyellii* - *Sphagnum* sp. Nonvascular Vegetation (CEGL004779, G3)
- *Panicum virgatum* - *Panicum rigidulum* var. *elongatum* - *Polygonum hydropiperoides* Herbaceous Vegetation (CEGL004921, G3?)
- *Pinus elliotii* var. *elliottii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003638, G2G3Q)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* / *Carpinus caroliniana* ssp. *caroliniana* / *Sabal minor* Forest (CEGL007544, G3G4)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest (CEGL004606, G4)
- *Pinus taeda* - *Quercus hemisphaerica* / *Osmanthus americanus* / *Ilex glabra* Woodland (CEGL003619, G2)
- *Pinus taeda* Temporarily Flooded Forest (CEGL007142, G4?)
- *Platanus occidentalis* - *Liquidambar styraciflua* - (*Ulmus americana*) / (*Crataegus viridis*) Forest (CEGL007335, G3G4)
- *Polygonum (hydropiperoides, punctatum)* - *Leersia* spp. Herbaceous Vegetation (CEGL004290, G4?)
- *Polygonum* spp. - *Phanopyrum gymnocarpon* Seasonally Flooded Herbaceous Vegetation (CEGL008555, G4)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Vegetation [Placeholder] (CEGL004291, GNR)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus laurifolia* / *Carpinus caroliniana* / *Justicia ovata* Forest (CEGL007348, G4?)
- *Quercus nigra* - *Magnolia virginiana* - *Taxodium distichum* Forest (CEGL004978, G3?)
- *Quercus pagoda* - *Quercus nigra* / *Halesia diptera* - *Ilex decidua* / *Chasmanthium sessiliflorum* - *Dicliptera brachiata* Forest (CEGL007354, G4?)
- *Quercus phellos* - *Quercus nigra* - *Quercus alba* / *Chasmanthium (laxum, sessiliflorum)* Forest (CEGL004771, G3G4)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Forest (CEGL007373, G4)
- *Salix nigra* Forest (CEGL002103, G4)
- *Scirpus cyperinus* Seasonally Flooded Southern Herbaceous Vegetation (CEGL003866, G4)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Lindernia dubia* - *Glottidium vesicarium* - *Eupatorium serotinum* Temporarily Flooded Herbaceous Alliance (A.2008)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Myriophyllum heterophyllum* Permanently Flooded Herbaceous Alliance (A.2003)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)

- *Panicum virgatum* Temporarily Flooded Herbaceous Alliance (A.1343)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* Temporarily Flooded Forest Alliance (A.431)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest Alliance (A.433)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Pinus taeda* Woodland Alliance (A.526)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Forest Alliance (A.296)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Sphagnum* spp. - *Pallavicinia lyellii* Saturated Nonvascular Alliance (A.1823)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain, from the coast northward and inland to the extent of unconsolidated sediments in Kentucky.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, KY, MS, TN

Map Zones: 46:C, 55:C

USFS Ecomap Regions: 231B:CC, 231H:CC, 232B:CC, 232D:CC, 232J:CC, 232K:CC, 232L:CC, 234A:CC

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Comer et al. 2003, Drew et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723045#references

Description Author: M. Pyne and R. Evans

Version: 18 Apr 2006

Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1455 EAST GULF COASTAL PLAIN SOUTHERN LOBLOLLY-HARDWOOD FLATWOODS (CES203.557)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat

Non-Diagnostic Classifiers: Pimple mounds; Isolated Wetland [Partially Isolated]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2455; ESLF 9124; ESP 1455

CONCEPT

Summary: This forested system occurs on broad upland flats in the East Gulf Coastal Plain of Alabama and Mississippi, as well as western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes"; 74d of EPA) of Louisiana, and likely occurs in other parts of the region as well. Its status and extent in this intervening terrain is unknown. Known examples in the Alabama/Mississippi parts of the range include a mosaic of open forests dominated by *Pinus taeda* interspersed with patches of *Quercus phellos* and sometimes other tree species. The ground surface displays an evident microtopography of alternating mounds and swales occurring in a tight local mosaic. These mounds are most likely "gilgai" (R. Wieland pers. comm.) resulting from vertic or shrink-swell properties of the Luinn soil series. Known examples display a range of moisture conditions from dry to wet. The wettest examples trap significant moisture from local rainfall events. These areas have ponded water for a minimum of several days at an interval and potentially for long periods of the year, especially when evapotranspiration is lowest. The vegetation of this system supports a relatively low vascular plant diversity and thus may appear floristically similar to other pine-hardwood vegetation of the region. The dry portion of this vegetational mosaic is dominated by grassy ground cover (*Chasmanthium sessiliflorum*) with scattered emergent greenbriars (*Smilax* spp.) underneath a nearly pure *Pinus taeda* overstory. The historical composition of this type is unknown, but it seems likely that *Pinus taeda* was a natural and even dominant component of this system, as it is in related systems in the West Gulf Coastal Plain (R. Evans pers. obs., T. Foti pers. comm.). Wetter areas are dominated by an overstory of *Quercus phellos* with an abundance of *Sabal minor* in the understory. Although the specific role of fire in this system is unknown, low-intensity ground fires may have been ecologically important. Such fires could have originated in the surrounding East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506).

In the western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes") of Louisiana (74d and adjacent 75a of EPA), the flatwoods vegetation tends to be dominated primarily by hardwoods in the most western portion, and a mixture of *Pinus glabra* and *Pinus taeda* in the intermediate portion to the east of this (Smith 1996b). In this "Louisiana Florida Parishes Spruce Pine Flatwoods Forest" some characteristic species include *Pinus glabra*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus virginiana*, *Pinus taeda*, and *Magnolia grandiflora*. Some important understory trees and shrubs include *Crataegus opaca*, *Sabal minor* (which may often be very abundant or dominant), and *Arundinaria gigantea ssp. tecta*.

Classification Comments: The description of associations in the NVC for this system is undoubtedly incomplete. Classification work is in progress, but more information is needed.

Related Concepts:

- Wet Spruce Pine-Hardwood Flatwoods Forest (Smith 1996b) Finer

DESCRIPTION

Environment: In the Alabama/Mississippi parts of this system's range, the ground surface displays an evident microtopography of alternating mounds and swales occurring in a tight local mosaic. In Louisiana, the soils are described as Hydric, acidic silt loams (including the Encrow, Gilbert, and Springfield series). The setting is broad, low flats, in small to large depressions, and along small, ill-defined drainages (locally known as "slashes" (Smith 1996b).

Vegetation: Known examples of this system in the Alabama/Mississippi parts of its range include a mosaic of open forests dominated by *Pinus taeda* interspersed with patches of *Quercus phellos* and sometimes other tree species. The vegetation of this system supports a relatively low vascular plant diversity and thus may appear floristically similar to other pine-hardwood vegetation of the region. The dry portion of this vegetational mosaic is dominated by grassy ground cover (e.g., *Chasmanthium sessiliflorum*) with scattered emergent greenbriars (*Smilax* spp.) underneath a nearly pure *Pinus taeda* overstory. The historical composition of this type is unknown, but it seems likely that *Pinus taeda* was a natural and even dominant component of this system, as it is in related systems in the West Gulf Coastal Plain (R. Evans pers. obs., T. Foti pers. comm.). Wetter areas are dominated by an overstory of *Quercus phellos* with an abundance of *Sabal minor* in the understory.

In the western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes") of Louisiana, the flatwoods vegetation tends to be dominated primarily by hardwoods in the most western portion, and a mixture of *Pinus glabra* and *Pinus taeda* in the intermediate portion to the east of this. In this "Louisiana Florida Parishes Spruce Pine Flatwoods Forest" stands contain *Pinus glabra*, *Quercus laurifolia*, *Quercus phellos*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus virginiana*, *Pinus taeda*, *Nyssa biflora*, *Nyssa sylvatica*, *Magnolia grandiflora*, *Salix nigra*, *Liquidambar styraciflua*, *Carya glabra*, *Acer rubrum*, and *Fraxinus*

pennsylvanica. Understory trees and shrubs include *Crataegus opaca* and *Sabal minor* (which may often be very abundant or dominant), as well as *Arundinaria gigantea* ssp. *tecta*, *Cephalanthus occidentalis*, *Diospyros virginiana*, *Cornus foemina*, *Crataegus viridis*, *Ilex opaca* var. *opaca*, *Ilex decidua*, *Itea virginica*, *Morella cerifera* (= *Myrica cerifera*), *Sambucus canadensis*, *Styrax americanus*, and *Viburnum dentatum* (Smith 1996b).

MEMBERSHIP

Associations:

- (*Quercus laurifolia*) / *Crataegus opaca* - *Crataegus viridis* Forest (CEGL007386, G1)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Quercus nigra* - *Pinus glabra* / *Viburnum dentatum* Forest (CEGL004964, G3)
- *Pinus glabra* - *Quercus laurifolia* / *Crataegus opaca* / *Sabal minor* Forest (CEGL004534, G1G2)
- *Quercus michauxii* - *Quercus (nigra, pagoda)* - *Liquidambar styraciflua* - *Pinus taeda* Forest (CEGL007715, G2G3)

Alliances:

- *Crataegus (aestivalis, opaca, rufula)* Seasonally Flooded Forest Alliance (A.320)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Pinus glabra* - *Quercus laurifolia* Saturated Forest Alliance (A.442)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)

SPATIAL CHARACTERISTICS

Spatial Summary: Apparently occurs in a variable patch size (large to small) across its range.

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: This forested system occurs on broad upland flats in the East Gulf Coastal Plain of Alabama and Mississippi, as well as western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes") in Louisiana. The complete and detailed range of this system is being developed and is not completely understood. It is not thought to extend into the Mississippi River Alluvial Plain of Louisiana (P. Faulkner pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AL, GA?, LA, MS

Map Zones: 46:C, 99:C

USFS Ecomap Regions: 231Bb:CCC, 232La:CCC, 234Ad:CCC

TNC Ecoregions: 43:C, 53:P

SOURCES

References: Comer et al. 2003, Smith 1996b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723047#references

Description Author: R. Evans, mod. M. Pyne

Version: 23 Jan 2008

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN TIDAL WOODED SWAMP (CES203.299)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial; Tidal / Estuarine

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: ESLF 9132

CONCEPT

Summary: This system encompasses the tidally flooded portions of river floodplains which flow into the northern Gulf of Mexico east of the Mississippi River. Large outflows of freshwater keep salinity levels at a minimum, and flooding is of short enough duration to allow survival of tree canopies. *Taxodium*, *Nyssa*, or *Fraxinus* generally dominate. These swamps may be regularly flooded at least twice daily (FNAI 1990).

Similar Ecological Systems:

- East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Related Concepts:

- Freshwater Tidal Swamp (FNAI 1990) Broader

DESCRIPTION

Vegetation: Stands are dominated by a combination of *Nyssa aquatica*, *Nyssa biflora*, *Taxodium distichum*, *Magnolia virginiana*, *Sabal palmetto*, *Juniperus virginiana* var. *silicicola*, *Cyrilla racemiflora*, *Quercus laurifolia*, *Fraxinus pennsylvanica*, *Sabal minor*, *Taxodium ascendens*, *Cliftonia monophylla*, *Pinus elliotii* var. *elliotii*, *Chamaecyparis thyoides*, *Hypericum nitidum*, *Cladium mariscus* ssp. *jamaicense*, and *Persea palustris*.

MEMBERSHIP

Associations:

- *Nyssa aquatica* Tidal Forest (CEGL008561, G3?)
- *Nyssa biflora* - (*Taxodium distichum*, *Nyssa aquatica*) / *Morella cerifera* - *Rosa palustris* Tidal Forest (CEGL004484, G3G4)
- *Nyssa biflora* - *Magnolia virginiana* - *Sabal palmetto* - *Juniperus virginiana* var. *silicicola* Forest (CEGL004684, G2)
- *Nyssa biflora* - *Magnolia virginiana* / *Cyrilla racemiflora* Forest (CEGL004683, G2)
- *Quercus laurifolia* - *Fraxinus pennsylvanica* - *Nyssa aquatica* / *Sabal minor* Tidal Forest (CEGL007884, G3?)
- *Taxodium ascendens* - *Cliftonia monophylla* - *Pinus elliotii* var. *elliotii* - *Chamaecyparis thyoides* / *Hypericum nitidum* - *Cladium mariscus* ssp. *jamaicense* Forest (CEGL004981, G2?)
- *Taxodium distichum* - *Nyssa aquatica* - *Persea palustris* Forest (CEGL004681, G2)
- *Taxodium distichum* - *Nyssa biflora* - *Magnolia virginiana* - *Fraxinus profunda* Forest (CEGL004682, G2)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Vine-Shrubland (CEGL004620, GNA)

Alliances:

- *Magnolia virginiana* - *Nyssa biflora* - (*Taxodium distichum*, *Nyssa aquatica*, *Persea palustris*) Tidal Forest Alliance (A.1885)
- *Nyssa biflora* - (*Nyssa aquatica*, *Taxodium distichum*) Tidal Forest Alliance (A.357)
- *Quercus* (*phellos*, *nigra*, *laurifolia*) Temporarily Flooded Forest Alliance (A.292)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Seasonally Flooded Vine-Shrubland Alliance (A.993)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)

DISTRIBUTION

Range: This system includes river floodplains which flow into the northern Gulf of Mexico east of the Mississippi River.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232D:CC, 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, FNAI 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723192#references

Description Author: R. Evans, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1525 EDWARDS PLATEAU RIPARIAN (CES303.652)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Woody-Herbaceous; Herbaceous; Streambed; Flood Scouring

National Mapping Codes: EVT 2525; ESLF 9165; ESP 1525

CONCEPT

Summary: This system occurs in various situations along small and intermittent streams of the Edwards Plateau, with drier representatives occurring in the western plateau and the Stockton Plateau, and moister representatives (such as communities dominated by *Juglans microcarpa* and *Brickellia laciniata*) in the eastern plateau. Representatives of this system typically occur in stream-scoured situations and vary in the openness of the habitat and physiognomy.

Classification Comments: Further field investigation is needed to better develop the association-level information for this system. Edwards Plateau Floodplain (CES303.651) occurs along larger, lower gradient rivers and streams in contrast with Edwards Plateau Riparian (CES303.652) which occurs along smaller, higher gradient streams. Any particular reach of a river would be classified and mapped as one or the other system.

Similar Ecological Systems:

- Edwards Plateau Floodplain (CES303.651)
- North American Warm Desert Riparian Woodland and Shrubland (CES302.753)
- Southeastern Great Plains Riparian (CES205.709)

DESCRIPTION

Environment: This system occurs on minor intermittent streams and tributaries throughout the Edwards Plateau of Texas.

MEMBERSHIP

Associations:

- *Adiantum capillus-veneris* - (*Thelypteris ovata* var. *lindheimeri*, *Thelypteris kunthii*) Herbaceous Vegetation (CEGL004514, G2)
- *Andropogon glomeratus* var. *pumilus* Herbaceous Vegetation (CEGL004099, GNA)
- *Celtis laevigata* var. *reticulata* - *Juglans microcarpa* / *Leptochloa dubia* Shrubland (CEGL002166, GNR)
- *Chilopsis linearis* / *Brickellia laciniata* Shrubland (CEGL004933, G3G4)
- *Juglans microcarpa* - *Brickellia laciniata* / *Indigofera lindheimeriana* Edwards Plateau Shrubland (CEGL004932, G2?)
- *Juniperus ashei* Semi-natural Forest (CEGL004159, GNA)
- *Justicia americana* - *Bacopa monnieri* Edwards Plateau Herbaceous Vegetation (CEGL004926, G3)
- *Muhlenbergia reverchonii* - *Bouteloua curtipendula* - *Desmanthus velutinus* Herbaceous Vegetation (CEGL004219, GNR)
- *Panicum virgatum* - *Andropogon glomeratus* - *Cladium mariscus* ssp. *jamaicense* Herbaceous Vegetation (CEGL004928, G2G3)
- *Platanus occidentalis* - (*Salix nigra*) / *Juglans microcarpa* - *Baccharis salicifolia* Woodland (CEGL004930, G2G3)
- *Platanus occidentalis* - *Juglans major* Woodland (CEGL004929, G2?)
- *Platanus occidentalis* - *Salix nigra* Woodland (CEGL002093, G5?)
- *Quercus fusiformis* - (*Celtis laevigata* var. *reticulata*, *Ulmus crassifolia*) Woodland (CEGL002153, G4?)
- *Quercus muehlenbergii* - *Juglans major* - (*Ulmus rubra*) / *Verbesina virginica* Forest (CEGL004927, G2G3)
- *Salix nigra* Forest (CEGL002103, G4)
- *Taxodium distichum* - *Platanus occidentalis* Edwards Plateau Forest (CEGL002104, G2)
- *Ulmus americana* - *Celtis* (*laevigata*, *occidentalis*) - *Fraxinus pennsylvanica* Forest (CEGL002090, G3?)
- *Ulmus crassifolia* - (*Carya illinoensis*) Small Stream Forest (CEGL004207, GNR)

Alliances:

- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Andropogon glomeratus* Temporarily Flooded Herbaceous Alliance (A.1338)
- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Chilopsis linearis* Intermittently Flooded Shrubland Alliance (A.1044)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis* (*occidentalis*, *laevigata*) Temporarily Flooded Forest Alliance (A.286)
- *Juglans microcarpa* Temporarily Flooded Shrubland Alliance (A.945)
- *Juniperus ashei* Semi-natural Forest Alliance (A.2023)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Muhlenbergia reverchonii* Herbaceous Alliance (A.1218)
- *Panicum virgatum* Temporarily Flooded Herbaceous Alliance (A.1343)
- *Platanus occidentalis* - (*Juglans major*, *Juglans microcarpa*, *Salix nigra*) Temporarily Flooded Woodland Alliance (A.2018)
- *Quercus fusiformis* - *Celtis laevigata* var. *reticulata* Woodland Alliance (A.663)

- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.298)

SPATIAL CHARACTERISTICS

Spatial Summary: This system occurs as linear patches along small and intermittent streams.

Adjacent Ecological Systems:

- Edwards Plateau Carbonate Glade and Barrens (CES303.655)
- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Upland Depression (CES303.654)
- Llano Uplift Acidic Forest, Woodland and Glade (CES303.657)

DISTRIBUTION

Range: This system is found along minor streams and tributaries throughout the Edwards Plateau.

Divisions: 302:C; 303:C

Nations: US

Subnations: TX

Map Zones: 35:C

USFS Ecomap Regions: 255E:CC, 315C:C?, 315D:CC, 315G:C?, 321B:??

TNC Ecoregions: 29:C

SOURCES

References: Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791373#references

Description Author: J. Teague

Version: 30 Oct 2007

Concept Author: L. Elliott and J. Teague

Stakeholders: Midwest, Southeast, West

ClassifResp: Southeast

GREAT BASIN FOOTHILL AND LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND (CES304.045)

CLASSIFIERS

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; Riparian Mosaic; Forest and Woodland (Treed); Riverine / Alluvial

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Temperate [Temperate Continental]

National Mapping Codes: ESLF 9168

CONCEPT

Summary: This system occurs in mountain ranges of the Great Basin and along the eastern slope of the Sierra Nevada within a broad elevation range from about 1220 m (4000 feet) to over 2135 m (7000 feet). This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. The variety of plant associations connected to this system reflects elevation, stream gradient, floodplain width, and flooding events. Dominant trees may include *Abies concolor*, *Alnus incana*, *Betula occidentalis*, *Populus angustifolia*, *Populus balsamifera ssp. trichocarpa*, *Populus fremontii*, *Salix laevigata*, *Salix gooddingii*, and *Pseudotsuga menziesii*. Dominant shrubs include *Artemisia cana*, *Cornus sericea*, *Salix exigua*, *Salix lasiolepis*, *Salix lemmonii*, or *Salix lutea*. Herbaceous layers are often dominated by species of *Carex* and *Juncus*, and perennial grasses and mesic forbs such as *Deschampsia caespitosa*, *Elymus trachycaulus*, *Glyceria striata*, *Iris missouriensis*, *Maianthemum stellatum*, or *Thalictrum fendleri*. Introduced forage species such as *Agrostis stolonifera*, *Poa pratensis*, *Phleum pratense*, and the weedy annual *Bromus tectorum* are often present in disturbed stands. These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. Livestock grazing is a major influence in altering structure, composition, and function of the community.

Related Concepts:

- Cottonwood - Willow: 235 (Eyre 1980) Broader
- Riparian (422) (Shiflet 1994) Broader
- Riparian Woodland (203) (Shiflet 1994) Broader. System and SRM type overlap along eastern Sierran foothills region of California.

MEMBERSHIP

Associations:

- *Alnus incana* / *Cornus sericea* Shrubland (CEGL001145, G3G4)
- *Artemisia cana* (*ssp. bolanderi*, *ssp. viscidula*) / *Leymus cinereus* Shrubland (CEGL001460, G1)
- *Artemisia cana ssp. viscidula* / *Deschampsia caespitosa* Shrubland (CEGL001074, G2G3)
- *Artemisia nova* - *Ericameria nana* Shrubland (CEGL002773, G3)
- *Betula occidentalis* / *Cornus sericea* Shrubland (CEGL001161, G3)
- *Betula occidentalis* / *Maianthemum stellatum* Shrubland (CEGL001162, G4?)
- *Betula occidentalis* / Mesic Graminoids Shrubland (CEGL002654, G3)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Populus angustifolia* / *Betula occidentalis* Woodland (CEGL000648, G3)
- *Populus angustifolia* / *Rhus trilobata* Woodland (CEGL000652, G3)
- *Populus balsamifera ssp. trichocarpa* / *Alnus incana* Forest (CEGL000667, G3)
- *Populus balsamifera ssp. trichocarpa* / Mixed Herbs Forest (CEGL000675, G3?)
- *Populus fremontii* / *Acer negundo* Forest (CEGL000662, G2Q)
- *Populus fremontii* / *Leymus triticoides* Woodland (CEGL002756, GNR)
- *Populus fremontii* / Mesic Forbs Woodland (CEGL002470, GNR)
- *Populus fremontii* / Mesic Graminoids Woodland (CEGL002473, GNR)
- *Populus fremontii* / *Salix exigua* Forest (CEGL000666, GNR)
- *Populus fremontii* / *Salix geeyeriana* Woodland (CEGL000943, G3?)
- *Salix lasiolepis* / *Rosa woodsii* / Mixed Herbs Shrubland (CEGL001217, G3Q)
- *Salix lemmonii* / Mesic-Tall Forbs Shrubland (CEGL002771, G3?)
- *Salix lemmonii* / *Rosa woodsii* Shrubland (CEGL002772, G3)
- *Salix lutea* / *Carex utriculata* Shrubland (CEGL001220, G4)
- *Salix lutea* / Mesic Forbs Shrubland (CEGL002774, G3?)

Alliances:

- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Artemisia cana* (*ssp. bolanderi*, *ssp. viscidula*) Shrubland Alliance (A.2557)
- *Artemisia nova* Shrubland Alliance (A.1105)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Betula occidentalis* Temporarily Flooded Shrubland Alliance (A.967)

- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Populus angustifolia* Temporarily Flooded Woodland Alliance (A.641)
- *Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus fremontii* Seasonally Flooded Woodland Alliance (A.654)
- *Populus fremontii* Temporarily Flooded Forest Alliance (A.313)
- *Populus fremontii* Temporarily Flooded Woodland Alliance (A.644)
- *Salix lasiolepis* Temporarily Flooded Shrubland Alliance (A.977)
- *Salix lemmonii* Seasonally Flooded Shrubland Alliance (A.2523)
- *Salix lutea* Seasonally Flooded Shrubland Alliance (A.1007)
- *Salix lutea* Temporarily Flooded Shrubland Alliance (A.980)

DISTRIBUTION

Range: Occurs in mountain ranges of the Great Basin and along the eastern slope of the Sierra Nevada within a broad elevation range from about 1220 m (4000 feet) to over 2135 m (7000 feet).

Divisions: 304:C

Nations: US

Subnations: CA, NV, OR, UT

Map Zones: 6:C, 7:C, 9:C, 10:C, 12:C, 13:C, 16:?, 17:C, 18:C, 21:P

USFS Ecomap Regions: 322A:CC, 341A:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342J:CC, M261E:CC, M261G:CP, M331D:??, M332A:??, M341A:CC, M341D:CC

TNC Ecoregions: 6:P, 11:C, 12:C

SOURCES

References: Barbour and Billings 1988, Barbour and Major 1977, Comer et al. 2003, Manning and Padgett 1989, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722664#references

Description Author: J. Nachlinger and K. Schulz

Version: 16 Apr 2003

Concept Author: J. Nachlinger and K. Schulz

Stakeholders: West
ClassifResp: West

HIGH ALLEGHENY WETLAND (CES202.069)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: >180-day hydroperiod; Bog and Fen Mosaic; Fen; Montane; Marsh; Swamp; Peat and mud; Temperate; Extensive Wet Flat; Depressional; Unglaciated; Palustrine; Bog; Depression

National Mapping Codes: ESLF 9356

CONCEPT

Summary: This system occurs along the high plateau of the Allegheny Mountains, immediately west of the Allegheny Front at elevations between 730 and 1430 m. Wetlands in this system are drained by low-gradient, meandering, intermittent to small headwater streams. Drainage is impounded in high, flat-lying basins by natural dams or "knickpoints" of resistant sandstone. In addition to poor moisture drainage, cold air drains from the surrounding uplands to pool in the flat basins, which function as frost pockets. Rainfall is plentiful, averaging about 1300 mm/year. Communities in this system may have substrates of shallow to deep peat or, less commonly, mineral soil. Soils are acidic to circumneutral. These high Allegheny wetlands form complex mosaics ranging in size from a few hectares to 6000 hectares. Forested swamps occupy the less disturbed margins or slightly higher "islands." Ombrotrophic bogs are rare but occur in undisturbed portions of a few of the larger wetlands. The more central, flood- or beaver-influenced portions contain shrub swamps, sedge fens, wet meadows, and open marshes. Forested swamps are dominated by *Picea rubens*, with varying cover by *Acer rubrum*, *Tsuga canadensis*, and *Betula alleghaniensis* var. *alleghaniensis*. Where limestone or calcareous shale influences seepage water, *Abies balsamea* and *Fraxinus nigra* are typical canopy dominants. Common shrub species are *Viburnum nudum* var. *cassinoides*, *Rhododendron maximum*, *Vaccinium myrtilloides*, *Alnus incana* ssp. *rugosa*, *Hypericum densiflorum*, *Ilex verticillata*, and *Photinia melanocarpa*. Herbaceous species frequently include *Rubus hispidus*, *Solidago uliginosa*, *Juncus effusus*, *Eriophorum virginicum*, *Osmunda cinnamomea* var. *cinnamomea*, *Polygonum sagittatum*, *Carex folliculata*, *Carex gynandra*, *Leersia oryzoides*, *Galium tinctorium*, *Solidago rugosa*, *Symplocarpus foetidus*, *Lycopus uniflorus* var. *uniflorus*, *Scirpus cyperinus*, *Carex scoparia* var. *scoparia*, and *Carex trisperma* var. *trisperma*. *Sphagnum* spp. and *Polytrichum* spp. dominate the bryophyte layer. This system is maintained by a spatially complex mix of seepage, low-energy flooding, beaver activity, and rainfall.

Similar Ecological Systems:

- North-Central Appalachian Acidic Swamp (CES202.604)
- Southern and Central Appalachian Bog and Fen (CES202.300)
- Southern Appalachian Seepage Wetland (CES202.317)

DESCRIPTION

Environment: This system occurs along the high plateau of the Allegheny Mountains, immediately west of the Allegheny Front at elevations between 730 and 1430 m. Wetlands in this system are drained by low-gradient, meandering, intermittent to small streams that form the headwaters of larger (often high-gradient) mountain rivers. The system is underlain by gently folded sedimentary rocks of Carboniferous and Devonian age. Drainage is impounded in high, flat-lying basins by natural dams or "knickpoints" of resistant sandstone (Pottsville and Price formations). These sandstone layers come to the surface along the gently dipping axes of breached anticlines or synclines, or occasionally on the gently dipping limb of a fold. Cold air drains from the surrounding uplands to pool in the flat basins, which function as frost pockets. Rainfall is plentiful, averaging about 1300 mm/year. Communities in this system may have substrates of shallow to deep peat (a few centimeters to up to 3 m depth) or, less commonly, mineral soil. Soils are acidic to circumneutral, with pH ranging from 3.1 to 6.5. High values for soil organic matter, total exchange capacity, exchangeable nitrogen, soluble sulphur, and phosphorus are typical. Most soils are low in boron, copper, potassium, and manganese.

Vegetation: These high Allegheny wetlands form complex mosaics of small-patch communities. Forested swamps occupy the less disturbed margins or slightly higher "islands" in the wetland mosaic. Ombrotrophic bogs are rare but occur in undisturbed portions of a few of the larger wetlands. The more central, flood- or beaver-influenced sections contain shrub swamps, sedge fens, wet meadows, and open marshes. A number of species have northern affiliations, including some that are disjunct (e.g., *Abies balsamea*, *Larix laricina*, and *Andromeda polifolia* var. *glaucophylla*). The shrub strata include characteristic central Appalachian species (e.g., *Rhododendron maximum*), Appalachian endemic species (e.g., *Ilex collina*), and species with a more southern affiliation (e.g., *Vaccinium erythrocarpum*). Forested swamps are dominated by *Picea rubens*, with varying cover by *Acer rubrum*, *Tsuga canadensis*, and *Betula alleghaniensis* var. *alleghaniensis*. Where limestone or calcareous shale influences seepage water, *Abies balsamea* and *Fraxinus nigra* are typical canopy dominants. Common shrub species are *Viburnum nudum* var. *cassinoides*, *Rhododendron maximum*, *Vaccinium myrtilloides*, *Alnus incana* ssp. *rugosa*, *Hypericum densiflorum*, *Ilex verticillata*, *Photinia melanocarpa*, *Viburnum recognitum*, and *Kalmia latifolia*. Herbaceous species frequently include *Rubus hispidus*, *Solidago uliginosa*, *Juncus effusus*, *Eriophorum virginicum*, *Osmunda cinnamomea* var. *cinnamomea*, *Polygonum sagittatum*, *Carex folliculata*, *Carex gynandra*, *Leersia oryzoides*, *Galium tinctorium*, *Solidago rugosa*, *Symplocarpus foetidus*, *Lycopus uniflorus* var. *uniflorus*, *Scirpus cyperinus*, *Carex scoparia* var. *scoparia*, *Carex trisperma* var. *trisperma*, *Carex stipata*, and *Calamagrostis canadensis* var. *canadensis*. *Sphagnum* spp. and *Polytrichum* spp. dominate the bryophyte layer.

Dynamics: This system is maintained by a spatially complex mix of seepage, low-energy flooding, beaver activity, and rainfall. Drainage in the flat headwater basins is partly impounded by resistant sandstone at the basin outlet. Low-gradient, meandering headwater streams provide regular low-energy inundation. Seepage from surrounding forests provides nutrients at the margins of the wetland mosaic, and where limestone or calcareous shale is present, circumneutral wetlands are maintained. Beaver activity encourages the cycling of early- to mid-successional types. In the rare ombrotrophic bogs, rainfall is the only source of moisture. Many of the forested swamps in this system were logged during 1880-1920, and some were subsequently burned and/or heavily grazed. Undisturbed examples exist (e.g., Cranberry Glades), where old-growth swamp buffers the central peatlands, which have been dated to 10,000 years. In presettlement time, some wetland mosaics in this system had significant forested components (e.g., Canaan Valley, Cranesville Swamp), while others (e.g., Cranberry Glades, Big Run Bog) were largely open peatlands with forested swamp only on the margins.

MEMBERSHIP

Associations:

- (*Andromeda polifolia* var. *glaucophylla*) / *Polytrichum strictum* - *Cladina* spp. - *Sphagnum* spp. Nonvascular Vegetation (CEGL006589, G1)
- *Abies balsamea* - *Picea rubens* / *Danthonia compressa* - *Lycopodium* spp. / *Sphagnum* spp. Forest (CEGL006592, G2)
- *Abies balsamea* - *Picea rubens* / *Ilex verticillata* / *Sphagnum* spp. Forest (CEGL006591, G2)
- *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132, GNR)
- *Alnus incana* - *Viburnum recognitum* / *Calamagrostis canadensis* Shrubland [Provisional] (CEGL006546, GNR)
- *Alnus incana* Swamp Shrubland (CEGL002381, G5)
- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549, GNR)
- *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534, G2?)
- *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Vegetation (CEGL007771, G2)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation (CEGL006412, G4G5)
- *Chrysosplenium americanum* Herbaceous Vegetation (CEGL006193, G3G5)
- *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation (CEGL006552, GNR)
- *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation (CEGL006570, G3)
- *Fraxinus nigra* - *Abies balsamea* / *Rhamnus alnifolia* Forest (CEGL006003, G1)
- *Hypericum densiflorum* / *Rubus hispidus* Shrubland (CEGL006464, GNR)
- *Larix laricina* / *Photinia melanocarpa* / *Sphagnum* spp. Forest (CEGL002472, G4?)
- *Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL006461, GNR)
- *Photinia pyrifolia* - *Ilex verticillata* - *Nemopanthus mucronatus* / *Osmunda cinnamomea* Saturated Shrubland (CEGL006545, GNR)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest (CEGL006277, G2?)
- *Picea rubens* - *Acer rubrum* / *Ilex verticillata* Forest (CEGL006556, G3)
- *Picea rubens* / *Carex trisperma* / *Sphagnum* spp. - *Polytrichum* spp. Forest (CEGL006590, G2)
- *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588, G2G3)
- *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* Forest (CEGL006593, G2)
- *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* Forest (CEGL006594, GNR)
- *Salix sericea* Shrubland (CEGL006305, GNR)
- *Schoenoplectus (tabernaemontani, acutus)* Eastern Herbaceous Vegetation (CEGL006275, GNR)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation (CEGL006349, GNR)
- *Solidago rugosa* - *Euthamia graminifolia* Herbaceous Vegetation (CEGL006568, GNR)
- *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510, G2G3)
- *Spiraea alba* Shrubland [Provisional] (CEGL006595, GNR)
- *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Shrubland (CEGL006571, GNR)
- *Vaccinium myrtilloides* / *Pteridium aquilinum* / *Polytrichum* spp. Shrubland (CEGL006596, GNR)
- *Vaccinium oxycoccos* - (*Vaccinium macrocarpon*) / *Rhynchospora alba* - *Drosera rotundifolia* / *Sphagnum* spp. Dwarf-shrubland (CEGL007856, G2)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (atlantica, echinata)* - *Eriophorum virginicum* - *Rhynchospora capitellata* - *Solidago patula* Saturated Herbaceous Alliance (A.1450)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)

- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Chrysosplenium americanum* Saturated Herbaceous Alliance (A.1685)
- *Eriophorum* spp. Saturated Herbaceous Alliance (A.2624)
- *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance (A.347)
- *Larix laricina* Saturated Forest Alliance (A.349)
- *Leersia oryzoides* - *Glyceria striata* Seasonally Flooded Herbaceous Alliance (A.1399)
- Low Forbs Mixed Herbaceous Alliance (A.3537)
- *Picea rubens* - *Abies balsamea* Saturated Forest Alliance (A.202)
- *Picea rubens* - *Acer rubrum* Saturated Forest Alliance (A.450)
- *Picea rubens* Saturated Forest Alliance (A.198)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Salix sericea* Seasonally Flooded Shrubland Alliance (A.3028)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Sparganium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
- *Sphagnum cuspidatum* - *Cladopodiella fluitans* Saturated Nonvascular Alliance (A.3006)
- *Spiraea* (*alba*, *tomentosa*) - *Rubus* spp. Seasonally Flooded Shrubland Alliance (A.3022)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)
- *Vaccinium macrocarpon* Saturated Dwarf-shrubland Alliance (A.1094)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system of wetland mosaics ranging in size from 5 to 6000 ha. Individual associations comprising the mosaic occur in small patches from 0.05 to 10 ha in size.

Adjacent Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)
- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Adjacent Ecological System Comments: Occurrences are embedded in Central and Southern Appalachian Spruce-Fir Forest (CES202.028), Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593), or Southern Appalachian Northern Hardwood Forest (CES202.029).

DISTRIBUTION

Range: The system occurs in a southwest/northeast-trending band about 40 km wide and 200 km long along the high, flat plateau of the Allegheny Mountains. The eastern boundary is the Allegheny Front, and the western boundary is the heavily dissected, lower elevation Allegheny Plateau. Minimum elevations range from 730 m in the north (Garrett County, Maryland) to 940 m in the south (Droop Mountain, West Virginia). The maximum elevation is 1422 m on Mount Porte Crayon, West Virginia.

Divisions: 202:C

Nations: US

Subnations: MD, PA?, WV

Map Zones: 61:C

USFS Ecomap Regions: M221B:CC

TNC Ecoregions: 59:C

SOURCES

References: Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.800809#references

Description Author: E.A. Byers and S. Gawler

Version: 01 May 2007

Concept Author: E.A. Byers and S. Gawler

Stakeholders: East

ClassifResp: East

INTERIOR HIGHLANDS FORESTED ACIDIC SEEP (CES202.321)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Ozark/Ouachita; Seepage-Fed Sloping

Non-Diagnostic Classifiers: Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9311

CONCEPT

Summary: This system of forested seeps occurs mainly in the Ouachita Mountains of central Arkansas, as well as on Mount Magazine and in the Ozarks. Examples may be found along the bottom slopes of smaller valleys where rock fractures allow water to seep out of the mountainsides and in the riparian zones of larger creeks, sometimes extending upslope along small ephemeral drainages. The soil remains saturated to very moist throughout the year. The vegetation is typically forested with highly variable canopy composition. *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, *Liquidambar styraciflua*, and *Quercus alba* are common and typical. Other canopy species may include *Fagus grandifolia* and *Magnolia tripetala*. Canopy coverage can be moderately dense to quite open. The subcanopy is often well-developed and characteristically includes *Ilex opaca* var. *opaca*, *Magnolia tripetala*, *Carpinus caroliniana*, and *Ostrya virginiana*.

Classification Comments: There are physiognomically and compositionally similar forested seep systems in the Appalachian Plateau that lack abundant evergreen ericads and are apparently less sphagnous. Examples from the Ozarks (on sandstone) are apparently less species-rich and may be associated with more acidic substrates; these are also included here.

DESCRIPTION

Environment: Examples of this system of forested seeps may be found along the bottom slopes of smaller valleys of the Ouachita Mountains of central Arkansas (where rock fractures allow water to seep out of the mountainsides), and in the riparian zones of larger creeks, sometimes extending upslope along small ephemeral drainages. The soil remains saturated to very moist throughout the year. More information is needed on the environmental details of Ozarkian examples.

Vegetation: Stands are typically forested with highly variable canopy composition. Some common and typical components are *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, *Liquidambar styraciflua*, and *Quercus alba*. Other canopy species may include *Fagus grandifolia* and *Magnolia tripetala*. The subcanopy is often well-developed and characteristically includes *Ilex opaca* var. *opaca*, *Magnolia tripetala*, *Carpinus caroliniana*, and *Ostrya virginiana*.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Carex* spp. / *Climacium americanum* Forest (CEGL002407, GU)
- *Acer rubrum* var. *trilobum* - *Liquidambar styraciflua* - *Magnolia tripetala* / *Osmunda regalis* - (*Cypripedium kentuckiense*) Forest (CEGL007444, G3?)
- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhexia mariana* var. *interior* Forest (CEGL007822, G2?)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance (A.347)

SPATIAL CHARACTERISTICS

Spatial Summary: Many are less than one hectare in area, but riparian seeps are often much larger.

DISTRIBUTION

Range: This system is found in the Ozark and Ouachita mountains of Arkansas, possibly extending into adjacent Oklahoma and Missouri.

Divisions: 202:C

Nations: US

Subnations: AR, MO?, OK?

Map Zones: 44:C

USFS Ecomap Regions: 223A:CC, M223A:CC, M231A:CC

TNC Ecoregions: 38:C, 39:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723179#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 26 Jan 2006
Concept Author: T. Foti and R. Evans

Stakeholders: Midwest, Southeast
ClassifResp: Southeast

1481 LAURENTIAN-ACADIAN ALKALINE CONIFER-HARDWOOD SWAMP (CES201.575)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Mesotrophic Water; Circumneutral Water; Depressional; *Thuja occidentalis* - *Fraxinus nigra*

Non-Diagnostic Classifiers: Saturated Soil; Moderate (100-500 yrs) Persistence; Forest and Woodland (Treed); Mineral: W/ A-Horizon >10 cm; Mineral: W/ A-Horizon <10 cm; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

National Mapping Codes: EVT 2481; ESLF 9345; ESP 1481

CONCEPT

Summary: These forested wetlands are found across northern New England and the upper Midwest and eastern to south-central Canada in basins where higher pH and/or nutrient levels are associated with a rich flora. The substrate is typically mineral soil, but there may be some peat; often, there is an organic epipedon over mineral soil. *Thuja occidentalis* is a diagnostic canopy species and may dominate the canopy or be mixed with other conifers or with deciduous trees, most commonly *Acer rubrum* or *Fraxinus nigra*. Some examples can be almost entirely deciduous and dominated by *Fraxinus nigra*. *Cornus sericea* is a common shrub. The herb layer tends to be more diverse than in acidic swamps. Small open fenny areas may occur within the wetland. Seepage may influence parts of the wetland, but the hydrology is dominated by the basin setting.

Classification Comments: This system encompasses both wet forests (on saturated mineral soils) and forest rich peatlands. Areas dominated by *Fraxinus nigra* and found throughout the Laurentian area in Minnesota and north of Green Bay in Wisconsin are included in this system.

Similar Ecological Systems:

- Laurentian-Acadian Alkaline Fen (CES201.585)
- North-Central Interior and Appalachian Rich Swamp (CES202.605)
- Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574)

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus* spp. - *Betula papyrifera* / *Cornus canadensis* Forest (CEGL002071, G4)
- *Fraxinus nigra* - Mixed Hardwoods - Conifers / *Cornus sericea* / *Carex* spp. Forest (CEGL002105, G4)
- *Larix laricina* / *Alnus incana* Forest (CEGL002471, G4)
- *Populus tremuloides* - *Populus balsamifera* - Mixed Hardwoods Lowland Forest (CEGL005036, G5)
- *Thuja occidentalis* - (*Larix laricina*) Seepage Forest (CEGL002455, G3G4)
- *Thuja occidentalis* - (*Picea mariana*, *Abies balsamea*) / *Alnus incana* Forest (CEGL002456, G4)
- *Thuja occidentalis* - *Acer rubrum* / *Cornus sericea* Forest (CEGL006199, GNR)
- *Thuja occidentalis* - *Betula alleghaniensis* Forest (CEGL002450, G2Q)
- *Thuja occidentalis* - *Fraxinus nigra* Forest (CEGL005165, GNR)
- *Thuja occidentalis* - *Larix laricina* / *Sphagnum* spp. Forest (CEGL005225, GNR)
- *Thuja occidentalis* / *Sphagnum* (*girgensohnii*, *warnstorffii*) Forest (CEGL006007, GNR)
- *Tsuga canadensis* - *Betula alleghaniensis* Saturated Forest (CEGL005003, G3)

Alliances:

- *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance (A.347)
- *Larix laricina* Saturated Forest Alliance (A.349)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Thuja occidentalis* - *Acer rubrum* Saturated Forest Alliance (A.446)
- *Thuja occidentalis* - *Betula alleghaniensis* Forest Alliance (A.417)
- *Thuja occidentalis* Saturated Forest Alliance (A.200)
- *Tsuga canadensis* Saturated Forest Alliance (A.201)

DISTRIBUTION

Range: Scattered locations from New England and adjacent Canada west to the Great Lakes and northern Minnesota.

Divisions: 201:C

Nations: US

Subnations: CT, ME, MI, MN, NY, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211Aa:CCC, 211Ab:CCC, 211Ba:CCC, 211Bb:CCC, 211Ca:CCC, 211Cb:CCP, 211Ea:CCC, 211Eb:CCP, 211Ec:CCC, 211Ed:CCC, 211Ee:CCC, 211Fb:CCC, 211Ja:CCP, 211Jb:CCP, 211Jc:CCP, 211Jd:CCC, 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 222Ib:CCC, 222Ic:CCC, 222Id:CCP, 222Ie:CCC,

222Ja:CCC, 222Ue:CCC, M211Aa:CCP, M211Ab:CCC, M211Ac:CCP, M211Ad:CCP, M211Ae:CCC, M211Af:CCC, M211Ba:CCC, M211Bb:CCP, M211Ca:CCC, M211Cb:CCC, M211Da:CCC, M211Db:CCC, M211Dc:CCC, M211Dd:CCC, M211De:CCC

TNC Ecoregions: 47:C, 48:C, 60:C, 61:C, 63:C, 64:C

SOURCES

References: Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723030#references

Description Author: S.C. Gawler

Version: 14 Dec 2004

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest
ClassifResp: East

LAURENTIAN-ACADIAN ALKALINE FEN (CES201.585)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Mesotrophic Water; Alkaline Water; Circumneutral Water; Organic Peat (>40 cm)

Non-Diagnostic Classifiers: Shallow (<15 cm) Water; Saturated Soil; Moderate (100-500 yrs) Persistence; Shrubland (Shrub-dominated); Extensive Wet Flat; Depressional; Broad-Leaved Shrub; Dwarf-Shrub; Graminoid

National Mapping Codes: ESLF 9198

CONCEPT

Summary: These fens, distributed across glaciated eastern and central North America, develop in open basins where bedrock or other substrate influence creates circumneutral to calcareous conditions. They are most abundant in areas of limestone bedrock, and widely scattered in areas where calcareous substrates are scarce. Shore fens, which are peatlands that are occasionally flooded along stream and lakeshores, are also included here because flooding tends to create moderately alkaline conditions. The vegetation may be graminoid-dominated, shrub-dominated, or a patchwork of the two; *Dasiphora fruticosa ssp. floribunda* is a common diagnostic shrub. The herbaceous flora is usually species-rich and includes calciphilic graminoids and forbs. *Sphagnum* dominates the substrate; *Campylium stellatum* is an indicator bryophyte. The edge of the basin may be shallow to deep peat over a sloping substrate, where seepage waters provide nutrients.

Classification Comments: Need to clarify the conceptual boundaries between this and the boreal fens in central and eastern Canada. Alkaline wooded swamps, some of which have fen-like characteristics, are treated under Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575).

Similar Ecological Systems:

- Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575)
- North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702)

MEMBERSHIP

Associations:

- *Alnus incana* - *Salix* spp. - *Betula pumila* / *Chamaedaphne calyculata* Shrubland (CEGL005227, GNR)
- *Betula pumila* - *Dasiphora fruticosa ssp. floribunda* / *Carex lasiocarpa* - *Trichophorum alpinum* Shrubland (CEGL002495, G3G5)
- *Betula pumila* / *Chamaedaphne calyculata* / *Carex lasiocarpa* Shrubland (CEGL002494, G4G5)
- *Carex (interior, hystericina, flava)* - *Trichophorum alpinum* / *Campylium stellatum* Shrub Herbaceous Vegetation (CEGL006331, G2G3)
- *Carex lasiocarpa* - (*Carex rostrata*) - *Equisetum fluviatile* Herbaceous Vegetation (CEGL005229, GNR)
- *Carex lasiocarpa* - *Calamagrostis* spp. - (*Eleocharis rostellata*) Herbaceous Vegetation (CEGL002383, G3G4)
- *Carex lasiocarpa* - *Carex buxbaumii* - *Trichophorum caespitosum* Boreal Herbaceous Vegetation (CEGL002500, G4G5)
- *Carex lasiocarpa* - *Trichophorum caespitosum* - *Rhynchospora capillacea* / *Andromeda polifolia* Herbaceous Vegetation (CEGL002496, G2Q)
- *Chamaedaphne calyculata* - *Myrica gale* / *Carex lasiocarpa* Dwarf-shrubland (CEGL005228, G4G5)
- *Dasiphora fruticosa ssp. floribunda* / *Carex (sterilis, hystericina, flava)* Shrub Herbaceous Vegetation (CEGL006326, G2)
- *Dasiphora fruticosa ssp. floribunda* / *Carex lasiocarpa* / *Campylium stellatum* Shrub Herbaceous Vegetation (CEGL006525, GNR)
- *Myrica gale* - *Dasiphora fruticosa ssp. floribunda* / *Carex lasiocarpa* - *Cladium mariscoides* Shrub Herbaceous Vegetation (CEGL006068, G2G3)
- *Myrica gale* / *Carex lasiocarpa* - *Lobelia kalmii* - *Trichophorum alpinum* Shrub Herbaceous Vegetation [Provisional] (CEGL006160, G3G4)
- *Thuja occidentalis* - (*Myrica gale*) / *Trichophorum alpinum* / *Drepanocladus* spp. Shrubland (CEGL005193, GNR)
- *Thuja occidentalis* - *Abies balsamea* / *Ledum groenlandicum* / *Carex trisperma* Woodland (CEGL006507, GNR)

Alliances:

- *Betula pumila* - (*Salix* spp.) Saturated Shrubland Alliance (A.1021)
- *Carex (flava, hystericina, interior, sterilis)* Saturated Shrub Herbaceous Alliance (A.1561)
- *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1453)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Dasiphora fruticosa ssp. floribunda* - *Myrica gale* - (*Carex lasiocarpa*) Saturated Shrubland Alliance (A.1017)
- *Dasiphora fruticosa ssp. floribunda* / *Carex (flava, interior, lasiocarpa, sterilis)* Saturated Shrub Herbaceous Alliance (A.1562)
- *Myrica gale* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1563)
- *Thuja occidentalis* Saturated Woodland Alliance (A.583)

DISTRIBUTION

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

Range: Scattered locations from New England and adjacent Canada west to the Great Lakes and northern Minnesota.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: MA, ME, MI, MN, NB, NH, NY, PA, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 65:P, 66:C

USFS Ecomap Regions: 211A:CP, 211E:CC, 211F:CP, 211I:CC, 212Ha:CCP, 212Hb:CCP, 212Hc:CCP, 212Hd:CCP, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCP, 212Hi:CCC, 212Hj:CCP, 212Hk:CCC, 212Hl:CCC, 212Hm:CCP, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Q:CP, 212Ra:CCP, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212S:CC, 212Tb:CCC, 212Te:CCP, 212X:CC, 212Y:CC, 212Z:CC, 221A:CC, 221B:CC, 222I:CC, M211A:CP, M211B:CP, M211C:CC

TNC Ecoregions: 47:C, 48:C, 60:C, 61:C, 63:C, 64:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723021#references

Description Author: S.C. Gawler

Version: 14 Dec 2004

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: East

1513 LOWER MISSISSIPPI RIVER FLATWOODS (CES203.193)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: EVT 2513; ESLF 9191; ESP 1513

CONCEPT

Summary: This system is comprised of forests, prairies and woodlands on Pleistocene terraces in the Mississippi Alluvial Plain of Arkansas, Missouri and Louisiana. It occurs primarily west of Crowley's Ridge on Pleistocene glacial outwash deposits in Arkansas and Missouri, and on Macon Ridge in Louisiana and adjacent Arkansas. The sites are above modern floodplains, but have poor internal drainage and are flat with poor runoff, leading to very wet conditions in winter and spring. They also often have a claypan that restricts both internal drainage and, later in the year, water availability. Therefore, they are very wet in the winter/spring and very dry in the summer, a moisture regime termed hydroxeric. Because of this moisture regime, the communities are variable, ranging from willow oak flats to post oak flats to prairies. In the 1940s, the Arkansas Game and Fish Commission produced a wildlife habitat map of Arkansas in which these sites were classified as "terrace hardwood forests." These communities have a large variety of upland and lowland tree species, ranging from post oak to overcup oak in a small area. Such species diversity may be explained by regeneration of species with dramatically different moisture tolerances on the same site in dry and wet years on these hydroxeric sites. Because the sites are above current floodplains and susceptible to being drained, they have been cleared at an even greater rate than nearby floodplain forests.

Classification Comments: T. Foti (pers. comm. 2007): "I think it does encompass the Louisiana Mesic Hardwood Flatwoods, and the species listed in that description look good for the whole system. Do we want to leave the potential for prairies in this system or include them in the Grand Prairie system? I am inclined to think that small prairie inclusions should remain in this system and larger, individually definable prairies, such as those formerly across the White River from the Grand Prairie proper, could be included in that system. That distinction might be mentioned in the description. The Grand Prairie should be listed as a similar ecological system."

Similar Ecological Systems:

- Lower Mississippi Alluvial Plain Grand Prairie (CES203.549)
- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)

Related Concepts:

- Mesic Hardwood Flatwood (LNHP 2004) Finer
- Wet Hardwood Flatwood (LNHP 2004) Finer

DESCRIPTION

Environment: The sites where this system is found are above modern floodplains, but have poor internal drainage and are flat with poor runoff, leading to very wet conditions in winter and spring. They also often have a claypan that restricts both internal drainage and, later in the year, water availability. Therefore, they are very wet in the winter/spring and very dry in the summer, a moisture regime termed hydroxeric. In Louisiana, distinct mesic and wet community variants are recognized (LNHP 2004).

Vegetation: The communities of this system are variable, ranging from willow oak flats to post oak flats to prairies. In examples on Macon Ridge (Louisiana), overstory dominants include *Carya alba*, *Nyssa sylvatica*, *Quercus alba*, *Quercus pagoda*, *Quercus nigra*, *Quercus michauxii*, and *Liquidambar styraciflua*. In addition, *Quercus shumardii* and *Quercus falcata* are fairly frequent but not usually abundant. Common midstory trees include *Cornus florida*, *Ostrya virginiana*, *Aralia spinosa*, *Ulmus alata*, *Sassafras albidum*, and *Acer rubrum*. Important shrubs/small trees are *Vaccinium arboreum*, *Vaccinium virgatum*, *Viburnum rufidulum*, *Crataegus marshallii*, *Aesculus pavia*, *Frangula caroliniana*, *Asimina triloba*, *Hypericum hypericoides*, and *Euonymus americanus*. Although infrequent, *Hamamelis virginiana* can be locally abundant. Important woody vines include *Toxicodendron radicans*, *Parthenocissus quinquefolia*, *Vitis rotundifolia*, *Vitis aestivalis*, and *Smilax smallii*. *Toxicodendron radicans* and *Parthenocissus quinquefolia* are usually thick on the ground, as well as being represented by high climbing individuals. Common and characteristic herbaceous plants include *Chasmanthium sessiliflorum*, *Dichantheium boscii*, *Podophyllum peltatum*, *Carex cherokeensis*, *Elephantopus carolinianus*, *Elephantopus tomentosus*, *Scleria oligantha*, *Aristolochia serpentaria*, *Botrychium virginianum*, *Passiflora lutea*, *Dioscorea villosa*, *Clitoria mariana*, *Sanicula canadensis*, *Geum canadense*, *Galium circaezans*, *Agrimonia rostellata*, *Spigelia marilandica*, *Clematis virginiana*, *Phryma leptostachya*, *Ruellia caroliniensis*, and *Smallanthus uvedalius* (LNHP 2004).

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)

Adjacent Ecological System Comments: These flatwoods are above existing floodplains and they are ecologically controlled by edaphic factors and precipitation.

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from the Missouri "bootheel" south to Louisiana. In Louisiana it is found on Macon Ridge (Ecoregion 73j (EPA 2004)). It is not reported from Kentucky, Tennessee, or Mississippi.

Divisions: 203:C

Nations: US

Subnations: AR, LA, MO

Map Zones: 45:C, 98:P

USFS Ecomap Regions: 234A:CC, 234D:CC

TNC Ecoregions: 42:C

SOURCES

References: EPA 2004, Foti pers. comm., LNHP 2004, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768783#references

Description Author: T. Foti and M. Pyne

Version: 30 Jan 2006

Concept Author: T. Foti and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MEDITERRANEAN CALIFORNIA ALKALI MARSH (CES206.947)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Alkaline Water; Saline Water Chemistry; Shallow (<15 cm) Water; Caliche Layer; Mediterranean [Mediterranean Xeric-Oceanic]; Depressional

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Lowland [Lowland]; Woody-Herbaceous; Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9188

CONCEPT

Summary: These highly variable systems occur in scattered locations throughout the California Central Valley and along California's south coast extending into Baja Norte, all at elevations below 300 m (1000 feet). They are found in old lake beds or in floodplains of major river systems where seasonal water inputs are limited, and often include some groundwater seepage. High rates of evaporation lead to alkaline water and soil conditions, with layers of salt encrusted soils often accumulating near seeps. These are highly variable in plant composition, but often include *Distichlis spicata*, *Juncus balticus*, *Anemopsis californica*, *Schoenoplectus americanus* (= *Scirpus americanus*), *Atriplex* spp., *Triglochin maritima*, and *Cirsium* spp. Endemic plant species include *Puccinellia howellii*.

Related Concepts:

- Wetlands (217) (Shiflet 1994) Broader

DISTRIBUTION

Range: Scattered locations throughout the California Central Valley and along California's south coast extending into Baja Norte, all at elevations below 300 m (1000 feet).

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 2:P, 4:C, 5:C

USFS Ecomap Regions: 261B:CC, 262A:CC, 322A:PP, 342B:??, M332G:??

TNC Ecoregions: 13:C, 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722734#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

MISSISSIPPI RIVER BOTTOMLAND DEPRESSION (CES203.490)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9352

CONCEPT

Summary: This system represents semipermanently flooded to saturated depressional areas of the lower Mississippi River Alluvial Valley, from southern Illinois south to Mississippi and Louisiana. These areas have a distinctly longer hydroperiod than other parts of the landscape. Typical and characteristic trees in examples of this system include *Acer rubrum* var. *drummondii*, *Carya aquatica*, *Fraxinus profunda*, *Gleditsia aquatica*, *Nyssa aquatica*, *Nyssa biflora*, *Planera aquatica*, *Quercus lyrata*, *Quercus palustris*, *Salix nigra*, and *Taxodium distichum*. Some characteristic shrubs include *Cephalanthus occidentalis*, *Cornus foemina*, *Decodon verticillatus*, *Forestiera acuminata*, *Itea virginica*, and *Planera aquatica*. Herbs are uncommon, but *Ludwigia peploides*, *Sagittaria lancifolia*, *Ceratophyllum* spp., *Elodea* spp., *Potamogeton* spp., and *Lemna minor* may be found.

Related Concepts:

- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: Examples of this system are found in depressions and backswamps of the lower Mississippi River Alluvial Valley, from southern Illinois south to Mississippi and Louisiana. These areas have a distinctly longer hydroperiod than other parts of the landscape.

Vegetation: Typical and characteristic trees in examples of this system include *Acer rubrum* var. *drummondii*, *Carya aquatica*, *Fraxinus profunda*, *Gleditsia aquatica*, *Nyssa aquatica*, *Nyssa biflora*, *Planera aquatica*, *Quercus lyrata*, *Quercus palustris*, *Salix nigra*, and *Taxodium distichum*. Some characteristic shrubs include *Cephalanthus occidentalis*, *Cornus foemina*, *Decodon verticillatus*, *Forestiera acuminata*, *Itea virginica*, and *Planera aquatica*. Herbs are uncommon, but *Ludwigia peploides*, *Sagittaria lancifolia*, *Ceratophyllum* spp., *Elodea* spp., *Potamogeton* spp., and *Lemna minor* may be found.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Gleditsia aquatica* - *Planera aquatica* - *Fraxinus profunda* Forest (CEGL002422, G3G5)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Forestiera acuminata* - (*Planera aquatica*, *Cephalanthus occidentalis*) Shrubland (CEGL003911, G3?)
- *Gleditsia aquatica* - *Carya aquatica* Forest (CEGL007426, G3?)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Floodplain Forest [Placeholder] (CEGL007389, GNR)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation (CEGL004725, G4?)
- *Quercus lyrata* - *Quercus palustris* / *Acer rubrum* var. *drummondii* / *Itea virginica* - *Cornus foemina* - (*Lindera melissifolia*) Forest (CEGL004778, G2?)
- *Salix nigra* / (*Clethra alnifolia*, *Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)
- *Salix nigra* / *Sagittaria lancifolia* Forest (CEGL007436, G4?)
- *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Forest (CEGL002421, G3G5)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- *Taxodium distichum* / *Planera aquatica* - *Forestiera acuminata* Lakeshore Woodland (CEGL007909, GNR)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)

- *Forestiera acuminata* Semipermanently Flooded Shrubland Alliance (A.1012)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Taxodium distichum* - (*Taxodium ascendens*) Seasonally Flooded Lakeshore Woodland Alliance (A.652)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 47:?, 98:C

USFS Ecomap Regions: 232E:CC, 234A:CC, 234C:CC, 234D:CC, 234E:CC

TNC Ecoregions: 42:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723096#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 23 Jan 2008

Concept Author: T. Foti and R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MISSISSIPPI RIVER HIGH FLOODPLAIN (BOTTOMLAND) FOREST (CES203.196)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9180

CONCEPT

Summary: "High bottomlands" are often temporarily flooded on older Holocene point bars and natural levees, with flooding less frequent than every five years. Wetland functions are primarily driven by precipitation and are classed as floodplain flats in a hydrogeomorphic classification (Klimas et al. 2004). They are flooded less frequently than adjacent riparian floodplains or low floodplains. These floodplains are of particular conservation interest because they have been cleared to a greater extent than riparian or low floodplains because of the reduced flooding of these sites. Also, flood control levees protect many of these sites, and with protection from levees, almost all sites are cleared. Thus, most wetlands remaining in large bottomland areas are riparian or low bottomlands, and the species, communities and other characteristics of high bottomlands have been essentially lost. Wildlife agency partners generally would like to see this distinction recognized. Because many of these sites are adjacent to uplands or non-flooded hydroxic flatwoods, both of which have a relatively high fire frequency, and high floodplains are relatively dry, they have a much higher typical fire frequency than lower bottomlands. Therefore, under pre-development conditions, they would have been more open and had a higher ground layer diversity than other floodplain systems.

Similar Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)
- Mississippi River Riparian Forest (CES203.190)

Related Concepts:

- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: These "high bottomlands" are often temporarily flooded on older Holocene point bars and natural levees, with flooding less frequent than every five years. Wetland functions are primarily driven by precipitation and are classed as floodplain flats in a hydrogeomorphic classification (Klimas et al. 2004). They are flooded less frequently than adjacent riparian floodplains or low floodplains.

Vegetation: Typical dominant trees in stands of this system include *Liquidambar styraciflua*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus phellos*, *Quercus shumardii*, *Quercus texana*, and *Carya* spp. Southern examples may contain *Quercus virginiana* and/or *Magnolia grandiflora*, northern ones may contain *Quercus palustris*. Wetter inclusions may contain *Quercus lyrata*. Some stands which lack these species may exhibit dominance by *Fraxinus pennsylvanica*, *Ulmus americana* and *Celtis laevigata*. *Gleditsia triacanthos* may also be a component. *Ulmus crassifolia* may be more commonly found west of the Mississippi River. Some small trees and shrubs include *Cornus florida*, *Ilex decidua*, *Ilex opaca* var. *opaca*, *Viburnum dentatum*, and *Carpinus caroliniana*. Southern stands may contain *Sabal minor*. The perennial graminoid bamboo *Arundinaria gigantea* ssp. *gigantea* may dominate the shrub stratum of some forests, or it may form non-forested stands called "canebrakes." *Vitis rotundifolia*, *Ampelopsis arborea*, and *Campsis radicans* are common vines.

Dynamics: Regeneration of remaining examples today are typified by small gap regeneration or large patch regeneration in tornado tracks, but originally, fire may have opened larger patches in which regeneration occurred.

MEMBERSHIP

Associations:

- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Quercus laurifolia* - *Quercus nigra* Mississippi River Alluvial Plain Forest (CEGL007916, GNR)
- *Quercus michauxii* - *Quercus shumardii* - *Liquidambar styraciflua* / *Arundinaria gigantea* Forest (CEGL002099, G3G4)
- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus phellos* - (*Quercus lyrata*) / *Carex* spp. - *Leersia* spp. Forest (CEGL002102, G3G4Q)

- *Quercus phellos* - (*Quercus similis*) - *Ulmus crassifolia* Forest (CEGL007921, G3G4)
- *Quercus phellos* - *Quercus nigra* - *Liquidambar styraciflua* Mississippi River Alluvial Plain Forest (CEGL007915, G4G5)
- *Quercus texana* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* - (*Gleditsia triacanthos*) Forest (CEGL004619, G4G5)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Forest (CEGL004648, G2)
- *Quercus virginiana* - *Quercus nigra* - *Liquidambar styraciflua* / *Ilex opaca* var. *opaca* / *Viburnum dentatum* Forest (CEGL007476, G2G3)
- *Quercus virginiana* - *Quercus pagoda* - *Magnolia grandiflora* / *Cornus florida* / *Sanicula* sp. Forest (CEGL007469, G2G3)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Vine-Shrubland (CEGL004620, GNA)

Alliances:

- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* Temporarily Flooded Forest Alliance (A.376)
- *Quercus virginiana* - *Quercus nigra* Saturated Forest Alliance (A.379)
- *Quercus virginiana* - *Quercus pagoda* Forest Alliance (A.375)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Seasonally Flooded Vine-Shrubland Alliance (A.993)

SPATIAL CHARACTERISTICS

Size: Large patch.

Adjacent Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 47:C, 98:C

USFS Ecomap Regions: 232E:CC, 234A:CC, 234C:CC, 234D:CC, 234E:CC

TNC Ecoregions: 42:C

SOURCES

References: Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768761#references

Description Author: T. Foti and M. Pyne

Version: 18 Apr 2005

Concept Author: T. Foti and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MISSISSIPPI RIVER LOW FLOODPLAIN (BOTTOMLAND) FOREST (CES203.195)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9183

CONCEPT

Summary: "Low bottomlands" are usually seasonally flooded in backswamps, with flooding more frequent than every five years, usually more frequently than every two years, generally by still water that may be impounded behind natural levees, and are classed as Low Gradient Riverine Backwater wetlands in hydrogeomorphic classifications. Low bottomlands occur along the Mississippi River and its tributaries in the Mississippi River Alluvial Plain ecoregion. Prolonged flooding dominates this system, and its duration is greater than in the adjacent Mississippi River Riparian Forest. Overcup oak is the characteristic dominant species. Soils are clayey with poor internal drainage.

Similar Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- Mississippi River Riparian Forest (CES203.190)--Flooding is of lower duration.

Related Concepts:

- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: "Low bottomlands" are usually seasonally flooded in backswamps, with flooding more frequent than every five years, usually more frequently than every two years, generally by still water that may be impounded behind natural levees, and are classed as Low Gradient Riverine Backwater wetlands in hydrogeomorphic classifications (Klimas et al. 2004).

Dynamics: Changes in soils and vegetation of this system are much slower than in the adjacent Mississippi River Riparian Forest. Regeneration is through small treefall gaps or large tornado tracks.

MEMBERSHIP

Associations:

- *Quercus lyrata* - *Carya aquatica* - (*Quercus texana*) / *Forestiera acuminata* Forest (CEGL002423, G3?)
- *Quercus lyrata* - *Liquidambar styraciflua* / *Forestiera acuminata* Forest (CEGL002424, G4?)
- *Quercus texana* - *Quercus lyrata* Forest (CEGL007407, G3G4)

Alliances:

- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus texana* - (*Quercus lyrata*) Seasonally Flooded Forest Alliance (A.331)

SPATIAL CHARACTERISTICS

Size: Large patch.

Adjacent Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- Mississippi River Riparian Forest (CES203.190)

Adjacent Ecological System Comments: Flooding is of lower duration in riparian forests and soil deposition is often more rapid, leading to rapid vegetation changes.

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 47:C, 98:C

USFS Ecomap Regions: 232E:CC, 234A:CC, 234C:CC, 234D:CC, 234E:CC

TNC Ecoregions: 42:C

SOURCES

References: Klimas et al. 1981, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768395#references

Description Author: T. Foti and M. Pyne

Version: 17 Feb 2005

Concept Author: T. Foti, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MISSISSIPPI RIVER RIPARIAN FOREST (CES203.190)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9161

CONCEPT

Summary: This system is comprised of "riverfront" Associations, generally temporarily (but rarely seasonally) flooded on point bars and natural levees adjacent to the river that formed them, with flooding more frequent than every five years, by flowing water directly from the stream. They occur along the lower Mississippi River and its tributaries in the Mississippi River Alluvial Plain ecoregion. They are classed as Low Gradient Riverine Overbank wetlands in a hydrogeomorphic classification. Flooding is of lower duration than on adjacent backswamps where water is impounded behind riverfront natural levees. Flooding is of longer duration than on adjacent high bottomlands that are typically temporarily flooded. Soils are typically sandier than those of low bottomlands.

Arundinaria gigantea is a common understory in these forests on natural levees and higher point bars, and may become dominant after thinning or removal of overstory. Willow and cottonwood sandbars may have an open-canopy (woodland-type) structure.

Similar Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)

Related Concepts:

- Riparian Forest (Evans 1991) Broader

DESCRIPTION

Environment: Stands of this system are generally temporarily (but rarely seasonally) flooded on point bars and natural levees adjacent to the river that formed them, with flooding more frequent than every five years, by flowing water directly from the stream. They are classed as Low Gradient Riverine Overbank wetlands in a hydrogeomorphic classification (Klimas et al. 2004). Flooding is of lower duration than on adjacent backswamps where water is impounded behind riverfront natural levees. Flooding is of longer duration than on adjacent high bottomlands that are typically temporarily flooded. Soils are typically sandier than those of low bottomlands.

Vegetation: Some of the most typical and characteristic tree species found in stands of this system include *Acer negundo*, *Acer saccharinum*, *Platanus occidentalis*, *Populus deltoides*, and *Salix nigra*. Other trees may include *Celtis laevigata*, *Carya illinoensis*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Liquidambar styraciflua*, *Quercus nigra*, *Quercus pagoda*, *Quercus texana*, *Ulmus americana*, and *Ulmus crassifolia*. In addition, *Quercus virginiana* may be present within its range. *Arundinaria gigantea* ssp. *gigantea* is a common understory component in these forests on natural levees and higher point bars, and may become dominant after thinning or removal of the overstory.

Dynamics: Often on sites with rapid soil deposition and, therefore, with rapid development of vegetation from low-diversity willow- and cottonwood-dominated communities to more diverse communities dominated by sycamore, pecan, sugarberry, green ash or Nuttall oak. Regeneration is through small treefall gaps or large tornado tracks.

MEMBERSHIP

Associations:

- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Acer saccharinum* - *Ulmus americana* Forest (CEGL002586, G4?)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Carya illinoensis* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* Mississippi River Alluvial Plain Forest (CEGL007912, G2G3)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Celtis laevigata* - (*Liquidambar styraciflua*) Forest (CEGL007913, G4)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Quercus laurifolia* - *Quercus nigra* Mississippi River Alluvial Plain Forest (CEGL007916, GNR)
- *Quercus texana* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* - (*Gleditsia triacanthos*) Forest (CEGL004619, G4G5)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Forest (CEGL004648, G2)
- *Quercus virginiana* - *Quercus nigra* - *Liquidambar styraciflua* / *Ilex opaca* var. *opaca* / *Viburnum dentatum* Forest (CEGL007476, G2G3)
- *Quercus virginiana* - *Quercus pagoda* - *Magnolia grandiflora* / *Cornus florida* / *Sanicula* sp. Forest (CEGL007469, G2G3)

- *Salix nigra* / (*Clethra alnifolia*, *Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Carya illinoensis* - (*Celtis laevigata*) Temporarily Flooded Forest Alliance (A.282)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* Temporarily Flooded Forest Alliance (A.376)
- *Quercus virginiana* - *Quercus nigra* Saturated Forest Alliance (A.379)
- *Quercus virginiana* - *Quercus pagoda* Forest Alliance (A.375)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)

SPATIAL CHARACTERISTICS

Size: Large patch.

Adjacent Ecological Systems:

- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 47:C, 98:C

USFS Ecomap Regions: 232E:CC, 234A:CC, 234C:CC, 234D:CC, 234E:CC

TNC Ecoregions: 42:C

SOURCES

References: Klimas et al. 1981, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768386#references

Description Author: T. Foti and M. Pyne

Version: 30 Jan 2006

Concept Author: T. Foti, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

NORTH AMERICAN WARM DESERT LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND (CES302.748)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Riverine / Alluvial

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Lowland [Lowland]; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]

National Mapping Codes: ESLF 9172

CONCEPT

Summary: This ecological system occurs in foothill and mountain canyons and valleys of the warm desert regions of the southwestern U.S. and adjacent Mexico, and consists of mid-to low-elevation (1100-1800 m) riparian corridors along perennial and seasonally intermittent streams. Rivers include upper portions of the Gila, Santa Cruz, Salt, San Pedro, and tributaries of the lower Colorado River (below the Grand Canyon), the lower Rio Grande and Pecos (up to its confluence with Rio Hondo) that occur in the desert portions of their range. The vegetation is a mix of riparian woodlands and shrublands. Dominant trees include *Populus angustifolia*, *Populus deltoides* ssp. *wislizeni*, *Populus fremontii*, *Platanus wrightii*, *Juglans major*, *Fraxinus velutina*, and *Sapindus saponaria*. Shrub dominants include *Salix exigua*, *Prunus* spp., *Alnus oblongifolia*, and *Baccharis salicifolia*. Vegetation is dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction.

Related Concepts:

- Arizona Cypress: 240 (Eyre 1980) Intersecting
- Cottonwood - Willow: 235 (Eyre 1980) Broader
- Riparian Woodland (203) (Shiflet 1994) Broader. System and SRM type overlap in Mojave Desert region of California.

MEMBERSHIP

Associations:

- *Alhagi maurorum* Semi-natural Shrubland (CEGL002784, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Elaeagnus angustifolia* Semi-natural Woodland (CEGL005269, GNA)
- *Juglans major* - *Pinus edulis* / *Bromus carinatus* Forest (CEGL001101, GUQ)
- *Juglans major* Forest [Provisional] (CEGL001102, GU)
- *Juglans microcarpa* / *Cladium mariscus* ssp. *jamaicense* Shrubland (CEGL004593, G2?)
- *Juglans microcarpa* / *Sorghastrum nutans* Shrubland (CEGL004594, G2G3)
- *Juglans microcarpa* Shrubland (CEGL001103, GNR)
- *Platanus wrightii* - *Alnus oblongifolia* / *Baccharis salicifolia* Forest (CEGL002686, G2)
- *Platanus wrightii* - *Fraxinus velutina* Forest (CEGL000644, GNR)
- *Platanus wrightii* - *Juglans major* Forest (CEGL000645, G2)
- *Platanus wrightii* / *Quercus oblongifolia* Woodland (CEGL005325, GNR)
- *Platanus wrightii* / *Quercus oblongifolia* Woodland [Provisional] (CEGL005338, GNR)
- *Platanus wrightii* Woodland (CEGL000937, GNR)
- *Populus angustifolia* - *Juniperus depeana* / *Brickellia californica* Woodland (CEGL000933, G4Q)
- *Populus angustifolia* / *Alnus oblongifolia* Woodland (CEGL000938, G4)
- *Populus angustifolia* / *Salix exigua* Woodland (CEGL000654, G4)
- *Populus angustifolia* / *Salix irrorata* Woodland (CEGL002647, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Artemisia tridentata* Woodland (CEGL005966, G2G3)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* ssp. *wislizeni* / *Acer negundo* Woodland (CEGL002336, GNR)
- *Populus deltoides* ssp. *wislizeni* / *Baccharis sarothroides* Forest (CEGL000663, GNR)
- *Populus deltoides* ssp. *wislizeni* / Disturbed Understory Woodland (CEGL003810, GNR)
- *Populus deltoides* ssp. *wislizeni* / *Rhus trilobata* Woodland (CEGL000940, G2)
- *Populus fremontii* - *Fraxinus velutina* Woodland (CEGL000942, G2G3)
- *Populus fremontii* - *Platanus wrightii* Forest (CEGL000665, G2)
- *Populus fremontii* - *Salix gooddingii* / *Baccharis salicifolia* Forest (CEGL002683, G2)
- *Populus fremontii* - *Salix gooddingii* / *Salix exigua* Forest (CEGL002684, G2)
- *Populus fremontii* - *Salix gooddingii* Woodland (CEGL000944, G2)
- *Populus fremontii* / *Acer negundo* Forest (CEGL000662, G2Q)
- *Populus fremontii* / *Baccharis emoryi* Woodland [Provisional] (CEGL002946, GNR)

- *Populus fremontii* / *Baccharis salicifolia* Woodland (CEGL000941, G2)
- *Populus fremontii* / *Betula occidentalis* Wooded Shrubland (CEGL002981, GNR)
- *Populus fremontii* / Mesic Forbs Woodland (CEGL002470, GNR)
- *Populus fremontii* / Mesic Graminoids Woodland (CEGL002473, GNR)
- *Populus fremontii* / *Muhlenbergia rigens* Woodland (CEGL001455, G2)
- *Populus fremontii* / *Salix geyeriana* Woodland (CEGL000943, G3?)
- *Populus fremontii* Forest [Placeholder] (CEGL000661, G2Q)
- *Rhus trilobata* - *Prunus serotina* Shrubland (CEGL001119, GUQ)
- *Robinia neomexicana* / *Thalictrum fendleri* Shrubland (CEGL001125, GNR)
- *Salix bonplandiana* Forest (CEGL000679, GNR)
- *Salix exigua* / *Agrostis stolonifera* Shrubland (CEGL001199, GNA)
- *Salix exigua* / *Elymus X pseudorepens* Shrubland (CEGL001198, G3)
- *Salix gooddingii* - *Fraxinus velutina* Temporarily Flooded Woodland (CEGL003729, G2)
- *Salix gooddingii* Woodland (CEGL002743, G3)
- *Salix irrorata* Shrubland (CEGL001214, GNR)
- *Salix laevigata* - *Fraxinus velutina* Woodland (CEGL000950, G1G2)
- *Salix laevigata* Woodland [Provisional] (CEGL002952, GNR)
- *Tamarix* spp. Temporarily Flooded Semi-natural Shrubland (CEGL003114, GNA)

Alliances:

- *Alhagi maurorum* Semi-natural Shrubland Alliance (A.2567)
- *Betula occidentalis* Temporarily Flooded Shrubland Alliance (A.967)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Elaeagnus angustifolia* Semi-natural Woodland Alliance (A.3566)
- *Juglans major* Temporarily Flooded Forest Alliance (A.957)
- *Juglans microcarpa* Temporarily Flooded Shrubland Alliance (A.945)
- *Platanus wrightii* Temporarily Flooded Forest Alliance (A.309)
- *Platanus wrightii* Temporarily Flooded Woodland Alliance (A.643)
- *Populus angustifolia* Temporarily Flooded Woodland Alliance (A.641)
- *Populus deltoides* ssp. *wislizeni* Temporarily Flooded Forest Alliance (A.312)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Populus fremontii* Seasonally Flooded Woodland Alliance (A.654)
- *Populus fremontii* Temporarily Flooded Forest Alliance (A.313)
- *Populus fremontii* Temporarily Flooded Woodland Alliance (A.644)
- *Rhus trilobata* Intermittently Flooded Shrubland Alliance (A.938)
- *Robinia neomexicana* Shrubland Alliance (A.924)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix bonplandiana* Temporarily Flooded Forest Alliance (A.314)
- *Salix gooddingii* Temporarily Flooded Woodland Alliance (A.640)
- *Salix irrorata* Temporarily Flooded Shrubland Alliance (A.976)
- *Salix laevigata* Temporarily Flooded Woodland Alliance (A.646)
- *Tamarix* spp. Semi-natural Temporarily Flooded Shrubland Alliance (A.842)

DISTRIBUTION

Range: This system occurs in southern Arizona, New Mexico, and adjacent Mexico, as well as in the desert mountain ranges of southeastern California, at low elevations. It also occurs in southern Nevada and western Texas.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXBS(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 12:C, 13:C, 14:C, 15:C, 16:?, 17:P, 24:C, 25:C, 26:C, 27:P

USFS Ecomap Regions: 313A:CC, 313C:CC, 315A:CC, 315B:CC, 321A:CC, 322A:CC, 322B:CC, 341F:CC, M261E:CC, M313A:CC, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000a, Szaro 1989, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722924#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Stakeholders: Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

NORTH AMERICAN WARM DESERT RIPARIAN MESQUITE BOSQUE (CES302.752)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Lowland]; Toeslope/Valley Bottom; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Riverine / Alluvial; Prosopis spp.-dominated

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated)

National Mapping Codes: ESLF 9178

CONCEPT

Summary: This ecological system consists of low-elevation (<1100 m) riparian corridors along perennial and intermittent streams in valleys of the warm desert regions of the southwestern U.S. and adjacent Mexico. Rivers include the lower Colorado (within and downstream of the Grand Canyon), Gila, Santa Cruz, Salt, lower Rio Grande, Pecos (up to near its confluence with Rio Hondo), and their tributaries that occur in the desert portions of their range. Dominant trees include *Prosopis glandulosa* and *Prosopis velutina*. Shrub dominants include *Baccharis salicifolia*, *Pluchea sericea*, and *Salix exigua*. Woody vegetation is relatively dense, especially when compared to drier washes. Vegetation, especially the mesquites, tap groundwater below the streambed when surface flows stop. Vegetation is dependent upon annual rise in the water table for growth and reproduction.

MEMBERSHIP

Associations:

- *Baccharis salicifolia* / *Muhlenbergia rigens* Shrubland (CEGL004572, G3?)
- *Baccharis sarothroides* - *Baccharis salicifolia* Shrubland (CEGL001160, G4)
- *Baccharis sarothroides* - *Parkinsonia microphylla* Shrubland (CEGL001159, G4)
- *Baccharis sergiloides* Shrubland [Placeholder] (CEGL002953, GNR)
- *Pluchea sericea* Seasonally Flooded Shrubland (CEGL003080, G3?)
- *Prosopis (glandulosa var. torreyana, velutina)* Woodland [Placeholder] (CEGL003082, G3?)
- *Prosopis glandulosa* - *Artemisia filifolia* / *Sporobolus giganteus* Shrubland (CEGL002192, G4)
- *Prosopis glandulosa* - *Atriplex* spp. Shrubland (CEGL002193, GNR)
- *Prosopis glandulosa* / *Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa* / *Bouteloua curtipendula* - *Nassella leucotricha* Woodland (CEGL002133, G3?)
- *Prosopis glandulosa* / *Bouteloua curtipendula* Shrubland (CEGL002194, GNR)
- *Prosopis glandulosa* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001510, G3G4)
- *Prosopis glandulosa* / *Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa* / Mixed Grasses Shrubland (CEGL001384, GNRQ)
- *Prosopis glandulosa* / *Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa* / *Pleuraphis mutica* Shrub Herbaceous Vegetation (CEGL001641, G5)
- *Prosopis glandulosa* / *Sporobolus airoides* Shrubland (CEGL001385, G5)
- *Prosopis glandulosa* / *Sporobolus flexuosus* Shrubland (CEGL001386, G4)
- *Prosopis glandulosa* Temporarily Flooded Woodland (CEGL004934, GNR)
- *Prosopis glandulosa var. glandulosa* / *Bouteloua gracilis* - *Buchloe dactyloides* Shrubland (CEGL003877, GNR)
- *Prosopis glandulosa var. torreyana* Shrubland (CEGL001381, G3)
- *Prosopis pubescens* Shrubland (CEGL001387, G1?)
- *Prosopis velutina* - *Acacia greggii* Shrubland (CEGL001388, GUQ)
- *Prosopis velutina* - *Acacia greggii* Woodland [Provisional] (CEGL005340, GNR)
- *Prosopis velutina* / *Amaranthus palmeri* Woodland [Provisional] (CEGL005341, GNR)
- *Prosopis velutina* / *Celtis laevigata var. reticulata* Shrubland (CEGL001390, GNR)
- *Prosopis velutina* / *Muhlenbergia porteri* Shrubland (CEGL001391, G3Q)
- *Prosopis velutina* / *Sorghum halepense* Semi-natural Woodland [Provisional] (CEGL005342, GNR)

Alliances:

- *Baccharis salicifolia* Intermittently Flooded Shrubland Alliance (A.933)
- *Baccharis sarothroides* Intermittently Flooded Shrubland Alliance (A.840)
- *Baccharis sergiloides* Intermittently Flooded Shrubland Alliance (A.2531)
- *Pleuraphis mutica* Shrub Herbaceous Alliance (A.1551)
- *Pluchea sericea* Seasonally Flooded Shrubland Alliance (A.798)
- *Prosopis (glandulosa, velutina)* Woodland Alliance (A.661)
- *Prosopis glandulosa* Shrub Herbaceous Alliance (A.1550)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)

- *Prosopis glandulosa* Temporarily Flooded Woodland Alliance (A.637)
- *Prosopis glandulosa* Woodland Alliance (A.611)
- *Prosopis pubescens* Shrubland Alliance (A.1042)
- *Prosopis velutina* Shrubland Alliance (A.1043)

DISTRIBUTION

Range: This system is found along perennial and intermittent streams in valleys of southern Arizona, southern Nevada, southeastern California, New Mexico, western Texas, and adjacent Mexico. Major rivers include the lower Colorado (within and downstream of the Grand Canyon), Gila, Santa Cruz, Salt, lower Rio Grande, Pecos (up to near its confluence with Rio Hondo), and their tributaries that occur in the desert portions of their range.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 13:C, 14:C, 15:C, 23:?, 25:C, 26:C, 27:?

USFS Ecomap Regions: 313C:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, M313A:PP, M313B:PP

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000a, Muldavin et al. 2000b, Szaro 1989, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722920#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Stakeholders: Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

NORTH AMERICAN WARM DESERT RIPARIAN WOODLAND AND SHRUBLAND (CES302.753)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Lowland]; Forest and Woodland (Tree); Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Riverine / Alluvial

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Toeslope/Valley Bottom

National Mapping Codes: ESLF 9182

CONCEPT

Summary: This ecological system consists of low-elevation (<1200 m) riparian corridors along medium to large perennial streams throughout canyons and desert valleys of the southwestern United States and adjacent Mexico. Rivers include the lower Colorado (into the Grand Canyon), Gila, Santa Cruz, Salt, lower Rio Grande (below Elephant Butte Reservoir in New Mexico to the Coastal Plain of Texas), and the lower Pecos (up to near its confluence with Rio Hondo in southeastern New Mexico). The vegetation is a mix of riparian woodlands and shrublands. Dominant trees include *Acer negundo*, *Fraxinus velutina*, *Populus fremontii*, *Salix gooddingii*, *Salix lasiolepis*, *Celtis laevigata* var. *reticulata*, *Platanus racemosa*, and *Juglans major*. Shrub dominants include *Salix geyeriana*, *Shepherdia argentea*, and *Salix exigua*. Vegetation is dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction.

Similar Ecological Systems:

- Edwards Plateau Riparian (CES303.652)
- Southeastern Great Plains Riparian (CES205.709)

Related Concepts:

- Cottonwood - Willow: 235 (Eyre 1980) Broader

MEMBERSHIP

Associations:

- *Acer negundo* - *Celtis laevigata* var. *reticulata* Woodland (CEGL002599, GNR)
- *Arundo donax* Riverbank Herbaceous Vegetation (CEGL004101, GNA)
- *Baccharis salicifolia* Riparian Shrubland (CEGL003549, G5)
- *Celtis laevigata* var. *reticulata* - *Juglans microcarpa* / *Leptochloa dubia* Shrubland (CEGL002166, GNR)
- *Celtis laevigata* var. *reticulata* / *Celtis pallida* Shrubland (CEGL001163, G3)
- *Chilopsis linearis* / *Brickellia laciniata* Shrubland (CEGL004933, G3G4)
- *Elaeagnus angustifolia* Semi-natural Woodland (CEGL005269, GNA)
- *Fallugia paradoxa* Desert Wash Shrubland (CEGL002357, GNR)
- *Juglans major* - *Pinus edulis* / *Bromus carinatus* Forest (CEGL001101, GUQ)
- *Juglans major* - *Prosopis velutina* Forest (CEGL005326, GNR)
- *Juglans major* Forest [Provisional] (CEGL001102, GU)
- *Juglans microcarpa* / *Cladium mariscus* ssp. *jamaicense* Shrubland (CEGL004593, G2?)
- *Juglans microcarpa* / *Sorghastrum nutans* Shrubland (CEGL004594, G2G3)
- *Juglans microcarpa* Shrubland (CEGL001103, GNR)
- *Parkinsonia florida* - *Olneya tesota* Woodland [Placeholder] (CEGL003035, G3?)
- *Platanus wrightii* - *Alnus oblongifolia* / *Baccharis salicifolia* Forest (CEGL002686, G2)
- *Platanus wrightii* - *Fraxinus velutina* Forest (CEGL000644, GNR)
- *Platanus wrightii* - *Juglans major* Forest (CEGL000645, G2)
- *Platanus wrightii* Woodland (CEGL000937, GNR)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Artemisia tridentata* Woodland (CEGL005966, G2G3)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* / *Muhlenbergia asperifolia* Forest (CEGL000678, G3)
- *Populus deltoides* ssp. *wislizeni* / *Acer negundo* Woodland (CEGL002336, GNR)
- *Populus deltoides* ssp. *wislizeni* / *Baccharis sarothroides* Forest (CEGL000663, GNR)
- *Populus deltoides* ssp. *wislizeni* / *Rhus trilobata* Woodland (CEGL000940, G2)
- *Populus fremontii* - *Celtis laevigata* var. *reticulata* / *Salvia pinguifolia* Forest (CEGL000664, GU)
- *Populus fremontii* - *Fraxinus velutina* Woodland (CEGL000942, G2G3)
- *Populus fremontii* - *Platanus wrightii* Forest (CEGL000665, G2)
- *Populus fremontii* - *Salix gooddingii* / *Baccharis salicifolia* Forest (CEGL002683, G2)
- *Populus fremontii* - *Salix gooddingii* / *Salix exigua* Forest (CEGL002684, G2)
- *Populus fremontii* - *Salix gooddingii* Woodland (CEGL000944, G2)

- *Populus fremontii* / *Acer negundo* Forest (CEGL000662, G2Q)
- *Populus fremontii* / *Baccharis salicifolia* Woodland (CEGL000941, G2)
- *Populus fremontii* / *Celtis laevigata* var. *reticulata* / *Mahonia haematocarpa* Woodland [Provisional] (CEGL005339, GNR)
- *Populus fremontii* / *Ericameria nauseosa* Woodland (CEGL002465, GNR)
- *Populus fremontii* / *Leymus triticoides* Woodland (CEGL002756, GNR)
- *Populus fremontii* / *Muhlenbergia rigens* Woodland (CEGL001455, G2)
- *Populus fremontii* Forest [Placeholder] (CEGL000661, G2Q)
- *Salix exigua* / *Agrostis stolonifera* Shrubland (CEGL001199, GNA)
- *Salix exigua* / Barren Shrubland (CEGL001200, G5)
- *Salix gooddingii* - *Fraxinus velutina* Temporarily Flooded Woodland (CEGL003729, G2)
- *Salix gooddingii* Woodland (CEGL002743, G3)
- *Tamarix* spp. Temporarily Flooded Semi-natural Shrubland (CEGL003114, GNA)

Alliances:

- *Acer negundo* Temporarily Flooded Woodland Alliance (A.642)
- *Arundo donax* Temporarily Flooded Herbaceous Alliance (A.1339)
- *Baccharis salicifolia* Intermittently Flooded Shrubland Alliance (A.933)
- *Celtis laevigata* var. *reticulata* Shrubland Alliance (A.1033)
- *Chilopsis linearis* Intermittently Flooded Shrubland Alliance (A.1044)
- *Elaeagnus angustifolia* Semi-natural Woodland Alliance (A.3566)
- *Fallugia paradoxa* Intermittently Flooded Shrubland Alliance (A.934)
- *Juglans major* Temporarily Flooded Forest Alliance (A.957)
- *Juglans microcarpa* Temporarily Flooded Shrubland Alliance (A.945)
- *Parkinsonia florida* - *Olneya tesota* Woodland Alliance (A.588)
- *Platanus wrightii* Temporarily Flooded Forest Alliance (A.309)
- *Platanus wrightii* Temporarily Flooded Woodland Alliance (A.643)
- *Populus deltoides* ssp. *wislizeni* Temporarily Flooded Forest Alliance (A.312)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Populus fremontii* Seasonally Flooded Woodland Alliance (A.654)
- *Populus fremontii* Temporarily Flooded Forest Alliance (A.313)
- *Populus fremontii* Temporarily Flooded Woodland Alliance (A.644)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix gooddingii* Temporarily Flooded Woodland Alliance (A.640)
- *Tamarix* spp. Semi-natural Temporarily Flooded Shrubland Alliance (A.842)

DISTRIBUTION

Range: This system occurs throughout canyons and desert valleys of the southwestern United States and adjacent Mexico. Major rivers and tributaries include the lower Colorado (up into the lower portions of the Grand Canyon), Gila, Salt, Rio Grande (from Elephant Butte Reservoir to the Gulf Coastal Plain), and the lower Pecos (near its confluence with Rio Hondo in southeastern New Mexico).

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 4:?, 13:C, 14:C, 15:C, 16:C, 17:?, 23:C, 24:?, 25:C, 26:C, 27:P, 35:P

USFS Ecomap Regions: 313A:CC, 313C:CC, 315A:CC, 315B:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, 341F:PP, M261E:CC, M313A:CP, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C, 29:P

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Griffith et al. 2004, Holland and Keil 1995, Muldavin et al. 2000a, Szaro 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722919#references

Description Author: NatureServe Western Ecology Team

Version: 23 Jan 2008

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

NORTH AMERICAN WARM DESERT WASH (CES302.755)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermittent Flooding; Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Riverine / Alluvial

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Sideslope

National Mapping Codes: ESLF 9151

CONCEPT

Summary: This ecological system is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of North America. Although often dry, the intermittent fluvial processes define this system, which are often associated with rapid sheet and gully flow. This system occurs as linear or braided strips within desert scrub-or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable, ranging from sparse and patchy to moderately dense, and typically occurs along the banks, but may occur within the channel. The woody layer is typically intermittent to open and may be dominated by shrubs and small trees such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Fallugia paradoxa*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Juglans microcarpa*, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psoralea spinosa*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, or *Sarcobatus vermiculatus*. Common upland shrubs such as *Larrea tridentata* and *Ambrosia dumosa* are often present along the edges of these washes.

Related Concepts:

- Creosotebush - Bursage (506) (Shiflet 1994) Intersecting. Washes occur as linear inclusions in the SRM type.
- Palo Verde - Cactus (507) (Shiflet 1994) Intersecting. Washes occur as linear inclusions in this SRM type.

MEMBERSHIP

Associations:

- *Acacia greggii* - *Parkinsonia microphylla* Shrubland (CEGL001340, G4G5)
- *Baccharis emoryi* Shrubland [Provisional] (CEGL002974, GNR)
- *Baccharis salicifolia* / *Muhlenbergia rigens* Shrubland (CEGL004572, G3?)
- *Baccharis sarothroides* - *Baccharis salicifolia* Shrubland (CEGL001160, G4)
- *Baccharis sarothroides* - *Parkinsonia microphylla* Shrubland (CEGL001159, G4)
- *Baccharis sergiloides* Shrubland [Placeholder] (CEGL002953, GNR)
- *Brickellia laciniata* - *Hymenoclea monogyra* Shrubland (CEGL001953, G4)
- *Chilopsis linearis* / *Brickellia laciniata* Shrubland (CEGL004933, G3G4)
- *Chilopsis linearis* Shrubland (CEGL001164, G3)
- *Encelia virginensis* Shrubland (CEGL001335, G4)
- *Ephedra californica* Shrubland [Placeholder] (CEGL002958, GNR)
- *Ericameria paniculata* Shrubland [Placeholder] (CEGL002706, G4G5)
- *Forestiera pubescens* Mojave Desert Shrubland [Provisional] (CEGL002959, GNR)
- *Grayia spinosa* - *Lycium andersonii* Shrubland (CEGL001347, G5)
- *Grayia spinosa* - *Lycium pallidum* Shrubland (CEGL001348, G5)
- *Hymenoclea monogyra* Thicket Shrubland (CEGL001169, G3)
- *Hymenoclea salsola* - (*Ambrosia eriocentra*) Shrubland (CEGL002702, G5)
- *Hymenoclea salsola* - *Salazaria mexicana* Shrubland (CEGL002703, G3?)
- *Hyptis emoryi* Shrubland [Placeholder] (CEGL002960, GNR)
- *Juglans microcarpa* / *Cladium mariscus* ssp. *jamaicense* Shrubland (CEGL004593, G2?)
- *Juglans microcarpa* / *Sorghastrum nutans* Shrubland (CEGL004594, G2G3)
- *Juglans microcarpa* Shrubland (CEGL001103, GNR)
- *Lepidospartum squamatum* Intermittently Flooded Shrubland [Placeholder] (CEGL003060, G3?)
- *Panicum bulbosum* - *Alopecurus aequalis* Herbaceous Vegetation (CEGL001653, G2)
- *Panicum bulbosum* - *Lycurus phleoides* Herbaceous Vegetation (CEGL001654, GNRQ)
- *Prosopis (glandulosa* var. *torreyana*, *velutina*) Woodland [Placeholder] (CEGL003082, G3?)
- *Prosopis glandulosa* - *Atriplex* spp. Shrubland (CEGL002193, GNR)
- *Prosopis glandulosa* / *Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa* / *Bouteloua curtipendula* - *Nassella leucotricha* Woodland (CEGL002133, G3?)
- *Prosopis glandulosa* / *Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001510, G3G4)
- *Prosopis glandulosa* / *Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa* / Mixed Grasses Shrubland (CEGL001384, GNRQ)

- *Prosopis glandulosa* / *Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa* / *Sporobolus airoides* Shrubland (CEGL001385, G5)
- *Prosopis glandulosa* Temporarily Flooded Woodland (CEGL004934, GNR)
- *Prosopis glandulosa* var. *glandulosa* / *Bouteloua gracilis* - *Buchloe dactyloides* Shrubland (CEGL003877, GNR)
- *Prosopis glandulosa* var. *torreyana* Shrubland (CEGL001381, G3)
- *Prosopis pubescens* Shrubland (CEGL001387, G1?)
- *Prosopis velutina* - *Acacia greggii* Shrubland (CEGL001388, GUQ)
- *Prosopis velutina* / *Celtis laevigata* var. *reticulata* Shrubland (CEGL001390, GNR)
- *Prosopis velutina* / *Mimosa dysocarpa* Shrubland [Provisional] (CEGL005346, GNR)
- *Prunus fasciculata* Shrubland [Placeholder] (CEGL002704, G4G5)
- *Psoralea spinosa* Shrubland [Placeholder] (CEGL002701, G4G5)
- *Rhus microphylla* / *Bouteloua curtipendula* Shrubland (CEGL001354, GNR)
- *Sapindus saponaria* - *Juglans major* Forest (CEGL000557, GNR)
- *Viguiera reticulata* Shrubland [Placeholder] (CEGL002962, GNR)

Alliances:

- *Acacia greggii* Shrubland Alliance (A.1036)
- *Baccharis salicifolia* Intermittently Flooded Shrubland Alliance (A.933)
- *Baccharis sarothroides* Intermittently Flooded Shrubland Alliance (A.840)
- *Baccharis sergiloides* Intermittently Flooded Shrubland Alliance (A.2531)
- *Brickellia laciniata* Intermittently Flooded Shrubland Alliance (A.940)
- *Chilopsis linearis* Intermittently Flooded Shrubland Alliance (A.1044)
- *Encelia virginensis* Shrubland Alliance (A.860)
- *Ephedra californica* Intermittently Flooded Shrubland Alliance (A.2536)
- *Ericameria paniculata* Intermittently Flooded Shrubland Alliance (A.2509)
- *Forestiera pubescens* Temporarily Flooded Shrubland Alliance (A.969)
- *Grayia spinosa* Intermittently Flooded Shrubland Alliance (A.1045)
- *Hymenoclea monogyra* Shrubland Alliance (A.1034)
- *Hymenoclea salsola* Shrubland Alliance (A.2512)
- *Hyptis emoryi* Intermittently Flooded Shrubland Alliance (A.2537)
- *Juglans microcarpa* Temporarily Flooded Shrubland Alliance (A.945)
- *Lepidospartum squamatum* Intermittently Flooded Shrubland Alliance (A.838)
- *Panicum bulbosum* Temporarily Flooded Herbaceous Alliance (A.1356)
- *Prosopis (glandulosa, velutina)* Woodland Alliance (A.661)
- *Prosopis glandulosa* Shrub Herbaceous Alliance (A.1550)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis glandulosa* Temporarily Flooded Woodland Alliance (A.637)
- *Prosopis glandulosa* Woodland Alliance (A.611)
- *Prosopis pubescens* Shrubland Alliance (A.1042)
- *Prosopis velutina* Shrubland Alliance (A.1043)
- *Prunus fasciculata* Intermittently Flooded Shrubland Alliance (A.2519)
- *Psoralea spinosa* Intermittently Flooded Shrubland Alliance (A.2520)
- *Rhus microphylla* Shrubland Alliance (A.1040)
- *Sapindus saponaria* Temporarily Flooded Forest Alliance (A.303)
- *Viguiera reticulata* Intermittently Flooded Shrubland Alliance (A.2539)

DISTRIBUTION

Range: This system is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of North America.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 4:P, 12:P, 13:C, 14:C, 15:P, 16:P, 17:C, 23:?, 24:C, 25:C, 26:C, 27:C

USFS Ecomap Regions: 261B:CC, 313A:CC, 313B:CP, 313C:CC, 313D:C?, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, 341E:C?, 341F:CC, M261E:PP, M313A:CC, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, MacMahon 1988, Muldavin et al. 2000b, Szaro 1989, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722917#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Stakeholders: Latin America, Southeast, West

NORTH PACIFIC BOG AND FEN (CES204.063)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Temperate [Temperate Oceanic]; Depressional; Organic Peat (>40 cm); Sphagnum spp.

National Mapping Codes: ESLF 9166

CONCEPT

Summary: This wetland system occurs in peatlands along the Pacific Coast from British Columbia south to northern California, in and west of the coastal mountain summits but including the Puget Sound lowlands. Elevations are mostly under 457 m (1500 feet), and annual precipitation ranges from 890-3050 mm (35-120 inches). These wetlands are relatively abundant in British Columbia but diminish rapidly in size and number farther south. They occur in river valleys, around lakes and marshes, or on slopes. The organic soils are characterized by an abundance of sodium cations from oceanic precipitation. Poor fens and bogs are often intermixed except in a few calcareous areas in British Columbia where rich fen vegetation may dominate. *Sphagnum* characterizes poor fens and bogs (pH <5.5), and the two are lumped here, while "brown mosses" and sedges characterize rich fens (pH >5.5). Mire profiles in British Columbia may be flat, raised (domed), or sloping, but most occurrences in Washington and Oregon are flat with only localized hummock development. Vegetation is usually a mix of conifer-dominated swamp, shrub swamp, and open sphagnum or sedge mire, often with small lakes and ponds interspersed. Vegetation includes many species common to boreal continental bogs and fens, such as *Ledum groenlandicum*, *Vaccinium uliginosum*, *Myrica gale*, *Andromeda polifolia*, *Vaccinium oxycoccos*, *Equisetum fluviatile*, *Comarum palustre*, and *Drosera rotundifolia*. However, it is also distinguished from boreal continental bogs and fens by the presence of Pacific coastal species, including *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, *Tsuga heterophylla*, *Ledum glandulosum*, *Thuja plicata*, *Gaultheria shallon*, *Spiraea douglasii*, *Carex aquatilis* var. *dives*, *Carex lynghyei*, *Carex obnupta*, *Carex pluriflora*, *Darlingtonia californica*, *Sphagnum pacificum*, *Sphagnum henryense*, and *Sphagnum mendocinum*.

Classification Comments: This system is distinguished and split from Boreal Depressional Bog (CES103.871) and Boreal Fen (CES103.872). The communities comprising this system are not well-described or classified. Several bog or fen ecological systems have recently (2007-2008) been classified for southeastern Alaska, hence this system no longer is considered to occur in Alaska. Where the "muskeg" of northern British Columbia should be placed is unclear and needs review from ecologists there. Discussion is that muskeg in the hypermaritime region is extensive, covering large areas of landscape, whereas this system in Oregon and Washington tends to occur in much smaller patches. How distinct is the hypermaritime muskeg of northern British Columbia from bogs and fens from central Vancouver Island south?

Similar Ecological Systems:

- Alaskan Pacific Maritime Dwarf-Shrub-Sphagnum Peatland (CES204.165)
- Alaskan Pacific Maritime Fen and Wet Meadow (CES204.158)
- Alaskan Pacific Maritime Mountain Hemlock Peatland (CES204.156)
- Alaskan Pacific Maritime Shore Pine Peatland (CES204.164)
- Boreal Depressional Bog (CES103.871)
- Boreal Fen (CES103.872)

Related Concepts:

- Labrador tea - Bog-laurel - Peat-moss (CWHvm1/Wb50) (Banner et al. 1993) Intersecting
- Lodgepole Pine: 218 (Eyre 1980) Intersecting
- Lt - Water sedge - Fen Moss (BWBSmw1/10) (DeLong et al. 1990) Intersecting
- Narrow-leaved cotton-grass - Peat-moss (CWHvm1/Wf50) (Banner et al. 1993) Intersecting
- Narrow-leaved cotton-grass - Peat-moss (MHmm1/Wf50) (Banner et al. 1993) Intersecting
- Non-forested bog (CWHvm1/31) (Banner et al. 1993) Intersecting
- Non-forested bog (CWHvm2/31) (Banner et al. 1993) Intersecting
- Non-forested bog (CWHwm/31) (Banner et al. 1993) Intersecting
- Non-forested bog (CWHws1/31) (Banner et al. 1993) Intersecting
- Non-forested bog (CWHws2/31) (Banner et al. 1993) Intersecting
- Non-forested bog (ESSFmk/31) (Banner et al. 1993) Intersecting
- Non-forested bog (ESSFwk2/31) (DeLong et al. 1994) Intersecting
- Non-forested bog (ICHmc2/31) (Banner et al. 1993) Intersecting
- Non-forested bog (ICHwc/31) (Banner et al. 1993) Intersecting
- Non-forested bog (SBPSmc/31) (Steen and Coupe 1997) Intersecting
- Non-forested bog (SBPSmc/31) (Banner et al. 1993) Intersecting
- Non-forested bog (SBSdk/31) (Steen and Coupe 1997) Intersecting
- Non-forested bog (SBSdk/31) (Banner et al. 1993) Intersecting

- Pl - Sphagnum (CWHms1/10) (Steen and Coupe 1997) Intersecting
- Pl - Sphagnum (CWHvm1/13) (Banner et al. 1993) Intersecting
- Pl - Sphagnum (CWHvm2/10) (Banner et al. 1993) Intersecting
- Pl - Sphagnum (CWHwm/10) (Banner et al. 1993) Intersecting
- Pl - Sphagnum (CWHws1/10) (Banner et al. 1993) Intersecting
- Pl - Sphagnum (CWHws2/10) (Banner et al. 1993) Intersecting
- Sedge - Sphagnum (ICHmw3/09) (Steen and Coupe 1997) Intersecting
- Sedge - Sphagnum (SBSmm/09) (Steen and Coupe 1997) Intersecting
- Sitka sedge - Peat-moss (CWHvh2/Wf51) (Banner et al. 1993) Intersecting
- Sitka sedge - Peat-moss (CWHvm1/Wf51) (Banner et al. 1993) Intersecting
- Sitka sedge - Peat-moss (CWHvm2/Wf51) (Banner et al. 1993) Intersecting
- Sitka sedge - Peat-moss (CWHwm/Wf51) (Banner et al. 1993) Intersecting
- Sitka sedge - Peat-moss (CWHws2/Wf51) (Banner et al. 1993) Intersecting
- Sitka sedge - Peat-moss (ICHvc/Wf51) (Banner et al. 1993) Intersecting
- Sitka sedge - Peat-moss (ICHwc/Wf51) (Banner et al. 1993) Intersecting
- Sitka sedge - Peat-moss (MHmm1/Wf51) (Banner et al. 1993) Intersecting
- Sitka Spruce: 223 (Eyre 1980) Intersecting
- Sweet gale - Sitka sedge (CWHvh2/Wf52) (Banner et al. 1993) Intersecting
- Sweet gale - Sitka sedge (CWHwm/Wf52) (Banner et al. 1993) Intersecting

DESCRIPTION

Dynamics: Successional patterns of wet meadows to fens to bogs in Alaska have been documented as follows, and are likely to be similar in this ecological system. Species that dominate the early stages of succession in newly formed ponded basins include *Equisetum variegatum*, *Equisetum fluviatile*, and *Comarum palustre*. *Sphagnum* species invade the surface and help in forming peat. Acidic and nutrient-poor-tolerant vascular species eventually dominate the sites, such as *Myrica gale*, *Empetrum nigrum*, *Vaccinium uliginosum*, *Andromeda polifolia*, and *Vaccinium oxycoccos* (= *Oxycoccus microcarpus*). The late-successional stage of a peatland supports various community types, depending on the pH, waterflow, and nutrient status of a site such as *Myrica gale* / *Empetrum nigrum* and *Picea sitchensis* / *Sphagnum* plant associations. Peat buildup, patterned ground, and changes in water table are recurrent aspects of peatland development rather than unidirectional successional events. It is unlikely that any of the late-seral peatland communities are stable in the sense of climax vegetation.

MEMBERSHIP

Associations:

- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826, G4)
- *Carex cusickii* - (*Menyanthes trifoliata*) Herbaceous Vegetation (CEGL003332, G2G3)
- *Carex limosa* Herbaceous Vegetation (CEGL001811, G2)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation (CEGL001831, G3)
- *Eriophorum chamissonis* / *Sphagnum* spp. Herbaceous Vegetation (CEGL003333, G4)
- *Kalmia microphylla* - *Ledum groenlandicum* / *Xerophyllum tenax* Shrubland (CEGL003359, G1)
- *Ledum glandulosum* - *Gaultheria shallon* / *Carex obnupta* Shrubland (CEGL003437, G2)
- *Ledum glandulosum* / *Carex obnupta* / *Sphagnum* spp. Shrubland (CEGL003434, G2)
- *Ledum glandulosum* / *Darlingtonia californica* / *Sphagnum* spp. Shrubland (CEGL003435, G2)
- *Ledum glandulosum* / *Sanguisorba officinalis* / *Sphagnum* spp. Shrubland (CEGL003436, G1G2)
- *Ledum groenlandicum* - *Kalmia microphylla* / *Sphagnum* spp. Shrubland (CEGL003414, G4)
- *Ledum groenlandicum* - *Myrica gale* / *Sphagnum* spp. Shrubland (CEGL003335, G2)
- *Malus fusca* Shrubland (CEGL003385, G3)
- *Myrica gale* / *Carex (aquatilis* var. *dives*, *utriculata*) Shrubland (CEGL003376, G3)
- *Pinus contorta* - (*Chamaecyparis nootkatensis*) / *Gaultheria shallon* Woodland (CEGL003205, G4G5)
- *Pinus contorta* / *Carex aquatilis* var. *dives* Woodland (CEGL003203, G3)
- *Pinus contorta* / *Empetrum nigrum* Woodland (CEGL003202, G5)
- *Pinus contorta* / *Trichophorum caespitosum* Woodland (CEGL003204, G4G5)
- *Pinus contorta* / *Vaccinium ovalifolium* Woodland (CEGL003206, G3)
- *Pinus contorta* var. *contorta* / *Ledum groenlandicum* / *Sphagnum* spp. Woodland (CEGL003337, G3)
- *Pinus monticola* / *Ledum groenlandicum* / *Sphagnum* spp. Woodland (CEGL003360, G1)
- *Rhynchospora alba* - (*Vaccinium oxycoccos*) / *Sphagnum tenellum* Herbaceous Vegetation [Provisional] (CEGL003338, G3)
- *Spiraea douglasii* / *Carex aquatilis* var. *dives* Shrubland (CEGL003415, G4)
- *Spiraea douglasii* / *Sphagnum* spp. Shrubland (CEGL003416, G3)
- *Spiraea douglasii* Shrubland (CEGL001129, G5)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Ledum groenlandicum* / *Sphagnum* spp. Forest (CEGL003339, G3)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Sphagnum* spp. Forest (CEGL003417, G1)
- *Tsuga heterophylla* / *Ledum glandulosum* / *Carex obnupta* - *Lysichiton americanus* Forest (CEGL000477, G1)

Alliances:

- *Carex aquatilis* var. *dives* Seasonally Flooded Herbaceous Alliance (A.1412)

- *Carex cusickii* Saturated Herbaceous Alliance (A.2580)
- *Carex limosa* Seasonally Flooded Herbaceous Alliance (A.1416)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Eriophorum* spp. Saturated Herbaceous Alliance (A.2624)
- *Ledum glandulosum* Saturated Shrubland Alliance (A.2514)
- *Ledum groenlandicum* Saturated Shrubland Alliance (A.2626)
- *Malus fusca* Seasonally Flooded Shrubland Alliance (A.2577)
- *Myrica gale* Seasonally Flooded Shrubland Alliance (A.3512)
- *Pinus contorta* Saturated Woodland Alliance (A.577)
- *Pinus monticola* Saturated Woodland Alliance (A.2593)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)
- *Tsuga heterophylla* Saturated Forest Alliance (A.203)

DISTRIBUTION

Range: This system occurs along the Pacific Coast from British Columbia south to northern California, west of the coastal mountain summits but including the Puget Sound lowlands. Occurrences diminish rapidly in size and number south of British Columbia.

Divisions: 204:C; 206:P

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CP, 342C:P?, 342H:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M332G:CC

TNC Ecoregions: 1:C, 2:C, 3:C, 69:P, 81:C

SOURCES

References: Banner et al. 1993, Comer et al. 2003, DeLong et al. 1990, DeLong et al. 1994, Eyre 1980, Steen and Coupe 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722029#references

Description Author: M.S. Reid, K. Boggs, J. Christy, mod. C. Chappell

Version: 08 Dec 2008

Concept Author: J.C. Christy

Stakeholders: Canada, West

ClassifResp: West

NORTH PACIFIC HARDWOOD-CONIFER SWAMP (CES204.090)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Eutrophic Water; Lowland [Lowland]; Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Depressional [Lakeshore]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; *Pinus contorta*; *Sphagnum* spp.

National Mapping Codes: ESLF 9190

CONCEPT

Summary: This wetland ecological system occurs from southern coastal British Columbia south into coastal Washington and Oregon, west of the coastal mountain summits (not interior). Treed swamps are common in southeastern Alaska (but are placed into different systems than this one), less so farther south. Forested swamps are mostly small-patch size, occurring sporadically in glacial depressions, in river valleys, around the edges of lakes and marshes, or on slopes with seeps that form subirrigated soils. These are primarily on flat to gently sloping lowlands up to 457 m (1500 feet) elevation but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock. This system is indicative of poorly drained, mucky areas, and areas are often a mosaic of moving water and stagnant water. Soils can be woody peat, muck, or mineral. It can be dominated by any one or a number of conifer and hardwood species (*Tsuga heterophylla*, *Picea sitchensis*, *Tsuga mertensiana*, *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Alnus rubra*, *Fraxinus latifolia*, *Betula papyrifera*) that are capable of growing on saturated or seasonally flooded soils. Overstory is often less than 50% cover, but shrub understory can have high cover. In the southern end of the range of this type, e.g., the Willamette Valley, tends to have more hardwood-dominated stands (especially *Fraxinus latifolia*) and very little in the way of conifer-dominated stands. While the typical landscape context for the type is extensive upland forests, for the *Fraxinus latifolia* stands, landscapes were very often formerly dominated by prairies and now by agriculture. Many conifer-dominated stands have been converted to dominance by *Alnus rubra* due to timber harvest.

Classification Comments: Shrub swamps are usually not intermixed with the forested swamps and tend to be more wet. Deciduous and conifer forested swamps are often intermixed and more similar to each other in hydrology, and so are combined here in this system.

Similar Ecological Systems:

- Alaskan Pacific Maritime Poorly Drained Conifer Woodland (CES204.315)

Related Concepts:

- Lodgepole Pine: 218 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Abies amabilis* / *Lysichiton americanus* Forest (CEGL000223, G3)
- *Alnus rubra* / *Athyrium filix-femina* - *Lysichiton americanus* Forest (CEGL003388, G3G4)
- *Alnus rubra* / *Rubus spectabilis* / *Carex obnupta* - *Lysichiton americanus* Forest (CEGL003389, G3G4)
- *Fraxinus latifolia* - (*Populus balsamifera* ssp. *trichocarpa*) / *Cornus sericea* Forest (CEGL003390, G4)
- *Fraxinus latifolia* / *Carex deweyana* - *Urtica dioica* Forest (CEGL003365, G1)
- *Fraxinus latifolia* / *Carex obnupta* Forest (CEGL000640, G4)
- *Fraxinus latifolia* / *Juncus patens* Forest (CEGL003391, G2)
- *Fraxinus latifolia* / *Spiraea douglasii* Forest (CEGL003392, G3)
- *Fraxinus latifolia* / *Symphoricarpos albus* Forest (CEGL003393, G4)
- *Picea sitchensis* / *Carex obnupta* - *Lysichiton americanus* Forest (CEGL000400, G2G3)
- *Picea sitchensis* / *Cornus sericea* / *Lysichiton americanus* Forest (CEGL000055, G2)
- *Picea sitchensis* / *Oplopanax horridus* / *Lysichiton americanus* Forest (CEGL003257, G4)
- *Picea sitchensis* / *Vaccinium ovalifolium* / *Lysichiton americanus* Forest (CEGL003265, G5)
- *Pinus contorta* (var. *latifolia*, var. *murrayana*) / *Vaccinium uliginosum* Forest (CEGL000171, G3)
- *Pinus contorta* - (*Populus tremuloides*) / *Vaccinium uliginosum* Forest (CEGL000158, G3Q)
- *Pinus contorta* / *Carex (aquatilis, angustata)* Woodland (CEGL000140, G4Q)
- *Pinus contorta* / *Deschampsia caespitosa* Forest (CEGL000147, G3)
- *Pinus contorta* / *Empetrum nigrum* Woodland (CEGL003202, G5)
- *Pinus contorta* var. *murrayana* - *Populus tremuloides* / *Spiraea douglasii* Forest (CEGL000157, G3G4)
- *Populus balsamifera* ssp. *trichocarpa* - *Alnus rubra* / *Carex obnupta* Woodland (CEGL003361, G1)
- *Populus tremuloides* / *Carex obnupta* Forest (CEGL003371, G2)
- *Thuja plicata* - *Tsuga heterophylla* / *Lysichiton americanus* Forest (CEGL002670, G3?)
- *Tsuga heterophylla* - *Chamaecyparis nootkatensis* / *Vaccinium ovalifolium* / *Lysichiton americanus* Forest (CEGL003240, G5)
- *Tsuga heterophylla* - *Thuja plicata* / *Vaccinium ovalifolium* / *Lysichiton americanus* Forest (CEGL003223, G5)

- *Tsuga heterophylla* / *Oplopanax horridus* / *Lysichiton americanus* Forest (CEGL003235, G4G5)
- *Tsuga mertensiana* - *Chamaecyparis nootkatensis* / *Elliottia pyroliflorus* / *Nephrophyllidium crista-galli* Woodland (CEGL003215, G4)
- *Tsuga mertensiana* - *Chamaecyparis nootkatensis* / *Gaultheria shallon* / *Lysichiton americanus* Woodland (CEGL003213, G5)
- *Tsuga mertensiana* - *Chamaecyparis nootkatensis* / *Lysichiton americanus* - *Athyrium filix-femina* Forest (CEGL003216, G3G4)
- *Tsuga mertensiana* - *Chamaecyparis nootkatensis* / *Vaccinium ovalifolium* / *Lysichiton americanus* Forest (CEGL003209, G5)

Alliances:

- *Abies amabilis* Seasonally Flooded Forest Alliance (A.187)
- *Alnus rubra* Seasonally Flooded Forest Alliance (A.342)
- *Fraxinus latifolia* Seasonally Flooded Forest Alliance (A.343)
- *Picea sitchensis* Saturated Forest Alliance (A.205)
- *Picea sitchensis* Seasonally Flooded Forest Alliance (A.182)
- *Picea sitchensis* Temporarily Flooded Forest Alliance (A.169)
- *Pinus contorta* - *Populus tremuloides* Seasonally Flooded Forest Alliance (A.440)
- *Pinus contorta* Saturated Woodland Alliance (A.577)
- *Pinus contorta* Seasonally Flooded Forest Alliance (A.188)
- *Pinus contorta* Temporarily Flooded Forest Alliance (A.175)
- *Pinus contorta* Temporarily Flooded Woodland Alliance (A.562)
- *Populus balsamifera ssp. trichocarpa* Temporarily Flooded Woodland Alliance (A.635)
- *Populus tremuloides* Seasonally Flooded Forest Alliance (A.340)
- *Tsuga heterophylla* Saturated Forest Alliance (A.203)
- *Tsuga heterophylla* Seasonally Flooded Forest Alliance (A.185)
- *Tsuga mertensiana* Seasonally Flooded Forest Alliance (A.186)
- *Tsuga mertensiana* Seasonally Flooded Woodland Alliance (A.570)

DISTRIBUTION

Range: This system occurs from southern British Columbia south to northwestern Oregon, including the Willamette Valley, west of the Cascade Crest.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC

TNC Ecoregions: 1:C, 2:C, 3:C, 69:C, 81:C

SOURCES

References: Chappell 1999, Chappell and Christy 2004, Chappell et al. 2001, Green and Klinka 1994, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768136#references

Description Author: C. Chappell, mod. M.S. Reid

Version: 08 Dec 2008

Concept Author: K. Boggs, G. Kittel, C. Chappell

Stakeholders: Canada, West

ClassifResp: West

1156 NORTH PACIFIC LOWLAND RIPARIAN FOREST AND SHRUBLAND (CES204.869)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Lowland]; Forest and Woodland (Treed); Riverine / Alluvial

Non-Diagnostic Classifiers: Temperate [Temperate Oceanic]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2156; ESLF 9106; ESP 1156

CONCEPT

Summary: Lowland riparian systems occur throughout the Pacific Northwest. They are the low-elevation, alluvial floodplains that are confined by valleys and inlets and are more abundant in the central and southern portions of the Pacific Northwest Coast. These forests and tall shrublands are linear in character, occurring on floodplains or lower terraces of rivers and streams. Major broadleaf dominant species are *Acer macrophyllum*, *Alnus rubra*, *Populus balsamifera ssp. trichocarpa*, *Salix sitchensis*, *Salix lucida ssp. lasiandra*, *Cornus sericea*, and *Fraxinus latifolia*. Conifers tend to increase with succession in the absence of major disturbance. Conifer-dominated types are relatively uncommon and not well-described; *Abies grandis*, *Picea sitchensis*, and *Thuja plicata* are important. Riverine flooding and the succession that occurs after major flooding events are the major natural processes that drive this system. Very early-successional stages can be sparsely vegetated or dominated by herbaceous vegetation.

Classification Comments: This system is driven by snowmelt and rainfall hydrology. It differs from Alaskan Pacific Maritime Floodplain Forest and Shrubland (CES204.154) by the presence of mature black cottonwood gallery forests, and generally narrow linear deciduous riparian forests and shrublands. The Alaskan type includes glacier melt-driven hydrology, which results in very wide riverine habitats with fewer mature deciduous forests, as well as non-glacial rivers common on the island archipelago, but also on the mainland, which are narrower and are mostly dominated by Sitka spruce with and without the codominance of black cottonwood.

Similar Ecological Systems:

- Alaskan Pacific Maritime Floodplain Forest and Shrubland (CES204.154)

Related Concepts:

- Black Cottonwood - Willow: 222 (Eyre 1980) Intersecting
- Red Alder: 221 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Abies grandis* - *Acer macrophyllum* / *Symphoricarpos albus* Forest (CEGL000519, G3Q)
- *Acer circinatum* / *Athyrium filix-femina* - *Tolmiea menziesii* Shrubland (CEGL003291, G5)
- *Acer macrophyllum* - *Pseudotsuga menziesii* / *Acer circinatum* / *Polystichum munitum* Forest (CEGL003394, G4)
- *Acer macrophyllum* - *Pseudotsuga menziesii* / *Corylus cornuta* / *Hydrophyllum tenuipes* Forest (CEGL000517, G3)
- *Acer macrophyllum* / *Acer circinatum* Forest (CEGL000560, G4G5)
- *Acer macrophyllum* / *Carex deweyana* Forest (CEGL003297, G3)
- *Acer macrophyllum* / *Rubus spectabilis* Forest (CEGL000561, G4)
- *Acer macrophyllum* / *Rubus ursinus* Forest (CEGL003395, G3)
- *Acer macrophyllum* / *Symphoricarpos albus* / *Urtica dioica ssp. gracilis* Forest (CEGL003396, G3)
- *Acer macrophyllum* / *Urtica dioica ssp. gracilis* Forest (CEGL003397, G3)
- *Alnus (incana, viridis ssp. sinuata)* / *Lysichiton americanus* - *Oenanthe sarmentosa* Shrubland (CEGL003293, G1)
- *Alnus rubra* / *Acer circinatum* / *Claytonia sibirica* Forest (CEGL003298, G4G5)
- *Alnus rubra* / *Elymus glaucus* Forest (CEGL003398, G4)
- *Alnus rubra* / *Oplopanax horridus* - *Rubus spectabilis* Forest (CEGL003399, G4G5)
- *Alnus rubra* / *Oxalis (oregana, trilliifolia)* Forest (CEGL003400, G4)
- *Alnus rubra* / *Petasites frigidus* Forest (CEGL003401, G4)
- *Alnus rubra* / *Rubus parviflorus* Forest (CEGL003402, G4)
- *Alnus rubra* / *Rubus spectabilis* / *Carex obnupta* - *Lysichiton americanus* Forest (CEGL003389, G3G4)
- *Alnus rubra* / *Rubus spectabilis* Forest (CEGL000639, G4G5)
- *Alnus rubra* / *Stachys chamissonis var. cooleyae* - *Tolmiea menziesii* Forest (CEGL003403, G4)
- *Cornus sericea* - *Salix (hookeriana, sitchensis)* Shrubland (CEGL003292, G3)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Corydalis scouleri* Herbaceous Vegetation (CEGL001939, G3?Q)
- *Equisetum arvense* Herbaceous Vegetation (CEGL003314, G5)
- *Fraxinus latifolia* - (*Populus balsamifera ssp. trichocarpa*) / *Cornus sericea* Forest (CEGL003390, G4)
- *Fraxinus latifolia* - *Populus balsamifera ssp. trichocarpa* / *Acer circinatum* Forest (CEGL003404, G3)

- *Fraxinus latifolia* - *Populus balsamifera* ssp. *trichocarpa* / *Corylus cornuta* - *Physocarpus capitatus* Forest (CEGL003364, G3)
- *Fraxinus latifolia* - *Populus balsamifera* ssp. *trichocarpa* / *Rubus spectabilis* Forest (CEGL003405, G2)
- *Fraxinus latifolia* - *Populus balsamifera* ssp. *trichocarpa* / *Symphoricarpos albus* Forest (CEGL000641, G4)
- *Fraxinus latifolia* / *Carex deweyana* - *Urtica dioica* Forest (CEGL003365, G1)
- *Fraxinus latifolia* / *Carex obnupta* Forest (CEGL000640, G4)
- *Fraxinus latifolia* / *Symphoricarpos albus* Forest (CEGL003393, G4)
- *Picea sitchensis* / *Alnus viridis* ssp. *sinuata* Woodland (CEGL003254, G5)
- *Picea sitchensis* / *Carex obnupta* - *Lysichiton americanus* Forest (CEGL000400, G2G3)
- *Picea sitchensis* / *Oplopanax horridus* - *Rubus spectabilis* Forest (CEGL003256, G4)
- *Populus balsamifera* (ssp. *trichocarpa*, ssp. *balsamifera*) / *Symphoricarpos* (*albus*, *oreophilus*, *occidentalis*) Forest (CEGL000677, G2)
- *Populus balsamifera* ssp. *trichocarpa* - *Acer macrophyllum* / *Equisetum hyemale* Forest (CEGL003406, G3)
- *Populus balsamifera* ssp. *trichocarpa* - *Acer macrophyllum* / *Symphoricarpos albus* Forest (CEGL003363, G3)
- *Populus balsamifera* ssp. *trichocarpa* - *Alnus rhombifolia* Forest (CEGL000668, G1)
- *Populus balsamifera* ssp. *trichocarpa* - *Alnus rubra* / *Rubus spectabilis* Forest (CEGL003407, G2G3)
- *Populus balsamifera* ssp. *trichocarpa* - *Alnus rubra* / *Symphoricarpos albus* Forest (CEGL003362, G3)
- *Populus balsamifera* ssp. *trichocarpa* - *Fraxinus latifolia* Forest (CEGL000674, G2Q)
- *Populus balsamifera* ssp. *trichocarpa* - *Picea sitchensis* - (*Acer macrophyllum*) / *Oxalis oregana* Forest (CEGL003418, G2G3)
- *Populus balsamifera* ssp. *trichocarpa* / *Alnus incana* Forest (CEGL000667, G3)
- *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* / *Impatiens capensis* Forest (CEGL003408, G1)
- *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* Forest (CEGL000672, G3G4)
- *Populus balsamifera* ssp. *trichocarpa* / *Oplopanax horridus* Woodland (CEGL003284, G3)
- *Populus balsamifera* ssp. *trichocarpa* / *Rubus spectabilis* Woodland (CEGL003283, G3)
- *Populus tremuloides* / *Carex pellita* Forest (CEGL000577, G2)
- *Quercus garryana* - (*Fraxinus latifolia*) / *Symphoricarpos albus* Forest (CEGL003299, G2)
- *Salix geeyeriana* - *Salix eriocephala* Shrubland (CEGL001213, GU)
- *Salix geeyeriana* - *Salix lemmonii* / *Carex aquatilis* var. *dives* Shrubland (CEGL001212, G3)
- *Salix lucida* ssp. *lasiandra* / *Salix fluviatilis* Woodland (CEGL000949, G3Q)
- *Salix lucida* ssp. *lasiandra* / *Urtica dioica* ssp. *gracilis* Woodland (CEGL003409, G2)
- *Salix sitchensis* / *Equisetum arvense* - *Petasites frigidus* Shrubland (CEGL003296, G4?)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Oplopanax horridus* / *Polystichum munitum* Forest (CEGL000497, G4)

Alliances:

- *Acer circinatum* Shrubland Alliance (A.2600)
- *Acer macrophyllum* Forest Alliance (A.263)
- *Acer macrophyllum* Seasonally Flooded Forest Alliance (A.339)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus rubra* Seasonally Flooded Forest Alliance (A.342)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Corydalis scouleri* Temporarily Flooded Herbaceous Alliance (A.1660)
- *Equisetum* (*arvense*, *variegatum*, *hyemale*) Semipermanently Flooded Herbaceous Alliance (A.3539)
- *Fraxinus latifolia* Seasonally Flooded Forest Alliance (A.343)
- *Fraxinus latifolia* Temporarily Flooded Forest Alliance (A.307)
- *Picea sitchensis* - *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.430)
- *Picea sitchensis* Saturated Forest Alliance (A.205)
- *Picea sitchensis* Temporarily Flooded Forest Alliance (A.169)
- *Picea sitchensis* Temporarily Flooded Woodland Alliance (A.561)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Woodland Alliance (A.635)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Pseudotsuga menziesii* - *Acer macrophyllum* Forest Alliance (A.427)
- *Quercus garryana* Forest Alliance (A.262)
- *Salix geeyeriana* Temporarily Flooded Shrubland Alliance (A.975)
- *Salix lucida* Temporarily Flooded Woodland Alliance (A.647)
- *Salix sitchensis* Seasonally Flooded Shrubland Alliance (A.2599)
- *Tsuga heterophylla* Seasonally Flooded Forest Alliance (A.185)

DISTRIBUTION

Range: This system occurs throughout the Pacific Northwest below the Silver Fir Zone in elevation.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CP

TNC Ecoregions: 1:C, 81:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Franklin and Dyrness 1973

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722806#references

Description Author: G. Kittel and C. Chappell

Version: 03 Sep 2008

Concept Author: G. Kittel and C. Chappell

Stakeholders: Canada, West

ClassifResp: West

1158 NORTH PACIFIC MONTANE RIPARIAN WOODLAND AND SHRUBLAND (CES204.866)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Riverine / Alluvial

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Montane [Montane]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2158; ESLF 9108; ESP 1158

CONCEPT

Summary: This ecological system occurs throughout mountainous areas of the Pacific Northwest coast, both on the mainland and on larger islands. It occurs on steep streams and narrow floodplains above foothills but below the alpine environments, e.g., above 1500 m (4550 feet) elevation in the Klamath Mountains and western Cascades of Oregon, up as high as 3300 m (10,000 feet) in the southern Cascades, and above 610 m (2000 feet) in northern Washington. Surrounding habitats include subalpine parklands and montane forests. In Washington, they are defined as occurring primarily above the *Tsuga heterophylla* zone, i.e., beginning at or near the lower boundary of the *Abies amabilis* zone. Dominant species include *Pinus contorta* var. *murrayana*, *Populus balsamifera* ssp. *trichocarpa*, *Abies concolor*, *Abies magnifica*, *Populus tremuloides*, *Alnus incana* ssp. *tenuifolia* (= *Alnus tenuifolia*), *Alnus viridis* ssp. *crispa* (= *Alnus crispa*), *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*), *Alnus rubra*, *Rubus spectabilis*, *Ribes bracteosum*, *Oplopanax horridus*, *Acer circinatum*, and several *Salix* species. In western Washington, major species are *Alnus viridis* ssp. *sinuata*, *Acer circinatum*, *Salix*, *Oplopanax horridus*, *Alnus rubra*, *Petasites frigidus*, *Rubus spectabilis*, and *Ribes bracteosum*. This is a disturbance-driven system that requires flooding, scour and deposition for germination and maintenance. It occurs on streambanks where the vegetation is significantly different than surrounding forests, usually because of its shrubby or deciduous character.

Classification Comments: Riparian and floodplain woodlands and shrublands in Alaska have been placed into a different system. Still need to determine where the Alaskan type grades into this one, and whether British Columbian riparian systems should be placed here or in the new Alaskan system.

Similar Ecological Systems:

- Alaskan Pacific Maritime Floodplain Forest and Shrubland (CES204.154)

Related Concepts:

- \$Mountain alder - Lady fern (ICHvc/52) (Banner et al. 1993) Intersecting
- \$Mountain alder - Lady fern (ICHwc/52) (Banner et al. 1993) Intersecting
- Act - Dogwood - Twinberry (ICHwk1/07) (Lloyd et al. 1990) Intersecting
- Act - Red-osier dogwood (CWHds1/09) (Steen and Coupe 1997) Intersecting
- Act - Red-osier dogwood (CWHms1/08) (Steen and Coupe 1997) Intersecting
- Act - Red-osier dogwood (CWHvm1/10) (Banner et al. 1993) Intersecting
- Act - Red-osier dogwood (CWHwm/06) (Banner et al. 1993) Intersecting
- Act - Red-osier dogwood (CWHws1/08) (Banner et al. 1993) Intersecting
- Act - Red-osier dogwood (CWHws2/08) (Banner et al. 1993) Intersecting
- Act - Willow (CWHds1/10) (Steen and Coupe 1997) Intersecting
- Act - Willow (CWHms1/09) (Steen and Coupe 1997) Intersecting
- Act - Willow (CWHvm1/11) (Banner et al. 1993) Intersecting
- Act - Willow (CWHwm/07) (Banner et al. 1993) Intersecting
- Act - Willow (CWHws1/09) (Banner et al. 1993) Intersecting
- Act - Willow (CWHws2/09) (Banner et al. 1993) Intersecting
- ActSx - Dogwood (ICHmc1/05) (Banner et al. 1993) Intersecting
- ActSx - Dogwood (ICHmc1/05) (Meidinger et al. 1988) Intersecting
- ActSx - Dogwood (ICHmc2/06) (Banner et al. 1993) Intersecting
- ActSx - Dogwood (ICHvc/05) (Banner et al. 1993) Intersecting
- ActSx - Dogwood (ICHwc/06) (Banner et al. 1993) Intersecting
- ActSx - Dogwood, High-bench (ICHmc2/06) (Banner et al. 1993) Intersecting
- ActSx - Dogwood, Medium-bench (ICHmc2/06) (Banner et al. 1993) Intersecting
- ActSxw - Red-osier dogwood (ICHwk4/10) (Steen and Coupe 1997) Intersecting
- Alder - Lady fern (ESSFwk1/09) (DeLong 2003) Intersecting
- Alder - Lady fern (ESSFwk1/51) (DeLong 2003) Intersecting
- B1 - Alder - Horsetail (ESSFmv2/06) (DeLong et al. 1994) Intersecting
- B1 - Alder - Horsetail (ESSFmv4/05) (DeLong et al. 1994) Intersecting
- Black Cottonwood - Willow: 222 (Eyre 1980) Broader
- Dr - Lily-of-the-valley (CWHvh2/10) (Banner et al. 1993) Intersecting

- Hardhack - Sitka sedge (ICHmc1/Ws50) (Banner et al. 1993) Intersecting
- Hardhack - Sitka sedge (ICHmc1/Ws50) (Meidinger et al. 1988) Intersecting
- Hardhack - Sitka sedge (SBSmk1/Ws50) (DeLong et al. 1993) Intersecting
- Hardhack - Sitka sedge (SBSwk1/Ws50) (DeLong 2003) Intersecting
- Hardhack - Sitka sedge (SBSwk1/Ws50) (Steen and Coupe 1997) Intersecting
- Maccalla's willow - Beaked sedge (ESSFxc/Ws05) (Steen and Coupe 1997) Intersecting
- Maccalla's willow - Beaked sedge (IDFdk3/Ws05) (Steen and Coupe 1997) Intersecting
- Maccalla's willow - Beaked sedge (IDFdk4/Ws05) (Steen and Coupe 1997) Intersecting
- Mountain alder - Mitrewort (ICHmc2/55) (Banner et al. 1993) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (CWHwm/Ws02) (Banner et al. 1993) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (ESSFwv/Ws02) (Banner et al. 1993) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (ICHmc2/Ws02) (Banner et al. 1993) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (ICHvc/Ws02) (Banner et al. 1993) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (ICHwk1/Ws02) (Lloyd et al. 1990) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (SBSmc2/Ws02) (Banner et al. 1993) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (SBSmc2/Ws02) (DeLong et al. 1993) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (SBSwk1/Ws02) (Steen and Coupe 1997) Intersecting
- Mountain alder - Pink spirea - Sitka sedge (SBSwk1/Ws02) (DeLong 2003) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (ICHmc2/FI02) (Banner et al. 1993) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (ICHwk1/FI02) (Lloyd et al. 1990) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (ICHwk4/FI02) (Steen and Coupe 1997) Intersecting
- Mountain alder - Skunk cabbage - Lady fern (ICHmc2/Ws01) (Banner et al. 1993) Intersecting
- Mountain alder - Skunk cabbage - Lady fern (ICHvk2/Ws01) (DeLong 2003) Intersecting
- Red Alder: 221 (Eyre 1980) Intersecting
- Sitka willow - Red-osier dogwood - Horsetail (SBSmk2/FI04) (MacKinnon et al. 1990) Intersecting
- Sitka willow - Red-osier dogwood - Horsetail (SBSvk/FI04) (DeLong 2003) Intersecting
- Sitka willow - Sitka sedge (CWHvm1/Ws06) (Banner et al. 1993) Intersecting
- Sitka willow - Sitka sedge (CWHvm2/Ws06) (Banner et al. 1993) Intersecting
- Sitka willow - Sitka sedge (SBSvk/Ws06) (DeLong 2003) Intersecting
- Sitka willow - Sitka sedge (SBSwk1/Ws06) (DeLong 2003) Intersecting
- Sitka willow - Sitka sedge (SBSwk1/Ws06) (Steen and Coupe 1997) Intersecting

MEMBERSHIP

Associations:

- *Alnus incana* / *Athyrium filix-femina* Shrubland (CEGL002628, G3)
- *Alnus incana* / *Cornus sericea* Shrubland (CEGL001145, G3G4)
- *Alnus incana* / *Equisetum arvense* Shrubland (CEGL001146, G3)
- *Alnus incana* / Mesic Forbs Shrubland (CEGL001147, G3)
- *Alnus incana* / *Spiraea douglasii* Shrubland (CEGL001152, G3)
- *Alnus incana* / *Symphoricarpos albus* Shrubland (CEGL001153, G3G4)
- *Alnus incana* Shrubland (CEGL001141, GNRQ)
- *Alnus viridis ssp. sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland (CEGL001156, G4)
- *Alnus viridis ssp. sinuata* / *Oplopanax horridus* Shrubland (CEGL001157, G4G5)
- *Betula glandulosa* / *Carex utriculata* Shrubland (CEGL001079, G4?)
- *Salix (boothii, geyeriana)* / *Carex aquatilis* Shrubland (CEGL001176, G3)
- *Salix boothii* - *Salix eastwoodiae* / *Carex nigricans* Shrubland (CEGL002607, G3)
- *Salix boothii* - *Salix geyeriana* / *Carex angustata* Shrubland (CEGL001185, G2)
- *Salix boothii* - *Salix lemmonii* Shrubland (CEGL001186, G3)
- *Salix boothii* / *Carex utriculata* Shrubland (CEGL001178, G4)
- *Salix commutata* / *Carex scopulorum* Shrubland (CEGL001189, G3)
- *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631, G4)
- *Salix sitchensis* / *Equisetum arvense* - *Petasites frigidus* Shrubland (CEGL003296, G4?)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Alnus viridis ssp. sinuata* Seasonally Flooded Shrubland Alliance (A.1000)
- *Alnus viridis ssp. sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Betula glandulosa* Seasonally Flooded Shrubland Alliance (A.995)
- *Salix boothii* Seasonally Flooded Shrubland Alliance (A.1001)
- *Salix boothii* Temporarily Flooded Shrubland Alliance (A.972)
- *Salix commutata* Seasonally Flooded Shrubland Alliance (A.1003)
- *Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)
- *Salix sitchensis* Seasonally Flooded Shrubland Alliance (A.2599)

DISTRIBUTION

Range: This system occurs throughout mountainous areas of the Pacific Northwest Coast, both on the mainland and on larger islands, above 1500 m (4550 feet) elevation in the Klamath Mountains and western Cascades, up as high as 3300 m (10,000 feet) in the southern Cascades, and above 610 m (2000 feet) in northern Washington.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 3:?, 7:C

USFS Ecomap Regions: 242A:CC, 242B:C?, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CP, M261G:CC

TNC Ecoregions: 1:C, 3:C, 4:C, 69:?, 81:C

SOURCES

References: Comer et al. 2003, Franklin and Dyrness 1973, Holland and Keil 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722809#references

Description Author: G. Kittel, mod. C. Chappell

Version: 08 Dec 2008

Concept Author: G. Kittel

Stakeholders: Canada, West

ClassifResp: West

1663 NORTH PACIFIC SHRUB SWAMP (CES204.865)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Eutrophic Water; Forest and Woodland (Treed); Depressional [Lakeshore]; Broad-Leaved Deciduous Tree; Broad-Leaved Deciduous Shrub

Non-Diagnostic Classifiers: Lowland [Lowland]; Depressional [Pond]; Depressional [Sinkhole]

National Mapping Codes: EVT 2663; ESLF 9173; ESP 1663

CONCEPT

Summary: Swamps vegetated by shrublands occur throughout the Pacific Northwest Coast, from Cook Inlet and Prince William Sound, Alaska, to the southern coast of Oregon. These are deciduous broadleaf tall shrublands that are located in depressions, around lakes or ponds, or river terraces where water tables fluctuate seasonally (mostly seasonally flooded regime), in areas that receive nutrient-rich waters. These depressions are poorly drained with fine-textured organic, muck or mineral soils and standing water common throughout the growing season. *Alnus viridis ssp. sinuata* often dominates the shrub layer, but many *Salix* species may also occur. The shrub layer can have many dead stems. However, various species of *Salix*, *Spiraea douglasii*, *Malus fusca*, *Cornus sericea*, *Alnus incana ssp. tenuifolia* (= *Alnus tenuifolia*), *Alnus viridis ssp. crispa* (= *Alnus crispa*), and/or *Alnus viridis ssp. sinuata* (= *Alnus sinuata*) can be the major dominants. They may occur in mosaics with marshes or forested swamps, being on average more wet than forested swamps and more dry than marshes. However, it is also frequent for them to dominate entire wetland systems.

Hardwood-dominated stands (especially *Fraxinus latifolia*) may be considered a shrub swamp when they are not surrounded by conifer forests but do not occur in Alaska. Typical landscape for the *Fraxinus latifolia* stands were very often formerly dominated by prairies and now by agriculture. Wetland species, including *Carex aquatilis var. dives* (= *Carex sitchensis*), *Carex utriculata*, *Equisetum fluviatile*, and *Lysichiton americanus*, dominate the understory. On some sites, *Sphagnum* spp. are common in the understory (Stikine, Yakutat Forelands, Copper River Delta).

Classification Comments: Shrub swamps are usually not intermixed with the forested swamps and tend to be more wet. Deciduous and conifer forested swamps are often intermixed and more similar to each other in hydrology, and so are combined into North Pacific Hardwood-Conifer Swamp (CES204.090). This system includes what is known by the Alaska Natural Heritage Program as Maritime Tall-Shrub Swamp. Associations found in this system in Alaska need to be identified and added to the list. Deciduous shrub swamps in the Cook Inlet Basin are better placed in Western North American Boreal Deciduous Shrub Swamp (CES105.122).

Similar Ecological Systems:

- Western North American Boreal Riparian Stringer Forest and Shrubland (CES105.144)

Related Concepts:

- II.B.1.f - Shrub swamp (closed) (Viereck et al. 1992) Intersecting
- II.B.2.f - Shrub swamp (open) (Viereck et al. 1992) Intersecting

MEMBERSHIP

Associations:

- *Alnus (incana, viridis ssp. sinuata) / Lysichiton americanus - Oenanthe sarmentosa* Shrubland (CEGL003293, G1)
- *Cornus sericea - Salix (hookeriana, sitchensis)* Shrubland (CEGL003292, G3)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Fraxinus latifolia / Carex deweyana - Urtica dioica* Forest (CEGL003365, G1)
- *Fraxinus latifolia / Carex obnupta* Forest (CEGL000640, G4)
- *Fraxinus latifolia / Juncus patens* Forest (CEGL003391, G2)
- *Fraxinus latifolia / Spiraea douglasii* Forest (CEGL003392, G3)
- *Fraxinus latifolia / Symphoricarpos albus* Forest (CEGL003393, G4)
- *Malus fusca* Shrubland (CEGL003385, G3)
- *Salix (hookeriana, sitchensis) - Spiraea douglasii* Shrubland (CEGL003386, G3G4)
- *Salix geyeriana - Salix hookeriana* Shrubland (CEGL003295, G1)
- *Salix hookeriana - (Malus fusca) / Carex obnupta - Lysichiton americanus* Shrubland (CEGL003432, G3)
- *Salix hookeriana - (Salix sitchensis)* Shrubland (CEGL003387, G2)
- *Salix sitchensis* Shrubland (CEGL002896, G4)
- *Spiraea douglasii* Shrubland (CEGL001129, G5)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Fraxinus latifolia* Seasonally Flooded Forest Alliance (A.343)
- *Malus fusca* Seasonally Flooded Shrubland Alliance (A.2577)

- *Salix hookeriana* Seasonally Flooded Shrubland Alliance (A.999)
- *Salix sitchensis* Seasonally Flooded Shrubland Alliance (A.2599)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)

DISTRIBUTION

Range: This system occurs throughout the Pacific Northwest Coast, from Cook Inlet Basin and Prince William Sound, Alaska, to the southern coast of Oregon.

Divisions: 204:C

Nations: CA, US

Subnations: AK, BC, OR, WA

Map Zones: 1:C, 2:C, 3:P, 7:C, 9:?, 77:C, 78:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 342I:??, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC

TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 69:C, 70:C, 81:C

SOURCES

References: Boggs 2002, Chappell and Christy 2004, Comer et al. 2003, Franklin and Dyrness 1973, Viereck et al. 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722810#references

Description Author: G. Kittel, P. Comer, K. Boggs, C. Chappell

Version: 10 Dec 2008

Concept Author: G. Kittel, P. Comer, K. Boggs, C. Chappell

Stakeholders: Canada, West

ClassifResp: West

NORTH-CENTRAL APPALACHIAN ACIDIC SWAMP (CES202.604)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: 30-180-day hydroperiod; Forest and Woodland (Treed); Extensive Wet Flat; Needle-Leaved Tree

Non-Diagnostic Classifiers: Acidic Water; Shallow (<15 cm) Water; Moderate (100-500 yrs) Persistence; Lowland; Temperate;

Mineral: W/ A-Horizon >10 cm; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9307

CONCEPT

Summary: These swamps are distributed from central New England through the Central Appalachians south to Virginia and west to Ohio. They are found at low to mid elevations (generally <700 m) in basins or on gently sloping seepage lowlands. The acidic substrate is mineral soil, often with a component of organic muck; if peat is present, it usually forms an organic epipedon over the mineral soil rather than a true peat substrate (although peat layers up to 1 m deep have been found in some of these swamps). *Tsuga canadensis* is usually present and may be dominant. It is often mixed with deciduous wetland trees such as *Acer rubrum* or *Nyssa sylvatica*. *Sphagnum* is an important component of the bryoid layer. Basin swamps tend to be more nutrient-poor and less species-rich than seepage swamps; in some settings, the two occur adjacent to each other with the basin swamp vegetation surrounded by seepage swamp vegetation on its upland periphery.

Classification Comments: This system excludes swamps with *Chamaecyparis thyoides*, a tree more characteristic of the Coastal Plain but which sometimes occurs inland. See Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522). Some examples of this system may appear similar to Southern and Central Appalachian Bog and Fen (CES202.300) or North-Central Interior and Appalachian Acidic Peatland (CES202.606); those systems are distinguished by their deeper peat substrate and overall partly forested character compared to the shallower organic soil and generally forested nature of the present system. Wetlands on the Allegheny Plateau, at higher elevations, are a distinct system, High Allegheny Wetland (CES202.069). There are many species with this type, but it is distinguished by occurring as a mosaic of open wetlands and smaller forest patches with a distinctive hydrology.

Similar Ecological Systems:

- High Allegheny Wetland (CES202.069)
- Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574)
- Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)
- Piedmont Seepage Wetland (CES202.298)
- Piedmont Upland Depression Swamp (CES202.336)

Related Concepts:

- Mountain / Piedmont Acidic Seepage Swamps (Fleming et al. 2005) Broader. can be attributed to one of two systems depending on their location. Occurrences in the central Appalachians are attributed to this system (CES202.604) while occurrences in the Piedmont are attributed to Piedmont Seepage Wetland (CES202.298).

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (CEGL006406, G4G5)
- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014, GNR)
- *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132, GNR)
- *Acer rubrum* / *Carex lacustris* Woodland (CEGL006105, GNR)
- *Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Woodland (CEGL006119, G3G5)
- *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220, G4G5)
- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156, GNR)
- *Betula alleghaniensis* - *Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Forest (CEGL006380, G4?)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest (CEGL006277, G2?)
- *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588, G2G3)
- *Tsuga canadensis* - *Betula alleghaniensis* / *Ilex verticillata* / *Sphagnum* spp. Forest (CEGL006226, G5)
- *Tsuga canadensis* - *Betula alleghaniensis* / *Veratrum viride* - *Carex scabrata* - *Oclemena acuminata* Forest (CEGL008533, G2)
- *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL006279, G4?)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Saturated Forest Alliance (A.3035)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Seasonally Flooded Woodland Alliance (A.653)
- *Picea rubens* Saturated Forest Alliance (A.198)

- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)
- *Tsuga canadensis* Saturated Forest Alliance (A.201)

DISTRIBUTION

Range: This system occurs from central New England south to western Virginia (the Central Appalachians region) and west to Ohio.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, NH, NJ, NY, OH, PA, RI, VA, VT

Map Zones: 53:C, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:P

USFS Ecomap Regions: 211E:CP, 211F:CC, 211G:CC, 211I:CC, 211J:CC, 221A:CC, 221B:CC, 221D:CC, 222I:CC, M211A:CP, M211B:CC, M211C:CC, M221A:CC

TNC Ecoregions: 49:C, 59:C, 60:C, 61:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723005#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTH-CENTRAL INTERIOR AND APPALACHIAN ACIDIC PEATLAND (CES202.606)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Acidic Water; >180-day hydroperiod; Shrubland (Shrub-dominated); Organic Peat (>40 cm)

Non-Diagnostic Classifiers: Oligotrophic Water; Long (>500 yrs) Persistence; Lowland; Temperate; Depressional; Isolated Wetland [Partially Isolated]; Unconsolidated

National Mapping Codes: ESLF 9193

CONCEPT

Summary: These *Sphagnum* and shrub peatlands occur in basins south of the Laurentian-Acadian region down to near the glacial boundary in the northeastern and north-central U.S. Unlike the true raised bogs of boreal regions, the vegetation is not raised above the groundwater level. They are found in colder regions, mostly in areas where glacial stagnation left coarse deposits and glacial depressions (many are "kettleholes"). The basins are generally closed, i.e., without inlets or outlets of surface water, and typically small in area. The nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of *Sphagnum* peat and the growth of peatland vegetation. In deeper basins, the vascular vegetation grows on a *Sphagnum* mat over water, with no mineral soil development. Ericaceous shrubs and dwarf-shrubs (e.g., *Chamaedaphne calyculata*) dominate, with patches of graminoid dominance. Some peatlands may have a sparse tree layer. Although these are often called bogs, in most cases they are technically fens (albeit nutrient-poor ones), as the vegetation remains in contact with the groundwater.

Classification Comments: This system occurs south of the Laurentian-Acadian division in the Midwest, south of the Northern Appalachian-Boreal ecoregion in the Northeast, and inland from the Coastal Plain, and these acidic peatlands are distinctive and discrete elements of the landscape. They are related to Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574), but occur in a different landscape setting and often have some more temperate floristic elements to distinguish them. They include treed, shrub, and graminoid associations, often occurring in a mosaic. In the Midwest, it may be necessary to split off the shrub/graminoid acid peatland (poor fen) types.

Similar Ecological Systems:

- Atlantic Coastal Plain Northern Bog (CES203.893)
- Boreal-Laurentian Bog (CES103.581)--raised bogs of Canada and parts of the extreme northeastern and northern midwestern U.S.
- Boreal-Laurentian Conifer Acidic Swamp (CES103.724)
- Boreal-Laurentian-Acadian Acidic Basin Fen (CES201.583)--similar fens but more northerly in distribution, centered in Division 201 rather than 202.
- Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574)--more-or-less uniform tree cover.

MEMBERSHIP

Associations:

- *Acer rubrum* / *Alnus incana* - *Ilex verticillata* / *Osmunda regalis* Woodland (CEGL006395, GNR)
- *Carex lasiocarpa* - *Carex oligosperma* - (*Lysimachia terrestris*) / *Sphagnum* spp. / *Spiraea tomentosa* Herbaceous Vegetation (CEGL005279, G3G4)
- *Carex oligosperma* - *Carex pauciflora* - *Eriophorum vaginatum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL005256, G4G5)
- *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Dwarf-shrubland (CEGL006008, G5)
- *Chamaedaphne calyculata* / *Carex oligosperma* - *Eriophorum virginicum* Dwarf-shrubland (CEGL005092, G3G4)
- *Chamaedaphne calyculata* / *Eriophorum virginicum* / *Sphagnum rubellum* Dwarf-shrubland (CEGL006513, GNR)
- *Dulichium arundinaceum* - *Triadenum virginicum* / *Sphagnum fallax* Herbaceous Vegetation (CEGL006077, GNR)
- *Dulichium arundinaceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006131, GNR)
- *Larix laricina* / *Photinia melanocarpa* / *Sphagnum* spp. Forest (CEGL002472, G4?)
- *Myrica gale* - *Chamaedaphne calyculata* / *Carex (lasiocarpa, utriculata)* - *Utricularia* spp. Shrub Herbaceous Vegetation (CEGL006302, G4G5)
- *Picea mariana* / (*Vaccinium corymbosum*, *Gaylussacia baccata*) / *Sphagnum* sp. Woodland (CEGL006098, G3G5)
- *Pinus rigida* - *Picea rubens* / *Viburnum nudum* var. *cassinoides* / *Sphagnum* spp. Woodland (CEGL006587, G1G2)
- *Pinus rigida* / *Chamaedaphne calyculata* / *Sphagnum* spp. Woodland (CEGL006194, G3G5)
- *Pinus rigida* / *Vaccinium myrtilloides* / *Sphagnum* spp. Woodland (CEGL006022, G1G2)
- *Sphagnum (cuspidatum, torreyanum)* - *Vaccinium macrocarpon* Nonvascular Vegetation (CEGL006394, GNR)
- *Sphagnum rubellum* - *Vaccinium oxycoccus* Nonvascular Vegetation (CEGL006135, GNR)
- *Vaccinium corymbosum* - *Gaylussacia baccata* - *Photinia melanocarpa* / *Calla palustris* Shrubland (CEGL005085, G2G3)
- *Vaccinium corymbosum* / *Sphagnum* spp. Shrubland (CEGL006190, G3G5)

Alliances:

- *Acer rubrum* Saturated Woodland Alliance (A.657)
- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Chamaedaphne calyculata* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1557)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Dulichium arundinaceum* Saturated Herbaceous Alliance (A.3023)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Larix laricina* Saturated Forest Alliance (A.349)
- *Picea mariana* Saturated Woodland Alliance (A.585)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Sphagnum cuspidatum* - *Cladopodiella fluitans* Saturated Nonvascular Alliance (A.3006)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

DISTRIBUTION

Range: This system is found from central New England to the Great Lakes and south-central Minnesota southward, generally associated with the glacial terminus or stagnation zones, and interior from the Coastal Plain.

Divisions: 202:C

Nations: CA, US

Subnations: CT, IL, IN, MA, ME, MI, MN, NH, NJ, NY, OH, ON, PA, RI, VT, WI

Map Zones: 41:?, 49:P, 50:P, 51:P, 52:P, 61:C, 62:C, 63:C, 64:C, 65:C, 66:P

USFS Ecomap Regions: 211F:CC, 211I:CP, 211J:CC, 221A:CC, 221B:CC, 221D:CC, 221E:CC, 221Fa:CCC, 222I:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222R:CC, 222Ua:CCP, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 45:P, 46:P, 48:P, 49:P, 60:C, 61:C, 64:C

SOURCES

References: Comer et al. 2003, Damman and French 1987

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723003#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: East

NORTH-CENTRAL INTERIOR AND APPALACHIAN RICH SWAMP (CES202.605)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Mesotrophic Water; Saturated Soil; Temperate; Depressional; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: Intermittent Flooding; Moderate (100-500 yrs) Persistence; Lowland; Forest and Woodland (Treed); Extensive Wet Flat; Mineral: W/ A-Horizon >10 cm

National Mapping Codes: ESLF 9306

CONCEPT

Summary: These forested wetlands are scattered throughout the north-central Midwest (south of the Laurentian region), the north-central Appalachians and southern New England at low to mid elevations. They are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include *Acer rubrum*, *Fraxinus nigra*, as well as calciphilic herbs. Conifers include *Larix laricina*, but typically not *Thuja occidentalis*, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development.

Classification Comments: This system occurs south of the Laurentian-Acadian region, and these circumneutral or enriched swamps are often rather distinctive and discrete elements of the landscape. They are related to Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575) but have more temperate elements and generally lack *Thuja occidentalis*. More alkaline shrub/herb fens are treated as part of North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702).

Similar Ecological Systems:

- Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575)
- North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702)
- Piedmont Seepage Wetland (CES202.298)--ranges north into Virginia.

Related Concepts:

- Mountain / Piedmont Basic Seepage Swamp (Fleming et al. 2005) Intersecting. in Virginia.

MEMBERSHIP

Associations:

- *Acer (rubrum, saccharinum) - Fraxinus spp. - Ulmus americana* Forest (CEGL005038, G4?)
- *Acer rubrum - Fraxinus americana - Fraxinus nigra - Betula alleghaniensis / Veratrum viride - Carex bromoides* Forest (CEGL008416, G3)
- *Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Forest (CEGL006502, GNR)
- *Fraxinus nigra - Acer rubrum - (Larix laricina) / Rhamnus alnifolia* Forest (CEGL006009, GNR)
- *Fraxinus nigra - Acer rubrum / Rhamnus alnifolia / Carex leptalea* Saturated Forest (CEGL007441, GNR)
- *Larix laricina - Acer rubrum / (Rhamnus alnifolia, Vaccinium corymbosum)* Forest (CEGL005232, G2G3)

Alliances:

- *Acer rubrum - Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Fraxinus nigra - Acer rubrum* Saturated Forest Alliance (A.347)
- *Larix laricina* Saturated Forest Alliance (A.349)

DISTRIBUTION

Range: This system is found from central New England to the southern Great Lakes and south-central Minnesota south to northern Illinois, Indiana, Ohio, and Pennsylvania. It is not known to extend south into the Southern Blue Ridge.

Divisions: 202:C

Nations: CA, US

Subnations: CT, DE?, IL, IN, MA, MD, MI, MN, NJ, NY, OH, ON, PA, RI, VT, WI

Map Zones: 41:C, 49:C, 50:C, 51:C, 52:C, 53:C, 61:C, 62:C, 63:C, 64:C, 65:C

USFS Ecomap Regions: 212Hb:CCP, 222H:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222L:CC, 222M:CC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC, M211Cc:CCC

TNC Ecoregions: 45:C, 46:C, 48:C, 49:P, 59:C, 60:?, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723004#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest, Southeast
ClassifResp: East

NORTH-CENTRAL INTERIOR SHRUB-GRAMINOID ALKALINE FEN (CES202.702)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Alkaline Water; Saturated Soil; Fen; Shrubland (Shrub-dominated); Woody-Herbaceous; Herbaceous; Seepage-Fed Sloping; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9184

CONCEPT

Summary: This fen system is found in the glaciated portions of the Midwest and southern Canada. Examples of this system can be located on level to sloping seepage areas, in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography. Groundwater flows through marls and shallow peat soils, and groundwater is typically minerotrophic and slightly alkaline. Examples of this system contain a core fen area of graminoids surrounded by shrubs with a fairly continuous sphagnum moss layer. Herbaceous and shrub cover is variable with little to no tree cover. Characteristic species include prairie grasses such as *Andropogon gerardii* and *Spartina pectinata* with prairie forbs and sedges (*Carex* spp.). Common shrub species include *Dasiphora fruticosa* ssp. *floribunda*, *Cornus* spp., and *Salix* spp. Alterations in wetland hydrology and agricultural development can threaten examples of this system.

Similar Ecological Systems:

- Laurentian-Acadian Alkaline Fen (CES201.585)
- North-Central Interior and Appalachian Rich Swamp (CES202.605)

DESCRIPTION

Environment: Examples of this system can be located on level to sloping seepage areas, in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography. Groundwater flows through marls and shallow peat soils, and groundwater is typically minerotrophic and slightly alkaline.

Vegetation: Examples of this system contain a core fen area of graminoids surrounded by shrubs with a fairly continuous sphagnum moss layer. Herbaceous and shrub cover is variable with little to no tree cover. Characteristic species include prairie grasses such as *Andropogon gerardii* and *Spartina pectinata* with prairie forbs and sedges (*Carex* spp.). Common shrub species include *Dasiphora fruticosa* ssp. *floribunda*, *Cornus* spp., and *Salix* spp.

Dynamics: Alterations in wetland hydrology and agricultural development can threaten examples of this system.

MEMBERSHIP

Associations:

- *Carex lasiocarpa* - *Carex oligosperma* / *Sphagnum* spp. Herbaceous Vegetation (CEGL002265, G3G4)
- *Cladium mariscoides* - (*Carex lasiocarpa*, *Hypericum kalmianum*, *Oligoneuron riddellii*, *Eleocharis elliptica*) Herbaceous Vegetation (CEGL005104, G2?)
- *Cornus amomum* - *Salix* spp. - *Toxicodendron vernix* - *Rhamnus lanceolata* Fen Shrubland (CEGL005087, G2G3)
- *Cornus racemosa* / *Carex* (*sterilis*, *aquatilis*, *lacustris*) Shrub Herbaceous Vegetation (CEGL006123, G2G3)
- *Cornus* spp. - *Salix* spp. - *Vaccinium corymbosum* - *Rhamnus alnifolia* - *Toxicodendron vernix* Shrubland (CEGL005083, G4?)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex interior* - *Carex flava* - *Sarracenia purpurea* Shrub Herbaceous Vegetation (CEGL005140, G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex sterilis* - *Andropogon gerardii* - *Arnoglossum plantagineum* Shrub Herbaceous Vegetation (CEGL005139, G3G4)
- *Symplocarpus foetidus* Herbaceous Vegetation (CEGL002385, G4?)
- *Vaccinium corymbosum* - *Gaylussacia baccata* - *Photinia melanocarpa* / *Calla palustris* Shrubland (CEGL005085, G2G3)

Alliances:

- *Carex* (*flava*, *hystericina*, *interior*, *sterilis*) Saturated Shrub Herbaceous Alliance (A.1561)
- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Cladium mariscoides* Seasonally Flooded Herbaceous Alliance (A.1368)
- *Cornus sericea* - *Photinia melanocarpa* - *Toxicodendron vernix* Saturated Shrubland Alliance (A.1016)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex* (*flava*, *interior*, *lasiocarpa*, *sterilis*) Saturated Shrub Herbaceous Alliance (A.1562)
- *Symplocarpus foetidus* - *Calla palustris* Saturated Herbaceous Alliance (A.1694)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

DISTRIBUTION

Range: This system is found in the northern Midwest and southern Canada.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: IA, IL, IN, MI, MN, ND, OH, ON, PA, SD, WI

Map Zones: 39:C, 40:C, 41:C, 42:C, 43:C, 49:C, 50:C, 51:C, 52:C, 62:P

USFS Ecomap Regions: 221F:CC, 222H:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jf:CCP, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222M:CC, 222U:CP, 251B:CC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:P

SOURCES

References: Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722958#references

Description Author: S. Menard, mod. J. Drake

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, East, Midwest
ClassifResp: Midwest

1518 NORTH-CENTRAL INTERIOR WET FLATWOODS (CES202.700)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saturated Soil; Flat; Forest and Woodland (Treed); Extensive Wet Flat; Isolated Wetland [Partially Isolated]

National Mapping Codes: EVT 2518; ESLF 9186; ESP 1518

CONCEPT

Summary: This small-patch system is found throughout the northern glaciated Midwest ranging east into Lower New England and the Champlain Valley. It usually occurs on somewhat poorly drained uplands or in depressions associated with glacial features such as tillplains, lakeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. Microtopography and fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. *Quercus palustris* and/ or *Quercus bicolor* typically dominate the wetter portions and are often associated with *Acer rubrum*. *Quercus alba*, *Quercus rubra*, and *Fagus grandifolia* are common in the better-drained areas. *Carya ovata* is a characteristic tree in the Champlain Valley. *Liquidambar styraciflua*, *Nyssa sylvatica*, *Fraxinus americana*, and *Fraxinus pennsylvanica* are also common associates, though their occurrence varies somewhat by region. Understory herbaceous and shrub species present in examples of this system can vary. Stands with more dense tree cover have less shrub and herbaceous cover, while those with moderate tree canopy cover tend to have a dense understory. Some common species in the wetter portions include *Carex* spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, *Alnus* spp., and *Ilex* spp. Flooding, drought and fire can influence this system.

Classification Comments: These are mostly north of the glacial line, but one association is in the Interior Low Plateau and that placement may need to be reviewed. Some examples in Michigan, Indiana, Ohio, Vermont, and southern Ontario are dominated by *Fagus grandifolia*, oak (primarily *Quercus alba* and *Quercus rubra*) and maple species (*Acer* spp.). Vermont's Valley Clayplain Forest is placed here tenuously as it has more of an upland component and occurs at a local matrix scale, not as a small-patch element.

DESCRIPTION

Environment: This system usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, lakeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system.

Vegetation: *Quercus palustris* and/or *Quercus bicolor* typically dominate the wetter portions and are often associated with *Acer rubrum*. *Quercus alba*, *Quercus rubra*, *Fagus grandifolia*, and *Acer saccharum* are common in the better-drained areas, seen in some examples around the southern Great Lakes and Lake Champlain. *Carya ovata* is a characteristic tree in the Champlain Valley. *Liquidambar styraciflua*, *Nyssa sylvatica*, *Fraxinus americana*, and *Fraxinus pennsylvanica* are also common associates, though their occurrence varies somewhat by region. Understory herbaceous and shrub species present in examples of this system can vary. Stands with more dense tree cover have less shrub and herbaceous cover, while those with moderate tree canopy cover tend to have a dense understory. Some common species include *Carex* spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, *Alnus* spp., and *Ilex* spp. In the clayplain forests of Vermont, characteristic herbs include *Waldsteinia fragarioides* and *Moehringia lateriflora* (= *Arenaria lateriflora*).

Dynamics: Flooding, drought and fire can influence this system. Invasive shrubs are a problem in some areas. Very few examples remain as almost all have been converted to agriculture.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Fagus grandifolia* - *Acer rubrum* / *Vaccinium corymbosum* Forest (CEGL006072, GNR)
- *Fagus grandifolia* - *Acer saccharum* - *Quercus bicolor* - *Acer rubrum* Flatwoods Forest (CEGL005173, G2G3)
- *Fagus grandifolia* - *Quercus alba* - (*Quercus michauxii*) - *Acer rubrum* Flatwoods Forest (CEGL005015, G3)
- *Quercus alba* - *Acer rubrum* - *Carya ovata* / *Viburnum acerifolium* / *Waldsteinia fragarioides* Forest (CEGL006122, GNR)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* / *Cornus florida* / *Andropogon gerardii* Woodland (CEGL006434, G1G3)
- *Quercus palustris* - (*Quercus bicolor*) - *Acer rubrum* / *Vaccinium corymbosum* / *Osmunda cinnamomea* Forest (CEGL006240, GNR)
- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus palustris* - *Quercus bicolor* - (*Liquidambar styraciflua*) Mixed Hardwood Forest (CEGL002432, G3G4)
- *Quercus palustris* - *Quercus bicolor* - *Acer rubrum* Flatwoods Forest (CEGL005037, G2G3)

- *Quercus palustris* - *Quercus bicolor* - *Nyssa sylvatica* - *Acer rubrum* Sand Flatwoods Forest (CEGL002100, G2?)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Fagus grandifolia* - *Quercus* spp. - *Acer* spp. Forest Alliance (A.230)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North-Central Interior Beech-Maple Forest (CES202.693)

DISTRIBUTION

Range: This system is found in the northern Midwest, southern Ontario, and portions of the northeastern U.S.

Divisions: 201:P; 202:C

Nations: CA, US

Subnations: CT, IA, IL, IN, MA, MI, MO, NY, OH, ON, PA, VT

Map Zones: 41:?, 42:C, 43:C, 44:P, 47:C, 49:?, 50:?, 51:C, 52:C, 53:P, 61:C, 62:P, 63:C, 64:P, 65:C

USFS Ecomap Regions: 211E:CC, 211F:CP, 221A:CC, 221B:CP, 222I:CP, 222Jh:CCC, 222Ua:CCC, 222Ue:CC?

TNC Ecoregions: 36:C, 44:C, 45:C, 47:?, 48:C, 49:P, 59:P, 61:C, 64:C

SOURCES

References: Braun 1950, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722960#references

Description Author: S. Menard, mod. J. Drake and S.C. Gawler

Version: 05 May 2008

Concept Author: S. Menard

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: Midwest

NORTH-CENTRAL INTERIOR WET MEADOW-SHRUB SWAMP (CES202.701)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional [Lakeshore]; Broad-Leaved Shrub; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Shallow (<15 cm) Water; Moderate (100-500 yrs) Persistence; Herbaceous; Depressional [Pond]; Isolated Wetland [Partially Isolated]; Muck

National Mapping Codes: ESLF 9185

CONCEPT

Summary: This system is found throughout the northern Midwest ranging into southern Canada. It is typically found on glacial potholes, river valleys, ponds, channels in glacial outwash, and on lakeplains. This system contains a deep to shallow area of freshwater marsh dominated by emergent species surrounded by a zone of wet meadow. The emergent marsh zone within this system contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate the core of this system. Wet meadows can surround the emergent marsh core along wet mineral soils or shallow peat with the water table typically just below the surface for most of the growing season. The vegetation in this zone of the system is dominated by sedges (*Carex* spp.) and grasses such as *Calamagrostis canadensis*. This system also can contain a zone of wet prairie species such as *Spartina pectinata*. Shrub swamps can also be associated with the wet meadows within this system. Typical shrub species include *Cornus* spp., *Salix* spp., and/or *Cephalanthus occidentalis*. Trees are generally absent and, if present, are scattered. Fire originating in adjacent uplands, as well as hydrology, can influence this system. In the absence of fire, drought and/or ditching can increase the proportion of shrubs compared to the wet meadow or prairie species.

Classification Comments: If examples of these associations are found within a medium to large floodplain, they should be considered part of North-Central Interior Floodplain (CES202.694). The freshwater marsh component was removed from this system to create a new system, North-Central Interior Freshwater Marsh (CES202.899).

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- Laurentian-Acadian Shrub-Herbaceous Wetland Systems (CES201.642)
- Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)

DESCRIPTION

Environment: This system is typically found on glacial potholes, river valleys, ponds, channels in glacial outwash, and on lakeplains. It contains a deep to shallow area of freshwater marsh dominated by emergent species surrounded by a zone of wet meadow. The emergent marsh zone within this system contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season.

Vegetation: Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate the core of this system. Wet meadows can surround the emergent marsh core along wet mineral soils or shallow peat with the water table typically just below the surface for most of the growing season. The vegetation in this zone of the system is dominated by sedges (*Carex* spp.) and grasses such as *Calamagrostis canadensis*. This system also can contain a zone of wet prairie species such as *Spartina pectinata*. Shrub swamps can also be associated with the wet meadows within this system. Typical shrub species include *Cornus* spp., *Salix* spp., and/or *Cephalanthus occidentalis*. Trees are generally absent and, if present, are scattered.

Dynamics: Fire originating in adjacent uplands, as well as hydrology, can influence this system. In the absence of fire, drought and/or ditching can increase the proportion of shrubs compared to the wet meadow or prairie species.

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex aquatilis* - *Carex* spp. Herbaceous Vegetation (CEGL002262, G4?)
- *Carex atherodes* Herbaceous Vegetation (CEGL002220, G3G5)
- *Carex crinita* - *Osmunda* spp. / *Physocarpus opulifolius* Seep Herbaceous Vegetation (CEGL002392, G2)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002027, G3?)
- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* - *Lythrum alatum* - (*Oxypolis rigidior*) Herbaceous Vegetation (CEGL002224, G3?)

- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* Sand Herbaceous Vegetation (CEGL005178, G3?)
- *Spiraea tomentosa* - *Salix humilis* / *Andropogon gerardii* - *Panicum virgatum* Shrubland (CEGL005069, G1Q)

Alliances:

- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex atherodes* Seasonally Flooded Herbaceous Alliance (A.1396)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Corylus americana* - (*Spiraea tomentosa*, *Malus ioensis*) Shrubland Alliance (A.897)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

DISTRIBUTION

Range: This system is found in the northern Midwest and southern Canada.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: IA, IL, IN, MI, MN, MO, ND, OH, ON, SD, WI

Map Zones: 39:C, 40:C, 41:C, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C, 62:P

USFS Ecomap Regions: 212Hb:CCP, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:?

SOURCES

References: Comer and Albert 1997, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722959#references

Description Author: S. Menard, mod. J. Drake

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, Midwest, Southeast
ClassifResp: Midwest

NORTHERN APPALACHIAN-ACADIAN CONIFER-HARDWOOD ACIDIC SWAMP (CES201.574)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Acidic Water; Extensive Wet Flat; *Picea* (*rubens*, *mariana*) - *Acer rubrum*

Non-Diagnostic Classifiers: Mesotrophic Water; Oligotrophic Water; Saturated Soil; Intermittent Flooding [Intermittent interval, Irregular Flooding]; Intermittent Flooding [Intermittent interval, Spring Flooding]; Moderate (100-500 yrs) Persistence; Forest and Woodland (Treed); Isolated Wetland [Partially Isolated]; Mineral: W/ A-Horizon <10 cm; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9346

CONCEPT

Summary: These forested wetlands are found in temperate northeastern and north-central U.S., primarily in glaciated regions in the eastern Laurentian-Acadian region. They occur on mineral soils that are nutrient-poor; there may be an organic epipedon, but the substrate is generally not deep peat. These basin wetlands remain saturated for all or nearly all of the growing season, and may have standing water seasonally. There may be some seepage influence, especially near the periphery. *Acer rubrum*, *Fraxinus* spp., *Picea rubens* (rarely *Picea mariana*), and *Abies balsamea* are the most typical trees. The herbaceous and shrub layers tend to be fairly species-poor. *Nemopanthus mucronatus* and *Osmunda* spp. are typical shrub and herb species.

Classification Comments: Acadian Sub-boreal Spruce Flat (CES201.562) is related but is more northern and occurs on imperfectly drained but not persistently saturated soils. *Picea rubens* in the East versus *Picea mariana* in the West and North may be helpful in distinguishing between this type and the more boreal acidic swamp, Boreal-Laurentian Conifer Acidic Swamp (CES103.724). This type is distributed in the Acadian and Northern Appalachian region of the U.S. and Canada, whereas Boreal-Laurentian Conifer Acidic Swamp (CES103.724) is found in the Upper Great Lakes region and into Canada. The attribution of CEG006380 to this system is questionable given that it is a seepage wetland, not a basin swamp association, but is included because portions of these wetlands may have seepage influence.

Similar Ecological Systems:

- Acadian Sub-boreal Spruce Flat (CES201.562)
- Boreal-Laurentian Conifer Acidic Swamp (CES103.724)--is similar but occurs in the upper Great Lakes region and adjacent Canada.
- Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575)
- North-Central Appalachian Acidic Swamp (CES202.604)
- North-Central Interior and Appalachian Acidic Peatland (CES202.606)

MEMBERSHIP

Associations:

- *Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Woodland (CEGL006119, G3G5)
- *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220, G4G5)
- *Betula alleghaniensis* - *Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Forest (CEGL006380, G4?)
- *Picea rubens* - *Abies balsamea* / *Gaultheria hispidula* / *Osmunda cinnamomea* / *Sphagnum* spp. Forest (CEGL006312, GNR)
- *Picea rubens* - *Acer rubrum* / *Nemopanthus mucronatus* Forest (CEGL006198, GNR)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer rubrum* Seasonally Flooded Woodland Alliance (A.653)
- *Picea rubens* - *Abies balsamea* Saturated Forest Alliance (A.202)
- *Picea rubens* - *Acer rubrum* Saturated Forest Alliance (A.450)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)

DISTRIBUTION

Range: This system occurs in New England and adjacent Canada west through New York. Occurrences in Massachusetts, Connecticut, and Pennsylvania are at higher elevations and peripheral to the range.

Divisions: 201:C

Nations: CA, US

Subnations: CT, MA, ME, NB?, NH, NY, ON, PA, VT

Map Zones: 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 211E:CC, 211J:CC, 221A:CC, 221B:CC, M211A:CC, M211D:CC

TNC Ecoregions: 47:P, 48:C, 60:C, 61:C, 63:C

SOURCES

References: Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003, Epstein pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723031#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler and D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN BASIN PEAT SWAMP (CES203.522)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Depressional [Peaty]; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9343

CONCEPT

Summary: This system is comprised of acidic peat swamps formed in basins of various sizes, predominantly Atlantic white-cedar swamps, occurring on the northern portion of the Atlantic Coastal Plain from Massachusetts south to Virginia. The hydrology is saturated, as evidenced by *Sphagnum*-dominated hummock-and-hollow microtopography. *Chamaecyparis thyoides* is characteristic and often dominant. *Acer rubrum* may also be an important species, especially after logging.

Similar Ecological Systems:

- North-Central Appalachian Acidic Swamp (CES202.604)
- Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)--has a *Chamaecyparis thyoides* component which is similar to this system in certain respects.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia virginiana* / *Viburnum nudum* var. *nudum* / *Osmunda cinnamomea* - *Woodwardia areolata* Forest (CEGL006238, G3?)
- *Acer rubrum* / *Alnus maritima* Woodland [Provisional] (CEGL006317, GNR)
- *Acer rubrum* / *Rhododendron maximum* Forest (CEGL006396, GNR)
- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156, GNR)
- *Chamaecyparis thyoides* - (*Tsuga canadensis*, *Betula alleghaniensis*) / *Clethra alnifolia* Forest (CEGL006189, G3)
- *Chamaecyparis thyoides* - *Acer rubrum* - *Magnolia virginiana* Forest (CEGL006078, GNR)
- *Chamaecyparis thyoides* - *Acer rubrum* / *Lycopus* spp. Forest (CEGL006364, GNR)
- *Chamaecyparis thyoides* - *Picea rubens* / *Gaylussacia baccata* / *Gaultheria hispidula* Forest (CEGL006363, G3?)
- *Chamaecyparis thyoides* / *Ilex glabra* - *Rhododendron viscosum* Forest (CEGL006188, G3)
- *Chamaecyparis thyoides* / *Rhododendron maximum* Forest (CEGL006355, G2G3)
- *Cladium mariscoides* - *Eriocaulon decangulare* - *Eriophorum virginicum* Herbaceous Vegetation (CEGL006467, GNR)
- *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland (CEGL006371, G4)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Saturated Woodland Alliance (A.657)
- *Chamaecyparis thyoides* - *Acer rubrum* Saturated Forest Alliance (A.448)
- *Chamaecyparis thyoides* - *Acer rubrum* Seasonally Flooded Forest Alliance (A.3008)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Vaccinium formosum* - *Vaccinium fuscatum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

DISTRIBUTION

Range: This system occurs on the northern portion of the Atlantic Coastal Plain from Massachusetts south to Virginia, with sporadic occurrences north to mid-coast Maine, and occasional disjunct occurrences inland; it is historic in eastern Pennsylvania.

Divisions: 201:C; 202:C; 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NH, NJ, NY, PA?, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 211Da:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, M211Bc:CCC

TNC Ecoregions: 58:C, 60:P, 61:C, 62:C, 63:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723070#references

Description Author: R. Evans, mod. S.C. Gawler
Version: 05 Feb 2009
Concept Author: R. Evans

Stakeholders: East, Southeast
ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN BASIN SWAMP AND WET HARDWOOD FOREST (CES203.520)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); North Atlantic Coastal Plain; Seepage-Fed Sloping

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9342

CONCEPT

Summary: This system is comprised of non-riverine hardwood swamps of seasonally flooded habitats, including relatively shallow groundwater-influenced depressions and other topographic depressions. It ranges from Long Island, New York, south to Virginia. Although supporting some seepage indicators, it is also affected by overland flow. The substrate is mineral soil overlain by a variable organic but non-peaty layer. Characteristic tree species include *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica*, *Quercus phellos*, and *Fraxinus pennsylvanica*. *Pinus taeda* is not uncommon south of Delaware Bay.

Classification Comments: Vegetation along streams is accommodated in a new system, Northern Atlantic Coastal Plain Stream and River (CES203.070).

Similar Ecological Systems:

- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)

DESCRIPTION

Vegetation: Characteristic tree species include *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica*, *Quercus phellos*, and *Fraxinus pennsylvanica*. *Pinus taeda* is not uncommon south of Delaware Bay.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Saururus cernuus* Forest (CEGL006606, GNR)
- *Acer rubrum* - *Nyssa sylvatica* - *Liquidambar styraciflua* - *Populus heterophylla* Forest (CEGL006013, G1)
- *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa biflora* / *Carex jorii* Forest (CEGL006223, G1G2)
- *Liquidambar styraciflua* - *Acer rubrum* - *Quercus phellos* / *Leucothoe racemosa* Forest (CEGL006110, G4G5)
- *Pinus serotina* / *Magnolia virginiana* / *Vaccinium corymbosum* / *Carex atlantica* Woodland (CEGL006470, GNR)
- *Populus heterophylla* - *Acer rubrum* - *Quercus palustris* - *Liquidambar styraciflua* Forest (CEGL006469, GNR)
- *Quercus* (*phellos*, *pagoda*, *michauxii*) / *Ilex opaca* var. *opaca* / *Clethra alnifolia* / *Woodwardia areolata* Forest (CEGL004644, G2?)
- *Quercus falcata* - *Quercus phellos* / *Ilex opaca* Forest (CEGL006390, GNR)
- *Quercus palustris* - (*Quercus bicolor*) - *Acer rubrum* / *Vaccinium corymbosum* / *Osmunda cinnamomea* Forest (CEGL006240, GNR)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)

DISTRIBUTION

Range: It ranges from Long Island, New York, south to Virginia.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, NY, PA, VA

Map Zones: 60:C, 65:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723072#references

Description Author: R. Evans, mod. J. Teague and M. Pyne

Version: 02 Feb 2007

Stakeholders: East, Southeast

1456 NORTHERN ATLANTIC COASTAL PLAIN PITCH PINE LOWLAND (CES203.374)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2456; ESLF 9125; ESP 1456

CONCEPT

Summary: This system is comprised of wetland Pine Barrens vegetation and Coastal Plain peatlands from the New Jersey Pine Barrens south into the Delmarva Peninsula and upper Chesapeake Bay. Although this system can be extensive, components often co-occur as a mosaic with upland pine barrens vegetation as well. The vegetation is characterized by associations having variable hydroperiods, occurring on a range of substrates from saturated deep peats to seasonally saturated mineral soils. Physiognomy of the component associations is similarly widely variable, ranging from wet grasslands dominated by *Calamovilfa brevipilis*, to boggy shrublands, to seasonally saturated pine forests characterized by mesic species. Fire frequency, as well as hydrology, has a profound influence on the vegetation. Where fire frequency is high, woody vegetation is impeded, favoring the development of large wet grasslands.

Classification Comments: Pondered wetlands with standing water (which may drop over the course of the season) and mineral soils are treated as Northern Atlantic Coastal Plain Pond (CES203.518).

Similar Ecological Systems:

- Atlantic Coastal Plain Northern Bog (CES203.893)--occurs to the north.
- Northern Atlantic Coastal Plain Pond (CES203.518)

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia virginiana* / *Viburnum nudum* var. *nudum* / *Osmunda cinnamomea* - *Woodwardia areolata* Forest (CEGL006238, G3?)
- *Chamaedaphne calyculata* / *Carex striata* Dwarf-shrubland (CEGL006208, GNR)
- *Fraxinus pennsylvanica* - *Juglans nigra* - *Ulmus americana* / *Cornus amomum* / *Onoclea sensibilis* Forest (CEGL006918, GNR)
- *Gaylussacia dumosa* / *Calamovilfa brevipilis* Shrub Herbaceous Vegetation (CEGL006397, G1)
- *Nyssa sylvatica* - *Magnolia virginiana* - (*Pinus rigida*) / *Rhododendron viscosum* - *Toxicodendron vernix* / *Smilax pseudochina* Woodland (CEGL006219, G1)
- *Panicum virgatum* Seasonally Flooded Herbaceous Vegetation (CEGL004128, GNR)
- *Pinus rigida* - *Nyssa sylvatica* / *Clethra alnifolia* - *Leucothoe racemosa* Forest (CEGL006926, G2)
- *Pinus rigida* / *Chamaedaphne calyculata* / *Sphagnum* spp. Woodland (CEGL006194, G3G5)
- *Pinus rigida* / *Gaylussacia baccata* - *Kalmia angustifolia* Woodland (CEGL006387, GNR)
- *Pinus rigida* / *Gaylussacia dumosa* / *Calamovilfa brevipilis* Woodland (CEGL006388, G1)
- *Pinus rigida* / *Vaccinium corymbosum* - *Leucothoe racemosa* / *Sphagnum* spp. Woodland (CEGL006195, G3)
- *Vaccinium corymbosum* / *Sphagnum* spp. Shrubland (CEGL006190, G3G5)

Alliances:

- *Acer (rubrum, saccharinum)* - *Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Calamovilfa brevipilis* Saturated Shrub Herbaceous Alliance (A.3007)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Pinus rigida* - *Acer rubrum* Saturated Forest Alliance (A.3005)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

DISTRIBUTION

Range: This system is best developed in the New Jersey Pine Barrens, but occurrences are present south to the inner Coastal Plain of Maryland.

Divisions: 203:C

Nations: US

Subnations: DE?, MD, NJ

Map Zones: 60:C

USFS Ecomap Regions: 232A:CC, 232H:CC

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723142#references

Description Author: R. Evans and L. Sneddon, mod. S.C. Gawler

Version: 05 May 2008

Concept Author: R. Evans and L. Sneddon

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN TIDAL SWAMP (CES203.282)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine

National Mapping Codes: ESLF 9303

CONCEPT

Summary: This system encompasses tidally flooded deciduous forests and shrublands in lower river floodplains and edges of estuaries of the North Atlantic Coastal Plain. This system is restricted to narrow zones along upper tidal reaches of Inner Coastal Plain rivers and tributaries which have sufficient volumes of freshwater and short flooding to be able to support tree canopies. According to Fleming et al. (2001), these areas are influenced by lunar tides up to 1 m (3 feet), but diluting freshwater flows from upstream keep salinity levels below 0.5 ppt. Deciduous hardwood species predominate, especially *Nyssa* and/or *Fraxinus*.

Classification Comments: The range of this system is generally conceived as Chesapeake Bay and northward (e.g., in the Coastal Plain from the James River, Virginia, northward to New Jersey). Examples of tidal swamp forests south of this region are treated under Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240); the boundaries may overlap somewhere in Virginia.

Similar Ecological Systems:

- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Polygonum* spp. Forest (CEGL006165, G2)
- *Alnus (incana ssp. rugosa, serrulata)* - *Cornus amomum* Shrubland (CEGL006337, GNR)
- *Fraxinus profunda* - *Nyssa biflora* - (*Fraxinus pennsylvanica*) / *Ilex verticillata* / *Polygonum arifolium* Forest (CEGL006287, G3)
- *Pinus taeda* - *Nyssa biflora* - *Taxodium distichum* / *Morella cerifera* / *Osmunda regalis var. spectabilis* Forest (CEGL004651, G2?)
- *Taxodium distichum* / *Carex hyalinolepis* Woodland (CEGL004654, G2?)
- *Taxodium distichum* / *Pontederia cordata* - *Peltandra virginica* Tidal Woodland (CEGL006059, GNR)

Alliances:

- *Alnus (incana, serrulata, maritima)* Tidal Shrubland Alliance (A.1024)
- *Fraxinus pennsylvanica* - *Acer rubrum* - *Ulmus americana* Tidal Forest Alliance (A.356)
- *Nyssa biflora* - (*Nyssa aquatica, Taxodium distichum*) Tidal Forest Alliance (A.357)
- *Taxodium distichum* Tidal Woodland Alliance (A.659)

DISTRIBUTION

Range: This system ranges from the James River, Virginia, northward to the New Jersey Coastal Plain. Examples are probably most common in the Chesapeake Bay region.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, NY, VA

Map Zones: 60:C, 65:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723205#references

Description Author: R. Evans and P. Coulling

Version: 18 Nov 2002

Concept Author: R. Evans and P. Coulling

Stakeholders: East, Southeast

ClassifResp: East

1161 NORTHERN ROCKY MOUNTAIN CONIFER SWAMP (CES306.803)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saturated Soil; Forest and Woodland (Treed); Seepage-Fed Sloping [Mineral]; Depressional; Mineral: W/ A-Horizon <10 cm

Non-Diagnostic Classifiers: Montane; Toeslope; Valley bottom; Temperate [Temperate Continental]; Bench; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2161; ESLF 9111; ESP 1161

CONCEPT

Summary: This ecological system occurs in the northern Rocky Mountains from northwestern Wyoming north into the Canadian Rockies and west into eastern Oregon and Washington. It is dominated by conifers on poorly drained soils that are saturated year-round or may have seasonal flooding in the spring. These are primarily on flat to gently sloping lowlands, but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock. This system is indicative of poorly drained, mucky areas, and areas are often a mosaic of moving water and stagnant water. Soils can be woody peat, muck or mineral but tend toward mineral. Stands generally occupy sites on benches, toeslopes or valley bottoms along mountain streams. Associations present include wetland phases of *Thuja plicata*, *Tsuga heterophylla*, and *Picea engelmannii* forests. The wetland types are generally distinguishable from other upland forests and woodlands by shallow water tables and mesic or hydric undergrowth vegetation; some of the most typical species include *Athyrium filix-femina*, *Dryopteris* spp., *Lysichiton americanus*, *Equisetum arvense*, *Senecio triangularis*, *Mitella breweri*, *Mitella pentandra*, *Streptopus amplexifolius*, *Calamagrostis canadensis*, or *Carex disperma*.

Classification Comments: May need to split out calcareous cedar (*Thuja plicata*) swamps from the other conifer swamps- needs more review.

Related Concepts:

- Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) Intersecting. Swamps dominated by engelmann spruce occur in this system.
- Western Redcedar - Western Hemlock: 227 (Eyre 1980) Intersecting
- Western Redcedar: 228 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Abies lasiocarpa* - *Picea engelmannii* / *Oplopanax horridus* Forest (CEGL000322, G3)
- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336, G4)
- *Betula glandulosa* / *Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula glandulosa* / *Carex utriculata* Shrubland (CEGL001079, G4?)
- *Picea (engelmannii X glauca, engelmannii)* / *Carex disperma* Forest (CEGL000405, G2Q)
- *Picea (engelmannii X glauca, engelmannii)* / *Lysichiton americanus* Forest (CEGL000412, G2)
- *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL002678, G4)
- *Picea engelmannii* / *Caltha leptosepala* Forest (CEGL000357, G3?)
- *Picea engelmannii* / *Carex disperma* Forest (CEGL000358, G2)
- *Picea engelmannii* / *Equisetum arvense* Forest (CEGL005927, G4)
- *Thuja plicata* - *Tsuga heterophylla* / *Lysichiton americanus* / *Sphagnum* spp. Forest (CEGL001787, G3G4)
- *Thuja plicata* - *Tsuga heterophylla* / *Lysichiton americanus* Forest (CEGL002670, G3?)
- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479, G3)
- *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473, G3G4)
- *Thuja plicata* / *Carex disperma* Forest [Provisional] (CEGL005931, G2?)

Alliances:

- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Betula glandulosa* Seasonally Flooded Shrubland Alliance (A.995)
- *Picea engelmannii* Saturated Forest Alliance (A.204)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Thuja plicata* Forest Alliance (A.166)
- *Thuja plicata* Seasonally Flooded Forest Alliance (A.193)
- *Tsuga heterophylla* Saturated Forest Alliance (A.203)

DISTRIBUTION

Range: This system occurs in the northern Rocky Mountains from northwestern Wyoming and central Montana, north into the

Canadian Rockies and west into eastern Oregon and Washington.

Divisions: 306:C

Nations: CA, US

Subnations: AB, BC, ID, MT, OR, WA, WY

Map Zones: 9:C, 10:C, 19:C, 20:C, 21:C, 29:C

USFS Ecomap Regions: 331A:PP, M331A:PP, M331D:P?, M332A:CC, M332B:CC, M332D:CP, M332E:CP, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 7:C, 8:C, 9:P, 26:C, 68:C

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Meidinger and Pojar 1991

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722870#references

Description Author: M.S. Reid

Version: 07 Sep 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

NORTHERN ROCKY MOUNTAIN LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND (CES306.804)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval [Short interval, Spring Flooding]; Montane [Lower Montane]; Riverine / Alluvial

Non-Diagnostic Classifiers: Circumneutral Water; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Unconsolidated

National Mapping Codes: ESLF 9155

CONCEPT

Summary: This ecological system of the northern Rocky Mountains and the east slopes of the Cascades consists of deciduous, coniferous, and mixed conifer-deciduous forests that occur on streambanks and river floodplains of the lower montane and foothill zones. Riparian forest stands are maintained by annual flooding and hydric soils throughout the growing season. Riparian forests are often accompanied by riparian shrublands or open areas dominated by wet meadows. *Populus balsamifera* is the key indicator species. Several other tree species can be mixed in the canopy, including *Populus tremuloides*, *Betula papyrifera*, *Betula occidentalis*, *Picea mariana*, and *Picea glauca*. *Abies grandis*, *Thuja plicata*, and *Tsuga heterophylla* are commonly dominant canopy species in western Montana and northern Idaho occurrences, in lower montane riparian zones. Shrub understory components include *Cornus sericea*, *Acer glabrum*, *Alnus incana*, *Betula papyrifera*, *Oplopanax horridus*, and *Symphoricarpos albus*. Ferns and forbs of mesic sites are commonly present in many occurrences, including such species as *Athyrium filix-femina*, *Gymnocarpium dryopteris*, and *Senecio triangularis*.

Classification Comments: This system is from the Canadian Rockies ecoregion project and represents lower montane riparian in Montana north into Canada. In the Okanagan, this is defined as all the cottonwood-dominated or -codominated riparian systems below subalpine and above the Ponderosa pine zone. This system occurs in fire-dominated landscapes, which distinguishes it from North Pacific and subalpine/alpine landscapes that have significantly different fire regimes. This system is distinguished from the similar Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833) by the floristic component of northern Rocky Mountain species, both in the woody layers and in the herbaceous taxa. This system may occur in northwestern Wyoming where *Populus balsamifera* dominates or codominates some woodlands, but those woodlands may be better placed into Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821), which lists *Populus balsamifera* as a possible dominant.

Similar Ecological Systems:

- Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768)
- Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

Related Concepts:

- Act - Dogwood - Prickly rose (SBSdk/08) (Banner et al. 1993) Intersecting
- Act - Dogwood - Prickly rose (SBSdk/08) (DeLong et al. 1993) Intersecting
- Act - Dogwood - Prickly rose (SBSdk/08) (Steen and Coupe 1997) Intersecting
- Act - Dogwood - Prickly rose, High-bench (SBSdk/08) (Banner et al. 1993) Intersecting
- Act - Dogwood - Prickly rose, High-bench (SBSdk/08) (Steen and Coupe 1997) Intersecting
- Act - Dogwood - Prickly rose, High-bench (SBSdk/08) (DeLong et al. 1993) Intersecting
- Act - Dogwood - Prickly rose, Medium-bench (SBSdk/08) (Banner et al. 1993) Intersecting
- Act - Dogwood - Prickly rose, Medium-bench (SBSdk/08) (DeLong et al. 1993) Intersecting
- Act - Dogwood - Prickly rose, Medium-bench (SBSdk/08) (Steen and Coupe 1997) Intersecting
- ActBl - Devil's club (SBSvk/12) (DeLong 2003) Intersecting
- ActSxw - Red-osier dogwood (SBSwk1/13) (Steen and Coupe 1997) Intersecting
- ActSxw - Red-osier dogwood (SBSwk1/13) (DeLong 2003) Intersecting
- Bebb's willow - Bluejoint (SBSdk/Ws03) (Banner et al. 1993) Intersecting
- Bebb's willow - Bluejoint (SBSdk/Ws03) (Steen and Coupe 1997) Intersecting
- Bebb's willow - Bluejoint (SBSdk/Ws03) (DeLong et al. 1993) Intersecting
- Black Cottonwood - Willow: 222 (Eyre 1980) Intersecting
- CR Black Cottonwood Riparian (Ecosystems Working Group 1998) Broader
- Drummond's willow - Beaked sedge (ESSFdc2/Ws04) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Beaked sedge (ICHvc/Ws04) (Banner et al. 1993) Intersecting
- Drummond's willow - Beaked sedge (MSxk/Ws04) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Beaked sedge (SBPSmk/Ws04) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Beaked sedge (SBSdk/Ws04) (DeLong et al. 1993) Intersecting
- Drummond's willow - Beaked sedge (SBSdk/Ws04) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Beaked sedge (SBSdk/Ws04) (Banner et al. 1993) Intersecting

- Drummond's willow - Beaked sedge (SBSmc2/Ws04) (DeLong et al. 1993) Intersecting
- Drummond's willow - Beaked sedge (SBSmc2/Ws04) (Banner et al. 1993) Intersecting
- Drummond's willow - Beaked sedge (SBSmk1/Ws04) (DeLong et al. 1993) Intersecting
- Drummond's willow - Beaked sedge (SBSwk1/Ws04) (DeLong 2003) Intersecting
- Drummond's willow - Beaked sedge (SBSwk1/Ws04) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Bluejoint (ICHmc2/56) (Banner et al. 1993) Intersecting
- Drummond's willow - Bluejoint (SBPSdc/FI05) (MacKenzie and Moran 2004) Intersecting
- Drummond's willow - Bluejoint (SBPSdc/FI05) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Bluejoint (SBSdk/54) (DeLong et al. 1993) Intersecting
- Drummond's willow - Bluejoint (SBSdk/54) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Bluejoint (SBSdk/54) (Banner et al. 1993) Intersecting
- Drummond's willow - Bluejoint (SBSdk/FI05) (DeLong et al. 1993) Intersecting
- Drummond's willow - Bluejoint (SBSdk/FI05) (Banner et al. 1993) Intersecting
- Drummond's willow - Bluejoint (SBSdk/FI05) (Steen and Coupe 1997) Intersecting
- Drummond's willow - Bluejoint (SBSdw3/FI05) (Banner et al. 1993) Intersecting
- Drummond's willow - Bluejoint (SBSdw3/FI05) (DeLong et al. 1993) Intersecting
- Mountain alder - Common horsetail (BWBSdk1/FI01) (Banner et al. 1993) Intersecting
- Mountain alder - Common horsetail (BWBSdk1/FI01) (MacKinnon et al. 1990) Intersecting
- Mountain alder - Common horsetail (CWHwm/FI01) (Banner et al. 1993) Intersecting
- Mountain alder - Common horsetail (ICHvc/FI01) (Banner et al. 1993) Intersecting
- Mountain alder - Common horsetail (MSxv/FI01) (Steen and Coupe 1997) Intersecting
- Mountain alder - Common horsetail (SBSvk/FI01) (DeLong 2003) Intersecting
- Mountain alder - Lady fern (SBSvk/11) (DeLong 2003) Intersecting
- Mountain alder - Lady fern (SBSvk/51) (DeLong 2003) Intersecting
- Mountain alder - Mitrewort (SBSdk/53) (Steen and Coupe 1997) Intersecting
- Mountain alder - Mitrewort (SBSdk/53) (DeLong et al. 1993) Intersecting
- Mountain alder - Mitrewort (SBSdk/53) (Banner et al. 1993) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (SBSdk/FI02) (Steen and Coupe 1997) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (SBSdk/FI02) (DeLong et al. 1993) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (SBSdk/FI02) (Banner et al. 1993) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (SBSmk2/FI02) (MacKinnon et al. 1990) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (SBSvk/FI02) (DeLong 2003) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (SBSwk1/FI02) (DeLong 2003) Intersecting
- Mountain alder - Red-osier dogwood - Horsetail (SBSwk1/FI02) (Steen and Coupe 1997) Intersecting
- Mountain alder - Stinging nettle (SBSdk/52) (Banner et al. 1993) Intersecting
- Mountain alder - Stinging nettle (SBSdk/52) (Steen and Coupe 1997) Intersecting
- Mountain alder - Stinging nettle (SBSdk/52) (DeLong et al. 1993) Intersecting
- RR Western Redcedar - Black Cottonwood Riparian (Ecosystems Working Group 1998) Broader
- Western Redcedar - Western Hemlock: 227 (Eyre 1980) Intersecting
- Western Redcedar: 228 (Eyre 1980) Intersecting
- WR Hybrid White Spruce - Black Cottonwood Riparian (Ecosystems Working Group 1998) Broader
- Ws - Thimbleberry (SBSdk/51) (DeLong et al. 1993) Intersecting
- Ws - Thimbleberry (SBSdk/51) (Steen and Coupe 1997) Intersecting
- Ws - Thimbleberry (SBSdk/51) (Banner et al. 1993) Intersecting

MEMBERSHIP

Associations:

- *Abies grandis* / *Athyrium filix-femina* Forest (CEGL000270, G3Q)
- *Abies grandis* / *Senecio triangularis* Forest (CEGL000280, G3)
- *Betula papyrifera* Forest [Provisional] (CEGL000520, G4Q)
- *Populus balsamifera* (*ssp. trichocarpa*, *ssp. balsamifera*) / *Symphoricarpos* (*albus*, *oreophilus*, *occidentalis*) Forest (CEGL000677, G2)
- *Populus balsamifera ssp. trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest (CEGL000542, G2)
- *Populus balsamifera ssp. trichocarpa* / *Alnus incana* Forest (CEGL000667, G3)
- *Populus balsamifera ssp. trichocarpa* / *Betula papyrifera* Forest (CEGL000670, GNRQ)
- *Populus balsamifera ssp. trichocarpa* / *Calamagrostis canadensis* Forest [Provisional] (CEGL005845, G2?)
- *Populus balsamifera ssp. trichocarpa* / *Cornus sericea* Forest (CEGL000672, G3G4)
- *Populus balsamifera ssp. trichocarpa* / *Oplopanax horridus* - *Acer glabrum* Forest (CEGL000482, G2)
- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479, G3)
- *Thuja plicata* / *Gymnocarpium dryopteris* Forest (CEGL000476, G3)
- *Tsuga heterophylla* / *Athyrium filix-femina* Forest (CEGL000491, G2Q)
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest (CEGL000494, G3G4)

Alliances:

- *Abies grandis* Temporarily Flooded Forest Alliance (A.176)
- *Betula papyrifera* Forest Alliance (A.267)
- *Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Thuja plicata* Forest Alliance (A.166)
- *Thuja plicata* Seasonally Flooded Forest Alliance (A.193)
- *Tsuga heterophylla* Forest Alliance (A.145)
- *Tsuga heterophylla* Temporarily Flooded Forest Alliance (A.174)

DISTRIBUTION

Range: This system is found in the northern Rocky Mountains.

Divisions: 303:P; 306:C

Nations: CA, US

Subnations: AB, BC, ID, MT, OR?, WA, WY

Map Zones: 8:C, 9:C, 10:C, 18:?, 19:C, 20:C, 21:C, 22:P

USFS Ecomap Regions: 331A:P?, 331D:PP, 331N:PP, 342A:??, 342C:??, 342D:??, M242C:PP, M331A:PP, M331B:P?, M332A:CP, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CP, M333C:CC, M333D:CC

TNC Ecoregions: 7:C, 8:C, 68:C

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Hansen et al. 1988b, Hansen et al. 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722869#references

Description Author: M.S. Reid

Version: 07 Sep 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

NORTHERN ROCKY MOUNTAIN WOODED VERNAL POOL (CES304.060)

CLASSIFIERS

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional; Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 9162

CONCEPT

Summary: These wooded vernal pools are small shallow circumneutral freshwater wetlands of glacial origin that partially or totally dry up as the growing season progresses. They are documented to occur in northern Idaho and western Montana. These vernal ponds and wetlands usually fill with water over the fall, winter and early spring, but then at least partially dry up towards the end of the growing season. Depending on annual patterns of temperature and precipitation, the drying of the pond may be complete or partial by the fall. These sites are usually shallow and less than 1 m in depth, but can be as much as 2 m deep. The pool substrate is a poorly drained, often clayey layer with shallow organic sediments. The freshwater ponds have pH ranges from 6.2 to 7.8 with most measurements between 6.5 and 7.5, i.e., relatively neutral. The ponds in Montana were thought to be isolated, but it has been shown that in high water years the ponds spill over, and there is an exchange of surface water between ponds. The pools have a ring of trees surrounding the ponds that provide shade and influence their hydrology. A variety of tree species dominant the upper canopy, including *Abies grandis*, *Abies lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *Pinus contorta*, *Pseudotsuga menziesii*, and the broadleaf trees *Populus balsamifera* ssp. *trichocarpa* (= *Populus trichocarpa*) (black cottonwood), *Fraxinus latifolia*, and, to a lesser extent, *Populus tremuloides* (quaking aspen) and *Betula papyrifera* (paper birch). Common shrubs include *Alnus incana*, *Cornus sericea* (= *Cornus stolonifera*), *Rhamnus alnifolia*, and *Salix* spp. *Alopecurus aequalis*, *Callitriche heterophylla*, *Carex vesicaria* (inflated sedge), *Eleocharis palustris*, and *Phalaris arundinacea* (reed canarygrass) are common herbaceous plant associates.

DISTRIBUTION

Divisions: 304:C

Nations: US

Subnations: ID, MT

Map Zones: 9:P, 10:C, 19:C, 21:P

USFS Ecomap Regions: M332A:??, M332B:??, M332E:??, M332G:??, M333A:PP, M333B:PP, M333C:PP, M333D:PP

TNC Ecoregions: 7:C, 8:P, 68:C

SOURCES

References: Mincemoyer 2005, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.785246#references

Description Author: G. Kittel

Version: 01 Oct 2007

Concept Author: Western Ecology Group

Stakeholders: West

ClassifResp: West

NORTHWESTERN GREAT PLAINS FLOODPLAIN (CES303.676)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Long (>25 yrs) Flooding Interval; Floodplain; Forest and Woodland (Treed); Riverine / Alluvial

National Mapping Codes: ESLF 9159

CONCEPT

Summary: This ecological system is found in the floodplains of medium and large rivers of the northwestern Great Plains, ranging from the Dakotas Mixedgrass Prairie west through the Northern Great Plains Steppe and north into Canada. This system occurs in the upper Missouri River Basin and includes parts of the Niobrara, White, Cheyenne, Little Missouri, Yellowstone, Powder, Bighorn, Milk, and Musselshell rivers. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system. These are the perennial big rivers of the region with hydrologic dynamics largely driven by snowmelt in the mountains, rather than local precipitation events. Dominate communities within this system range from floodplain forests to wet meadows to gravel/sand flats, however, they are linked by underlying soils and flooding regime. Dominant species are *Populus balsamifera ssp. trichocarpa* or *Populus deltoides* and *Salix* spp. *Fraxinus pennsylvanica*, *Salix amygdaloides*, and *Ulmus americana* are common in some stands. If present, common shrub species include *Amorpha fruticosa*, *Cornus drummondii*, *Cornus sericea*, *Symphoricarpos occidentalis*, *Salix exigua*, *Salix interior*, and *Salix planifolia*. Grass cover underneath the trees is an important part of this system and is a mix of cool-season graminoid species, including *Carex pellita* (= *Carex lanuginosa*), *Elymus lanceolatus*, *Pascopyrum smithii*, and *Schoenoplectus* spp., with warm-season species such as *Panicum virgatum*, *Schizachyrium scoparium*, and *Spartina pectinata*. This system is often subjected to heavy grazing and/or agriculture and can be heavily degraded. In Montana, most occurrences are now degraded to the point where the cottonwood overstory is the only remaining natural component; undergrowth is dominated by *Bromus inermis*, or a complex of pasture grasses. Another factor is that groundwater depletion and lack of fire have created additional species changes. In most cases, the majority of the wet meadow and prairie communities may be extremely degraded or extirpated from the system.

Classification Comments: This system needs to be more clearly delineated from Northwestern Great Plains Riparian (CES303.677). The component plant association list is incomplete. All the riparian/floodplain/alluvial systems of the Great Plains region need to be revisited for naming conventions, along with better definitions of conceptual boundaries. There is much apparent overlap in their concepts and distribution, and the names add to the confusion. In particular, the difference between "riparian" and "floodplain" usage in the names needs revisiting and possible changing. These systems include Northwestern Great Plains Floodplain (CES303.676), Northwestern Great Plains Riparian (CES303.677), Western Great Plains Floodplain (CES303.678), and Western Great Plains Riparian (CES303.956).

Similar Ecological Systems:

- Western Great Plains Floodplain (CES303.678)

Related Concepts:

- Bluestem Prairie (601) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Juncus* spp. - *Carex* spp. Sandhills Herbaceous Vegetation (CEGL002028, G3G4)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Cornus drummondii* - *Amorpha fruticosa* - *Cornus sericea* Shrubland (CEGL005220, G4?)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) / *Symphoricarpos occidentalis* Forest (CEGL002088, G4?)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix (exigua, interior)* Woodland (CEGL000659, G3G4)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Cornus sericea* Forest (CEGL000657, G2G3)
- *Populus deltoides* / *Juniperus scopulorum* Woodland (CEGL002152, G1G2)
- Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049, G4G5)
- *Salix exigua* Temporarily Flooded Shrubland (CEGL001197, G5)
- *Salix planifolia* Shrubland (CEGL001224, G4)
- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Spartina pectinata* - *Carex* spp. Herbaceous Vegetation (CEGL001477, G3?)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)

Alliances:

- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Temporarily Flooded Forest Alliance (A.308)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix planifolia* Seasonally Flooded Shrubland Alliance (A.1008)
- Sand Flats Temporarily Flooded Sparsely Vegetated Alliance (A.1864)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found in the northwestern Great Plains, north of the North Platte River through southern Canada. It is found in eastern Montana along the upper Missouri, Yellowstone, Bighorn, Milk, and Musselshell rivers; in northern Nebraska and the Dakotas on the Niobrara, upper Missouri, White, Cheyenne, and Little Missouri rivers; and in Canada on the Saskatchewan River.

Divisions: 205:P; 303:C

Nations: CA, US

Subnations: AB, MB, MT, ND, NE, SD, SK, WY?

Map Zones: 20:C, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:C?, 331E:C?, 331F:CC, 331G:CP, 331K:CC, 331L:CC, 331M:CC

TNC Ecoregions: 26:C, 34:C, 66:P, 67:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722982#references

Description Author: S. Menard, K. Kindscher, mod. M.S. Reid and K.A. Schulz

Version: 23 Jan 2008

Concept Author: S. Menard, K. Kindscher, NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

PIEDMONT SEEPAGE WETLAND (CES202.298)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping

National Mapping Codes: ESLF 9308

CONCEPT

Summary: This Piedmont system consists of seepage-fed wetlands on gentle slopes, with substantial seepage flow. Vegetation is variable, both within and among examples. Included are hillside seepage bogs with substantial boggy flora and with strong influence by fire, and lower slope and floodplain edge seeps with forb-dominated vegetation.

Classification Comments: This system is fairly heterogeneous, covering a broad range of environments and vegetation. Two distinct subtypes can be recognized, which may warrant separating into different systems. Seepage bogs have a very distinctive flora, appear to be naturally influenced by fire, and usually occur in more upland settings, often with upland systems completely surrounding them. Some are related to the Atlantic Coastal Plain Sandhill Seep (CES203.253). Non-boggy seeps have a non-fire-tolerant flora and occur in lower topographic settings. Between these two extremes are seepage bogs with less Coastal Plain character, though they still have *Sarracenia* spp. There are also streamhead seeps, which have some bog flora and have Coastal Plain species, but which occur along drainages. They are transitional to Southern Piedmont Small Floodplain and Riparian Forest (CES202.323), but are also related to the Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252). These different Piedmont wetland communities are put into one system, rather than separated as in the Coastal Plain, because the differences are not as sharp and the range of variation smaller within each. This system is readily distinguished from adjacent upland systems by the presence of wetland flora and soils, as well as seepage. They are somewhat less clearly distinguished from adjacent floodplain systems, but are distinctly wetter most of the time. They are saturated without having standing water as floodplain pools do. These differences are reflected in the vegetation.

Piedmont seepage wetlands are separated from Southern Appalachian Seepage Wetland (CES202.317) by floristic differences. A few examples in the upper Piedmont may be better placed with the southern Appalachian system, but most are geographically separated.

Similar Ecological Systems:

- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)
- North-Central Appalachian Acidic Swamp (CES202.604)--ranges south to northern Virginia.
- North-Central Interior and Appalachian Rich Swamp (CES202.605)--ranges south to northern Virginia.
- Southern Appalachian Seepage Wetland (CES202.317)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

DESCRIPTION

Environment: Occurs in small patches where seepage water creates wetland conditions. Seepage commonly occurs at the base of slopes on the edge of bottomlands or in headwaters of small streams. Others occur on gently sloping hillsides where impermeable soils and slope force shallow groundwater to the surface. The soil is saturated seasonally to permanently, but has no substantial amount of standing water.

Vegetation: Vegetation generally is patchy and heterogeneous in structure. Most examples do not have closed tree canopies, and well-developed shrub or herb layers are almost always present. The trees are often not very distinctive, consisting of widespread wetland species, such as *Acer rubrum*, or of non-wetland species shared with adjacent communities. Often tree cover comes primarily from trees rooted in adjacent communities. The shrub layer normally consists of wetland species. *Alnus serrulata*, *Viburnum nudum*, *Vaccinium* spp., and other ericaceous species are most common. The herb layer is quite variable. Large wetland ferns such as *Osmunda cinnamomea* are often prominent. Various wetland grasses, sedges, and rushes may be abundant, and forbs such as *Impatiens capensis*, *Saururus cernuus*, *Boehmeria cylindrica*, and *Rudbeckia laciniata* are also often prominent. A distinct subtype is boggy in character, with substantial amounts of *Sphagnum*. The boggy seeps often have a number of species characteristic of Coastal Plain wetlands and otherwise absent in the Piedmont, such as *Sarracenia purpurea*, *Sarracenia flava*, *Smilax laurifolia*, and *Cyrtilla racemiflora*. Examples from the southwestern end of this system's range (e.g., in Alabama's Talladega Ridge Subsection [231Dd] or level IV ecoregion 45d), contain *Magnolia virginiana*, which is more typical of the Coastal Plain.

Dynamics: The presence of seepage is the primary determinant of this system. Long-term droughts that affect seepage flow presumably have an effect. Canopy dynamics are not well known and potentially may vary substantially over short distances in response to wetness. Wetness clearly limits recruitment of most tree and shrub seedlings to drier microsites in the wettest examples. Fire is an important influence in some examples. Many of the boggy seeps are associated with Southeastern Interior Longleaf Pine Woodland (CES202.319) and have a substantial fire-tolerant flora. At the other end of the spectrum, floodplain edge seeps may seldom if ever have burned. Long-term geomorphic processes may be important in these systems. Headward erosion by small streams,

or meandering by larger stream channels, sometimes drains seeps and eliminates the wetland vegetation. Piedmont Seepage Wetland (CES202.298) are often left undisturbed when surrounding forests are logged. Effects of logging on water infiltration or surface flow may have significant indirect effects.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Liriodendron tulipifera* / *Ilex opaca* var. *opaca* / *Osmunda cinnamomea* Forest (CEGL004551, G2G3)
- *Acer rubrum* var. *trilobum* / *Morella caroliniensis* - *Gaylussacia frondosa* / *Andropogon glomeratus* - (*Sarracenia flava*) Woodland (CEGL004781, G2)
- *Acer rubrum* var. *trilobum* / *Viburnum nudum* var. *nudum* / *Osmunda cinnamomea* - *Saururus cernuus* - *Impatiens capensis* Forest (CEGL004426, G3?)
- *Alnus serrulata* - *Magnolia virginiana* / *Andropogon glomeratus* - *Eupatorium pilosum* - *Rhynchospora gracilentia* - *Xyris torta* Shrubland (CEGL006499, GNR)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Saturated Woodland Alliance (A.657)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, usually less than one acre.

Size: Occurs as small patches, most less than one acre in size. A few stream seepage wetlands may cover a couple of acres in branching linear bodies. Occasionally two or three patches will occur close enough together to be treated as a single occurrence, but most examples are isolated.

Adjacent Ecological Systems:

- Southeastern Interior Longleaf Pine Woodland (CES202.319)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Adjacent Ecological System Comments: This system may be embedded in a variety of other systems. Most common are Southern Piedmont Dry Oak-(Pine) Forest (CES202.339), Southeastern Interior Longleaf Pine Woodland (CES202.319), Southern Piedmont Small Floodplain and Riparian Forest (CES202.323), and Southern Piedmont Large Floodplain Forest (CES202.324).

DISTRIBUTION

Range: This system ranges throughout the Piedmont, from Alabama to North Carolina and possibly the southeastern corner of Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA?

Map Zones: 54:C, 59:C

USFS Ecomap Regions: 221D:CC, 231A:CC, 231I:CC, M221D:CC

TNC Ecoregions: 50:P, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723193#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 01 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

PIEDMONT UPLAND DEPRESSION SWAMP (CES202.336)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 9302

CONCEPT

Summary: This system represents isolated wetlands primarily of the Piedmont in small, shallow basins in upland settings where water pools due to limited soil drainage. Most known examples occur on mafic rocks. The typical hydrology is seasonally flooded. Most examples consist of forests of wetland oaks, but a few are treeless or open-canopied ponds. Vegetation is zoned with an outer ring of trees, a more interior ring of shrubs, herbs and vines, and a central area with or without standing water year round depending on precipitation. This system also includes the wet hardwood forests ("Iredell Flatwoods" or "Gabbro Glades") which occur on gently sloping terrain or shallowly depressed upland flats over gabbro-derived clays in the Piedmont of Georgia and South Carolina. A few examples occur in the adjacent Southern Blue Ridge; these are only extremely rare and small-patch examples.

Classification Comments: This system is distinct from all other Piedmont systems in its ponded wetland hydrology in upland settings. The vegetation is generally also distinct from all other Piedmont systems. Though apparently quite different, Piedmont Hardpan Woodland and Forest (CES202.268) is closely related by the importance of an impermeable clay hardpan, and some intermediate gradations occur. A few examples of this system (CES202.336) appear to be closely related to Coastal Plain depressional wetlands, sharing some flora, but most are more distinct. The system has significant variation in vegetation and environment. The forested swamps and open pools represent well-marked subtypes. There is a more subtle distinction between the basic and acidic soil swamps. There is substantial variation among the pools, related to substrate, basin morphology, and geographic location. A few disjunct examples may occur in the Southern Blue Ridge because of similarity in topographic setting and general structure. They do, however, occur on different substrates (quartzite and sandstone) than any examples in the Piedmont. Their vegetation is different from other examples but not in having more montane flora. Their vegetation is no more different than most other pools are from each other.

Similar Ecological Systems:

- Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)
- North-Central Appalachian Acidic Swamp (CES202.604)--replaces CES202.336 to the north?
- Piedmont Hardpan Woodland and Forest (CES202.268)

Related Concepts:

- Upland Swamp Glades (Wharton 1978) Finer

DESCRIPTION

Environment: This system occurs in small, shallow basins or gentle swales on flat to rolling upland sites, and occasionally in depressions on narrow, steeper ridgetops. Soils have a dense clay hardpan or some other impermeable layer that limits internal drainage. Rainwater accumulates in the basins and persists through the wet season, occasionally persisting all year. Only a few kinds of rock are known to form these depressions. Most examples occur on mafic rocks such as gabbro or diabase, but a few occur on slates or on mafic to felsic tuffs where a dense clay hardpan has formed. A few occur over bedrock of other kinds. Rock chemistry affects soil chemistry and influences variation in vegetation, but hydroperiod is a more important influence.

Vegetation: Vegetation consists either of swamps dominated by wetland oaks, or of more open-canopy pools with sparse trees and with substantial shrub or herbaceous vegetation. Swamps are most often dominated by *Quercus phellos*, with a substantial minority dominated by *Quercus lyrata* and a few having *Quercus bicolor*, *Quercus michauxii*, or other species. Examples that have been logged or cleared may be dominated by *Acer rubrum* or *Liquidambar styraciflua*. Lower strata are generally sparse in the swamps, often just a few shrubs such as *Vaccinium* spp., patches of *Smilax*, and a few wetland herbs. Open ponds may have the same canopy species on the edges, but a few have *Nyssa sylvatica* or other wetland species. The lower strata are better developed in the open pools, with *Cephalanthus occidentalis*, *Leucothoe racemosa*, *Vaccinium* spp., or other wetland species occurring as thickets along the edge or scattered in the interior. Large *Smilax* tangles sometimes occur. Herbs are usually still sparse or patchy, but may include dense beds of various graminoids or ferns, as well as scattered clumps. *Sphagnum* is sometimes extensive in parts of the pools. These isolated seasonal wetlands are often important breeding sites for amphibians.

Dynamics: The dynamics of water levels are the most important factor in these systems, differentiating them from the surrounding uplands and differentiating the various communities within the system. Most basins have almost no watershed, so water comes largely from rainfall. Variation in rainfall patterns will drive variation in duration of flooding, though most basins have an outlet that limits water depth. Fire is presumably naturally rare in these systems. Though they would naturally be exposed to fires in the surrounding uplands, standing water and lack of continuous fuel would limit fires to the edges, expect perhaps in early fall. Presumably important as a dynamic process is the migration of amphibians, which concentrate in these systems for breeding. Ecosystem dynamics may be strongly affected by the suitability of surrounding uplands for amphibian adult habitat.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* - (*Leucothoe racemosa*) / *Carex jorii* Shrubland (CEGL004075, G1)
- *Leucothoe racemosa* - *Vaccinium fuscatum* - *Smilax walteri* Shrubland (CEGL004533, G1?)
- *Liquidambar styraciflua* - *Acer rubrum* / *Carex* spp. - *Sphagnum* spp. Forest (CEGL007388, G2G3Q)
- *Nyssa biflora* / *Cephalanthus occidentalis* - *Leucothoe racemosa* Forest (CEGL004550, G1)
- *Quercus palustris* - *Quercus bicolor* / *Viburnum prunifolium* / *Leersia virginica* - *Impatiens capensis* Forest (CEGL004643, G2)
- *Quercus phellos* - *Quercus (michauxii, shumardii)* - *Fraxinus americana* / (*Quercus oglethorpensis*) / *Zephyranthes atamasca* Gabbro Upland Depression Forest (CEGL008484, G2?)
- *Quercus phellos* / *Carex (albolutescens, intumescens, jorii)* / *Climacium americanum* Forest (CEGL007403, G2G3)
- *Scirpus cyperinus* - *Dulichium arundinaceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL004134, G1Q)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Vaccinium formosum* - *Vaccinium fuscatum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, occurring as isolated bodies surrounded by upland systems. Open pools are usually less than one acre, while swamps may be up to several acres in size.

Size: Occurs as small patches. Pools are usually less than one acre, and may be substantially smaller. Swamps range up to several acres, a few to ten or more acres. Most examples occur as isolated patches, but a few occur as small groups. Extensive mafic rock areas may support a number of swamps, but most are probably not close enough together to be treated as single occurrences. Most remaining examples are of natural size.

Adjacent Ecological Systems:

- Piedmont Hardpan Woodland and Forest (CES202.268)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Most examples are surrounded by Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) or Piedmont Hardpan Woodland and Forest (CES202.268).

DISTRIBUTION

Range: This system ranges throughout the Piedmont, from Virginia to Alabama. A few examples attributable to this system are found in the adjacent Southern Blue Ridge.

Divisions: 202:C

Nations: US

Subnations: AL, GA, MD, NC, SC, VA

Map Zones: 54:C, 57:C, 59:C, 60:C, 61:C

TNC Ecoregions: 51:C, 52:C, 59:?

SOURCES

References: Comer et al. 2003, Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723169#references

Description Author: M.P. Schafale, mod. M. Pyne

Version: 01 Feb 2007

Concept Author: M. Schafale

Stakeholders: East, Southeast

ClassifResp: Southeast

RED RIVER LARGE FLOODPLAIN FOREST (CES203.065)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed)

Non-Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

National Mapping Codes: ESLF 9319

CONCEPT

Summary: This system represents a geographic subset of Kuchler's (1964) Southern Floodplain Forest which is specifically restricted to the main stem of the Red River in southwestern Arkansas (partly bordering Texas) and Louisiana in the West Gulf Coastal Plain and Upper West Gulf Coastal Plain. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphic features present within the floodplain. Some of the major geomorphic features associated with different community types within the system include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993). Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding, including bald-cypress and water tupelo. However, herbaceous and shrub vegetation may be present in certain areas as well. This system is generally similar in concept to West Gulf Coastal Plain Large River Floodplain Forest (CES203.488) but is distinct from it because of the difference in magnitude between the typical large rivers (such as the Trinity, Neches, and Sabine), on the one hand, and the Mississippi River on the other. Its range is conceptually coincident with the vast majority of Subsection 234Ai of Keys et al. (1995), excluding the portion of 234Ai within TNC Ecoregion 42 (Mississippi River Alluvial Plain). Its range is also coincident with Level IV Ecoregion 35g (Red River Bottomlands) of Omernik.

Classification Comments: This system is generally similar in concept to West Gulf Coastal Plain Large River Floodplain Forest (CES203.488), but is distinct from it because of the difference in magnitude between the typical large rivers (such as the Trinity, Neches, and Sabine), on the one hand, and the Mississippi River on the other. In Arkansas (at least), this system is most closely affiliated with the "Billyhaw-Perry-Portland" Soil Association (MUID=AR033 in STATSGO).

Similar Ecological Systems:

- West Gulf Coastal Plain Large River Floodplain Forest (CES203.488)

DESCRIPTION

Environment: Some of the major geomorphic features associated with different community types within the system include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993). The "flatwoods" of the upper terraces within the floodplain are a different system.

Vegetation: The forests of the Red River are thought to differ from those of other systems because of the greater presence of "riverfront" species (P. Faulkner pers. comm.). More information is needed, including a review of the affiliations of associations to this system versus CES203.488.

MEMBERSHIP

Associations:

- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Forestiera acuminata* - (*Planera aquatica*, *Cephalanthus occidentalis*) Shrubland (CEGL003911, G3?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Gleditsia aquatica* - *Carya aquatica* Forest (CEGL007426, G3?)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Platanus occidentalis* - *Liquidambar styraciflua* - (*Ulmus americana*) / (*Crataegus viridis*) Forest (CEGL007335, G3G4)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Quercus lyrata* - *Carya aquatica* - (*Quercus texana*) / *Forestiera acuminata* Forest (CEGL002423, G3?)
- *Quercus lyrata* - *Liquidambar styraciflua* / *Forestiera acuminata* Forest (CEGL002424, G4?)
- *Quercus phellos* - (*Quercus similis*) - *Ulmus crassifolia* Forest (CEGL007921, G3G4)
- *Quercus phellos* - *Liquidambar styraciflua* / *Ilex decidua* - *Carpinus caroliniana* / *Lysimachia radicans* Forest (CEGL007370, G3?)
- *Quercus sinuata* var. *sinuata* - *Ulmus crassifolia* / *Sabal minor* Red River Bottomland Forest (CEGL004130, G1G2?)
- *Salix nigra* Large River Floodplain Forest (CEGL007410, G3G5)
- *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Forest (CEGL002421, G3G5)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)

- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)

Alliances:

- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Forestiera acuminata* Semipermanently Flooded Shrubland Alliance (A.1012)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)
- West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278)

Adjacent Ecological System Comments: What are the flatwoods in the Red River area really?

DISTRIBUTION

Range: This system is restricted to the main stem of the Red River in southwestern Arkansas (partly bordering Texas) and Louisiana in the West Gulf Coastal Plain and Upper West Gulf Coastal Plain of the United States. The portion of the Red River to the west (Keys et al. 231Em) is treated as part of West Gulf Coastal Plain Large River Floodplain Forest (CES203.488).

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 37:C, 98:C

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Kuchler 1964, Post 1969, Sharitz and Mitsch 1993, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.754556#references

Description Author: R. Evans and T. Foti

Version: 23 Nov 2004

Concept Author: M. Pyne, R. Evans, T. Foti

Stakeholders: Southeast

ClassifResp: Southeast

ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL RIPARIAN WOODLAND AND SHRUBLAND (CES306.821)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence; Montane [Lower Montane]; Riverine / Alluvial; Mineral: W/ A-Horizon <10 cm; Unconsolidated

Non-Diagnostic Classifiers: Circumneutral Water; Floodplain; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Stream terrace (undifferentiated); Valley bottom; Temperate [Temperate Continental]; Braided channel or stream; Drainage bottom (undifferentiated)

National Mapping Codes: ESLF 9156

CONCEPT

Summary: This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevational range from approximately 900 to 2800 m. This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Dominant trees may include *Acer negundo*, *Populus angustifolia*, *Populus deltoides*, *Populus fremontii*, *Pseudotsuga menziesii*, *Picea pungens*, *Salix amygdaloides*, or *Juniperus scopulorum*. Dominant shrubs include *Acer glabrum*, *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Crataegus rivularis*, *Forestiera pubescens*, *Prunus virginiana*, *Rhus trilobata*, *Salix monticola*, *Salix drummondiana*, *Salix exigua*, *Salix irrorata*, *Salix lucida*, *Shepherdia argentea*, or *Symphoricarpos* spp. Exotic trees of *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests. In the Wyoming Basins, the high-elevation *Populus angustifolia*-dominated rivers are included here, including along the North Platte, Sweetwater, and Laramie rivers. In these situations, *Populus angustifolia* is extending down into the sage steppe zone of the basins.

Classification Comments: This system is physiognomically diverse; because of relatively rapid spatial and temporal shifts in structure and composition, it was too complex to split into different, structurally defined systems (e.g., a shrubland system and a woodland system). This riparian system has been applied to the Green, Yampa, and Colorado rivers (upstream of the Grand Canyon) on the Colorado Plateau. Within and below the Grand Canyon is classified as North American Warm Desert Riparian Woodland and Shrubland (CES302.753). More research is needed to determine if creating a Colorado Plateau riparian woodland and shrubland system is ecologically justified.

Related Concepts:

- Aspen: 217 (Eyre 1980) Intersecting
- Blue Spruce: 216 (Eyre 1980) Intersecting. Blue spruce commonly occurs in riparian zones
- Cottonwood - Willow: 235 (Eyre 1980) Broader
- Riparian (422) (Shiflet 1994) Broader

DESCRIPTION

Environment: This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. It is found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. It may also occur in upland areas of mesic swales and hillslopes below seeps and springs.

The climate of this system is continental with typically cold winters and hot summers. Surface water is generally high for variable periods. Soils are typically alluvial deposits of sand, clays, silts and cobbles that are highly stratified with depth due to flood scour and deposition. Highly stratified profiles consist of alternating layers of clay loam and organic material with coarser sand or thin layers of sandy loam over very coarse alluvium. Soils are fine-textured with organic material over coarser alluvium. Some soils are more developed due to a slightly more stable environment and greater input of organic matter.

Dynamics: This ecological system contains early-, mid- and late-seral riparian plant associations. It also contains non-obligate riparian species. Cottonwood communities are early-, mid- or late-seral, depending on the age class of the trees and the associated species of the occurrence (Kittel et al. 1999b). Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood occurrences do not regenerate in place, but regenerate by "moving" up and down a river reach. Over time a healthy riparian area supports all stages of cottonwood communities (Kittel et al. 1999b).

MEMBERSHIP

Associations:

- *Acer negundo* - *Celtis laevigata* var. *reticulata* Woodland (CEGL002599, GNR)
- *Acer negundo* - *Ostrya knowltonii* Woodland [Provisional] (CEGL002342, GNR)
- *Acer negundo* - *Populus angustifolia* / *Cornus sericea* Forest (CEGL000627, G2)
- *Acer negundo* / *Betula occidentalis* Woodland (CEGL000936, G1G2)
- *Acer negundo* / *Brickellia grandiflora* Woodland [Provisional] (CEGL002692, GNR)
- *Acer negundo* / *Cornus sericea* Forest (CEGL000625, G3?)
- *Acer negundo* / Disturbed Understory Woodland (CEGL002693, GNR)
- *Acer negundo* / *Equisetum arvense* Forest (CEGL000626, G2?)
- *Acer negundo* / *Prunus virginiana* Forest (CEGL000628, G3)
- *Acer negundo* / *Quercus gambelii* Woodland (CEGL002797, GNR)
- *Acer negundo* / *Rhus trilobata* Woodland (CEGL002750, GNR)
- *Agrostis* (*gigantea*, *stolonifera*) Semi-natural Herbaceous Vegetation (CEGL001558, GNA)
- *Artemisia cana* / *Juncus balticus* Shrubland (CEGL005998, GNR)
- *Betula occidentalis* / *Purshia tridentata* / *Hesperostipa comata* Shrubland (CEGL001084, G1)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)
- *Carex praegracilis* Herbaceous Vegetation (CEGL002660, G3G4)
- *Cirsium arvense* - Weedy Forbs Great Plains Herbaceous Vegetation (CEGL005260, GNA)
- *Conyza canadensis* Semi-natural Herbaceous Vegetation (CEGL002800, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Elaeagnus angustifolia* Semi-natural Woodland (CEGL005269, GNA)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Elymus repens* Semi-natural Herbaceous Vegetation (CEGL005868, GNA)
- *Equisetum* (*arvense*, *variegatum*) Herbaceous Vegetation (CEGL005148, GNR)
- *Equisetum hyemale* Herbaceous Vegetation (CEGL002760, G3)
- *Equisetum laevigatum* Herbaceous Vegetation (CEGL002241, GNR)
- *Forestiera pubescens* Shrubland (CEGL001168, G1G2)
- *Fraxinus anomala* Woodland (CEGL002752, GUQ)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Juniperus scopulorum* / *Cornus sericea* Woodland (CEGL000746, G4)
- *Juniperus scopulorum* Temporarily Flooded Woodland [Placeholder] (CEGL002777, G1)
- *Juniperus scopulorum* Woodland (CEGL003550, GNR)
- *Leymus cinereus* - *Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Phragmites australis* Western North America Temperate Semi-natural Herbaceous Vegetation (CEGL001475, G5)
- *Pinus ponderosa* / *Alnus incana* Woodland (CEGL002638, G2)
- *Pinus ponderosa* / *Cornus sericea* Woodland (CEGL000853, G3)
- *Pinus ponderosa* / *Crataegus douglasii* Woodland (CEGL000855, G1)
- *Pinus ponderosa* / *Juglans major* Woodland (CEGL000858, G2)
- *Pinus ponderosa* Temporarily Flooded Woodland [Provisional] (CEGL002766, G3)
- *Poa pratensis* Semi-natural Seasonally Flooded Herbaceous Vegetation (CEGL003081, GNA)
- *Populus angustifolia* - *Juniperus scopulorum* Woodland (CEGL002640, G2G3)
- *Populus angustifolia* - *Picea pungens* / *Alnus incana* Woodland (CEGL000934, G3)
- *Populus angustifolia* - *Pinus ponderosa* Woodland (CEGL000935, G4Q)
- *Populus angustifolia* - *Populus deltoides* - *Salix amygdaloides* Forest (CEGL000656, GUQ)
- *Populus angustifolia* - *Pseudotsuga menziesii* Woodland (CEGL002641, G3)
- *Populus angustifolia* / *Acer grandidentatum* Forest (CEGL000646, G2G3)
- *Populus angustifolia* / *Alnus incana* Woodland (CEGL002642, G3)
- *Populus angustifolia* / *Betula occidentalis* Woodland (CEGL000648, G3)
- *Populus angustifolia* / *Cornus sericea* Woodland (CEGL002664, G4)
- *Populus angustifolia* / *Crataegus rivularis* Woodland (CEGL002644, G2?)
- *Populus angustifolia* / Invasive Perennial Grasses Semi-natural Woodland (CEGL003749, GNA)
- *Populus angustifolia* / *Lonicera involucrata* Forest (CEGL000650, GUQ)
- *Populus angustifolia* / *Prunus virginiana* Woodland (CEGL000651, G2Q)
- *Populus angustifolia* / *Quercus gambelii* Woodland [Provisional] (CEGL002804, GNR)
- *Populus angustifolia* / *Rhus trilobata* Woodland (CEGL000652, G3)
- *Populus angustifolia* / *Rosa woodsii* Forest (CEGL000653, G2G3)
- *Populus angustifolia* / *Salix* (*monticola*, *drummondiana*, *lucida*) Woodland (CEGL002645, G3)
- *Populus angustifolia* / *Salix drummondiana* - *Acer glabrum* Woodland (CEGL002646, G2?)
- *Populus angustifolia* / *Salix exigua* Woodland (CEGL000654, G4)
- *Populus angustifolia* / *Salix irrorata* Woodland (CEGL002647, G2)
- *Populus angustifolia* / *Salix ligulifolia* - *Shepherdia argentea* Woodland (CEGL000655, G1)
- *Populus angustifolia* / *Symphoricarpos* (*albus*, *occidentalis*, *oreophilus*) Woodland (CEGL002648, G2Q)

- *Populus angustifolia* Sand Dune Forest (CEGL002643, G1)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Artemisia tridentata* Woodland (CEGL005966, G2G3)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix* (*exigua*, *interior*) Woodland (CEGL000659, G3G4)
- *Populus deltoides* / *Symphoricarpos occidentalis* Woodland (CEGL000660, G2G3)
- *Populus deltoides* ssp. *wislizeni* / *Acer negundo* Woodland (CEGL002336, GNR)
- *Populus deltoides* ssp. *wislizeni* / Disturbed Understory Woodland (CEGL003810, GNR)
- *Populus deltoides* ssp. *wislizeni* / *Rhus trilobata* Woodland (CEGL000940, G2)
- *Populus fremontii* - *Salix gooddingii* Woodland (CEGL000944, G2)
- *Populus fremontii* / *Acer negundo* Forest (CEGL000662, G2Q)
- *Populus fremontii* / *Artemisia tridentata* Woodland (CEGL005365, GNR)
- *Populus fremontii* / *Betula occidentalis* Wooded Shrubland (CEGL002981, GNR)
- *Populus fremontii* / *Equisetum* spp. Woodland [Provisional] (CEGL003775, GNR)
- *Populus fremontii* / *Ericameria nauseosa* Woodland (CEGL002465, GNR)
- *Populus fremontii* / *Leymus triticoides* Woodland (CEGL002756, GNR)
- *Populus fremontii* / Mesic Forbs Woodland (CEGL002470, GNR)
- *Populus fremontii* / Mesic Graminoids Woodland (CEGL002473, GNR)
- *Populus fremontii* / *Salix exigua* Forest (CEGL000666, GNR)
- *Populus fremontii* / *Salix geyeriana* Woodland (CEGL000943, G3?)
- *Pseudotsuga menziesii* / *Betula occidentalis* Woodland (CEGL002639, G3?)
- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (CEGL000899, G4)
- *Rhus trilobata* Intermittently Flooded Shrubland (CEGL001121, G3)
- *Salix amygdaloides* Woodland (CEGL000947, G3)
- *Salix eastwoodiae* / *Carex aquatilis* Shrubland (CEGL001195, G2)
- *Salix eastwoodiae* / *Carex utriculata* Shrubland (CEGL001196, G2?)
- *Salix eastwoodiae* Shrubland (CEGL001194, G2Q)
- *Salix exigua* - *Salix ligulifolia* Shrubland (CEGL002655, G2G3)
- *Salix exigua* - *Salix lucida* ssp. *caudata* Shrubland (CEGL001204, G2)
- *Salix exigua* / *Agrostis stolonifera* Shrubland (CEGL001199, GNA)
- *Salix exigua* / Barren Shrubland (CEGL001200, G5)
- *Salix exigua* / *Elymus X pseudorepens* Shrubland (CEGL001198, G3)
- *Salix exigua* / *Equisetum arvense* Shrubland (CEGL001201, G3?)
- *Salix exigua* / Mesic Forbs Shrubland (CEGL001202, G2)
- *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203, G5)
- *Salix exigua* Temporarily Flooded Shrubland (CEGL001197, G5)
- *Salix gooddingii* / *Salix exigua* Woodland [Provisional] (CEGL003778, GNR)
- *Salix irrorata* Shrubland (CEGL001214, GNR)
- *Salix lasiolepis* - *Cornus sericea* / *Rosa woodsii* Shrubland (CEGL003453, G2G3)
- *Salix lasiolepis* / Barren Ground Shrubland (CEGL001216, G3?)
- *Salix lasiolepis* / *Rosa woodsii* / Mixed Herbs Shrubland (CEGL001217, G3Q)
- *Salix ligulifolia* Shrubland (CEGL001218, G2G3)
- *Salix lutea* / *Leymus cinereus* Shrubland (CEGL005322, GNR)
- *Salix lutea* Shrubland (CEGL003780, GNR)
- *Shepherdia argentea* Shrubland (CEGL001128, G3G4)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)
- *Tamarix* spp. Temporarily Flooded Semi-natural Shrubland (CEGL003114, GNA)

Alliances:

- (*Cirsium arvense*, *Euphorbia esula*, *Melilotus* spp.) - Mixed Forbs Herbaceous Alliance (A.3564)
- *Acer negundo* Seasonally Flooded Forest Alliance (A.341)
- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer negundo* Temporarily Flooded Woodland Alliance (A.642)
- *Agrostis stolonifera* Seasonally Flooded Herbaceous Alliance (A.1405)
- *Artemisia cana* Temporarily Flooded Shrubland Alliance (A.843)
- *Betula occidentalis* Intermittently Flooded Shrubland Alliance (A.936)
- *Betula occidentalis* Temporarily Flooded Shrubland Alliance (A.967)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex praegracilis* Seasonally Flooded Herbaceous Alliance (A.1419)
- *Conyza canadensis* Seasonally Flooded Herbaceous Alliance (A.2657)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Elaeagnus angustifolia* Semi-natural Woodland Alliance (A.3566)

- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Elymus repens* Herbaceous Alliance (A.2658)
- *Equisetum (arvense, variegatum, hyemale)* Semipermanently Flooded Herbaceous Alliance (A.3539)
- *Equisetum laevigatum* Semipermanently Flooded Herbaceous Alliance (A.2648)
- *Forestiera pubescens* Temporarily Flooded Shrubland Alliance (A.969)
- *Fraxinus anomala* Temporarily Flooded Woodland Alliance (A.2511)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Juniperus scopulorum* Temporarily Flooded Woodland Alliance (A.563)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Pinus ponderosa* Temporarily Flooded Woodland Alliance (A.565)
- *Poa pratensis* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1382)
- *Populus angustifolia* Temporarily Flooded Forest Alliance (A.310)
- *Populus angustifolia* Temporarily Flooded Woodland Alliance (A.641)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Populus fremontii* Seasonally Flooded Woodland Alliance (A.654)
- *Populus fremontii* Temporarily Flooded Forest Alliance (A.313)
- *Populus fremontii* Temporarily Flooded Woodland Alliance (A.644)
- *Pseudotsuga menziesii* Temporarily Flooded Woodland Alliance (A.568)
- *Rhus trilobata* Intermittently Flooded Shrubland Alliance (A.938)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix amygdaloides* Temporarily Flooded Woodland Alliance (A.645)
- *Salix eastwoodiae* Seasonally Flooded Shrubland Alliance (A.1005)
- *Salix gooddingii* Temporarily Flooded Woodland Alliance (A.640)
- *Salix irrorata* Temporarily Flooded Shrubland Alliance (A.976)
- *Salix lasiolepis* Temporarily Flooded Shrubland Alliance (A.977)
- *Salix ligulifolia* Temporarily Flooded Shrubland Alliance (A.978)
- *Salix lutea* Temporarily Flooded Shrubland Alliance (A.980)
- *Shepherdia argentea* Temporarily Flooded Shrubland Alliance (A.960)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Tamarix* spp. Semi-natural Temporarily Flooded Shrubland Alliance (A.842)

DISTRIBUTION

Range: This system is found throughout the lower montane Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 m. It is also found in the island mountain ranges of central and eastern Montana.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, ID, MT, NM, NV, OR, SD, UT, WY

Map Zones: 8:?, 9:C, 13:C, 15:C, 16:C, 17:P, 18:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:C, 29:C, 33:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 331B:CC, 331D:CP, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341F:CC, 342A:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342J:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332G:CC, M341B:CC, M341C:CC

TNC Ecoregions: 6:P, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Daubenmire 1952, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1992, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett et al. 1989, Szaro 1989, Tuhy et al. 2002, Walford 1996, Walford et al. 1997, Walford et al. 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722852#references

Description Author: M.S. Reid

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West
ClassifResp: West

ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN SHRUBLAND (CES306.832)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Woodland; Short (50-100 yrs) Persistence; Montane [Upper Montane]; Montane [Montane]; Shrubland (Shrub-dominated); Riverine / Alluvial; Broad-Leaved Deciduous Shrub

Non-Diagnostic Classifiers: Circumneutral Water; Erosional stream terrace; Floodplain; Montane [Lower Montane]; Stream terrace (undifferentiated); Valley bottom; Alluvial terrace; Temperate [Temperate Continental]; Mineral: W/ A-Horizon <10 cm; Drainage bottom (undifferentiated)

National Mapping Codes: ESLF 9187

CONCEPT

Summary: This system is found throughout the Rocky Mountain cordillera from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau. These are montane to subalpine riparian shrublands occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally it is found at higher elevations, but can be found anywhere from 1700-3475 m. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this system are associated with beaver activity. This system often occurs as a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. The dominant shrubs reflect the large elevational gradient and include *Alnus incana*, *Betula glandulosa*, *Betula occidentalis*, *Cornus sericea*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix monticola*, *Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems are of either conifer or aspen forests.

Related Concepts:

- Barclay's willow - Arrow-leaved groundsel (ESSFdc2/Sc03) (Steen and Coupe 1997) Intersecting
- Riparian (422) (Shiflet 1994) Broader
- Willow - Sedge (ESSFxc/10) (Steen and Coupe 1997) Intersecting

MEMBERSHIP

Associations:

- *Acer glabrum* Drainage Bottom Shrubland (CEGL001062, G4?)
- *Alnus incana* - *Betula occidentalis* Shrubland (CEGL001142, G2G3)
- *Alnus incana* - *Salix (monticola, lucida, ligulifolia)* Shrubland (CEGL002651, G3)
- *Alnus incana* - *Salix drummondiana* Shrubland (CEGL002652, G3)
- *Alnus incana* / *Athyrium filix-femina* Shrubland (CEGL002628, G3)
- *Alnus incana* / *Calamagrostis canadensis* Shrubland (CEGL001143, G3Q)
- *Alnus incana* / *Carex (aquatilis, deweyana, lenticularis, luzulina, pellita)* Shrubland (CEGL001144, G3)
- *Alnus incana* / *Carex scopulorum var. prionophylla* Shrubland (CEGL000122, G1)
- *Alnus incana* / *Cornus sericea* Shrubland (CEGL001145, G3G4)
- *Alnus incana* / *Equisetum arvense* Shrubland (CEGL001146, G3)
- *Alnus incana* / *Glyceria striata* Shrubland (CEGL000228, G3)
- *Alnus incana* / *Lysichiton americanus* Shrubland (CEGL002629, G3)
- *Alnus incana* / Mesic Forbs Shrubland (CEGL001147, G3)
- *Alnus incana* / Mesic Graminoids Shrubland (CEGL001148, G3)
- *Alnus incana* / *Ribes (inerme, hudsonianum, lacustre)* Shrubland (CEGL001151, G3)
- *Alnus incana* / *Scirpus microcarpus* Shrubland (CEGL000481, G2G3)
- *Alnus incana* / *Spiraea douglasii* Shrubland (CEGL001152, G3)
- *Alnus incana* / *Symphoricarpos albus* Shrubland (CEGL001153, G3G4)
- *Alnus incana* Shrubland (CEGL001141, GNRQ)
- *Alnus incana ssp. tenuifolia* - *Salix irrorata* Shrubland (CEGL002687, G3)
- *Alnus oblongifolia* / *Symphoricarpos oreophilus* Forest (CEGL001063, GU)
- *Alnus viridis ssp. sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland (CEGL001156, G4)
- *Alnus viridis ssp. sinuata* Shrubland [Placeholder] (CEGL001154, GNRQ)
- *Betula glandulosa* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653, G3G4)
- *Betula occidentalis* - *Dasiphora fruticosa ssp. floribunda* Shrubland (CEGL001083, G2Q)
- *Betula occidentalis* / *Cornus sericea* Shrubland (CEGL001161, G3)
- *Betula occidentalis* / *Maianthemum stellatum* Shrubland (CEGL001162, G4?)

- *Betula occidentalis* / Mesic Graminoids Shrubland (CEGL002654, G3)
- *Betula occidentalis* Shrubland (CEGL001080, G3G4)
- *Cornus sericea* / *Galium triflorum* Shrubland (CEGL001166, G3?)
- *Cornus sericea* / *Heracleum maximum* Shrubland (CEGL001167, G3)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Corylus cornuta* Shrubland [Provisional] (CEGL002903, G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Deschampsia caespitosa* Shrubland (CEGL001107, G4)
- *Elymus repens* Semi-natural Herbaceous Vegetation (CEGL005868, GNA)
- *Fraxinus anomala* Woodland (CEGL002752, GUQ)
- *Ribes lacustre* - *Ribes hudsonianum* / *Cinna latifolia* Shrubland (CEGL003445, G2)
- *Ribes lacustre* - *Ribes hudsonianum* / *Glyceria striata* Shrubland (CEGL003446, G2G3)
- *Ribes lacustre* / *Mertensia ciliata* Shrubland (CEGL001172, G1G2Q)
- *Salix* (*boothii*, *geyeriana*) / *Carex aquatilis* Shrubland (CEGL001176, G3)
- *Salix bebbiana* / Mesic Graminoids Shrubland (CEGL001174, G3)
- *Salix bebbiana* Shrubland (CEGL001173, G3?)
- *Salix boothii* - *Salix eastwoodiae* / *Carex nigricans* Shrubland (CEGL002607, G3)
- *Salix boothii* - *Salix geeyeriana* / *Carex angustata* Shrubland (CEGL001185, G2)
- *Salix boothii* - *Salix geeyeriana* Shrubland (CEGL001184, GU)
- *Salix boothii* - *Salix lemmonii* Shrubland (CEGL001186, G3)
- *Salix boothii* / *Calamagrostis canadensis* Shrubland (CEGL001175, G3G4Q)
- *Salix boothii* / *Carex nebrascensis* Shrubland (CEGL001177, G4G5)
- *Salix boothii* / *Carex utriculata* Shrubland (CEGL001178, G4)
- *Salix boothii* / *Deschampsia caespitosa* - *Geum rossii* Shrubland (CEGL002904, G4)
- *Salix boothii* / *Equisetum arvense* Shrubland (CEGL002671, G3)
- *Salix boothii* / *Maianthemum stellatum* Shrubland (CEGL001187, G3Q)
- *Salix boothii* / Mesic Forbs Shrubland (CEGL001180, G3)
- *Salix boothii* / Mesic Graminoids Shrubland (CEGL001181, G3?)
- *Salix boothii* / *Poa palustris* Shrubland (CEGL001183, GNA)
- *Salix brachycarpa* / *Carex aquatilis* Shrubland (CEGL001244, G2G3)
- *Salix brachycarpa* / Mesic Forbs Shrubland (CEGL001135, G4)
- *Salix candida* / *Carex utriculata* Shrubland (CEGL001188, G2)
- *Salix commutata* / *Carex scopulorum* Shrubland (CEGL001189, G3)
- *Salix commutata* / Mesic Graminoid Shrubland (CEGL003497, GNR)
- *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (CEGL002667, G3)
- *Salix drummondiana* / *Carex scopulorum* var. *prionophylla* Shrubland (CEGL001584, G2G3)
- *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631, G4)
- *Salix drummondiana* / Mesic Forbs Shrubland (CEGL001192, G4)
- *Salix drummondiana* Shrubland [Placeholder] (CEGL001190, G3Q)
- *Salix eriocephala* / *Ribes aureum* - *Rosa woodsii* Shrubland (CEGL001233, G3)
- *Salix geeyeriana* - *Salix eriocephala* Shrubland (CEGL001213, GU)
- *Salix geeyeriana* - *Salix lemmonii* / *Carex aquatilis* var. *dives* Shrubland (CEGL001212, G3)
- *Salix geeyeriana* - *Salix monticola* / *Calamagrostis canadensis* Shrubland (CEGL001247, G3)
- *Salix geeyeriana* - *Salix monticola* / Mesic Forbs Shrubland (CEGL001223, G3)
- *Salix geeyeriana* / *Calamagrostis canadensis* Shrubland (CEGL001205, G5)
- *Salix geeyeriana* / *Carex aquatilis* Shrubland (CEGL001206, G3)
- *Salix geeyeriana* / *Carex utriculata* Shrubland (CEGL001207, G5)
- *Salix geeyeriana* / *Deschampsia caespitosa* Shrubland (CEGL001208, G4)
- *Salix geeyeriana* / Mesic Forbs Shrubland (CEGL002666, G3)
- *Salix geeyeriana* / Mesic Graminoids Shrubland (CEGL001210, G3?)
- *Salix geeyeriana* / *Poa palustris* Shrubland (CEGL001211, GNA)
- *Salix glauca* / *Deschampsia caespitosa* Shrubland (CEGL001137, G4)
- *Salix lemmonii* / Mesic-Tall Forbs Shrubland (CEGL002771, G3?)
- *Salix lemmonii* / *Rosa woodsii* Shrubland (CEGL002772, G3)
- *Salix ligulifolia* / *Carex utriculata* Shrubland [Provisional] (CEGL002975, GNR)
- *Salix ligulifolia* Shrubland (CEGL001218, G2G3)
- *Salix lucida* ssp. *caudata* / *Rosa woodsii* Shrubland (CEGL002621, G3)
- *Salix lucida* ssp. *caudata* Shrubland [Provisional] (CEGL001215, G3Q)
- *Salix lutea* / *Calamagrostis canadensis* Shrubland (CEGL001219, G3?)
- *Salix lutea* / *Carex utriculata* Shrubland (CEGL001220, G4)
- *Salix lutea* / Mesic Forbs Shrubland (CEGL002774, G3?)
- *Salix lutea* / *Rosa woodsii* Shrubland (CEGL002624, G3)
- *Salix monticola* / *Angelica ampla* Shrubland (CEGL001221, GNR)

- *Salix monticola* / *Calamagrostis canadensis* Shrubland (CEGL001222, G3)
- *Salix monticola* / *Carex aquatilis* Shrubland (CEGL002656, G3)
- *Salix monticola* / *Carex utriculata* Shrubland (CEGL002657, G3)
- *Salix monticola* / Mesic Forbs Shrubland (CEGL002658, G4)
- *Salix monticola* / Mesic Graminoids Shrubland (CEGL002659, G3)
- *Salix monticola* Thicket Shrubland (CEGL001139, G2Q)
- *Salix planifolia* / *Calamagrostis canadensis* Shrubland (CEGL001225, G4)
- *Salix planifolia* / *Caltha leptosepala* Shrubland (CEGL002665, G4)
- *Salix planifolia* / *Carex aquatilis* Shrubland (CEGL001227, G5)
- *Salix planifolia* / *Carex scopulorum* Shrubland (CEGL001229, G4)
- *Salix planifolia* / *Deschampsia caespitosa* Shrubland (CEGL001230, G2G3)
- *Salix planifolia* / Mesic Forbs Shrubland (CEGL002893, G4)
- *Salix planifolia* Shrubland (CEGL001224, G4)
- *Salix wolfii* / *Carex aquatilis* Shrubland (CEGL001234, G4)
- *Salix wolfii* / *Carex microptera* Shrubland (CEGL001235, G3Q)
- *Salix wolfii* / *Carex nebrascensis* Shrubland (CEGL001236, G3Q)
- *Salix wolfii* / *Carex utriculata* Shrubland (CEGL001237, G4)
- *Salix wolfii* / *Deschampsia caespitosa* Shrubland (CEGL001238, G3)
- *Salix wolfii* / *Fragaria virginiana* Shrubland (CEGL001239, G4?)
- *Salix wolfii* / Mesic Forbs Shrubland (CEGL001240, G3)
- *Salix wolfii* / *Poa palustris* Shrubland (CEGL001241, GNA)
- *Salix wolfii* / *Swertia perennis* - *Pedicularis groenlandica* Shrubland (CEGL001242, G2)

Alliances:

- *Acer glabrum* Temporarily Flooded Shrubland Alliance (A.952)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Alnus oblongifolia* Temporarily Flooded Forest Alliance (A.953)
- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Betula glandulosa* Seasonally Flooded Shrubland Alliance (A.995)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Betula occidentalis* Temporarily Flooded Shrubland Alliance (A.967)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Corylus cornuta* Temporarily Flooded Shrubland Alliance (A.2596)
- *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance (A.958)
- *Elymus repens* Herbaceous Alliance (A.2658)
- *Fraxinus anomala* Temporarily Flooded Woodland Alliance (A.2511)
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)
- *Salix bebbiana* Temporarily Flooded Shrubland Alliance (A.971)
- *Salix boothii* Seasonally Flooded Shrubland Alliance (A.1001)
- *Salix boothii* Temporarily Flooded Shrubland Alliance (A.972)
- *Salix brachycarpa* Seasonally Flooded Shrubland Alliance (A.998)
- *Salix candida* Seasonally Flooded Shrubland Alliance (A.1002)
- *Salix commutata* Seasonally Flooded Shrubland Alliance (A.1003)
- *Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)
- *Salix drummondiana* Temporarily Flooded Shrubland Alliance (A.973)
- *Salix eriocephala* Temporarily Flooded Shrubland Alliance (A.974)
- *Salix geyeriana* Seasonally Flooded Shrubland Alliance (A.1006)
- *Salix geyeriana* Temporarily Flooded Shrubland Alliance (A.975)
- *Salix glauca* Temporarily Flooded Shrubland Alliance (A.963)
- *Salix lemmonii* Seasonally Flooded Shrubland Alliance (A.2523)
- *Salix ligulifolia* Temporarily Flooded Shrubland Alliance (A.978)
- *Salix lucida* Temporarily Flooded Shrubland Alliance (A.979)
- *Salix lutea* Seasonally Flooded Shrubland Alliance (A.1007)
- *Salix lutea* Temporarily Flooded Shrubland Alliance (A.980)
- *Salix monticola* Temporarily Flooded Shrubland Alliance (A.981)
- *Salix planifolia* Seasonally Flooded Shrubland Alliance (A.1008)
- *Salix planifolia* Temporarily Flooded Shrubland Alliance (A.982)
- *Salix wolfii* Seasonally Flooded Shrubland Alliance (A.1009)
- *Salix wolfii* Temporarily Flooded Shrubland Alliance (A.983)

DISTRIBUTION

Range: This system is found throughout the Rocky Mountain cordillera from New Mexico north into Montana (including the isolated island mountain ranges of central and eastern Montana), and also occurs in mountainous areas of the Intermountain West and

Colorado Plateau.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Map Zones: 1:C, 6:?, 7:?, 8:?, 9:C, 10:C, 12:C, 15:?, 16:C, 17:P, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:P, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:P?, 315H:PP, 321A:PP, 331A:C?, 331B:C?, 331J:CC, 341A:CP, 341B:CP, 341C:CP, 341D:CP, 341F:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342J:CC, M242C:CP, M242D:CC, M261E:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC, M341C:CC

TNC Ecoregions: 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 68:C

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Kittel 1993, Kittel 1994, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Rondeau 2001, Szaro 1989, Tuhy et al. 2002, Walford 1996

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722841#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN WOODLAND (CES306.833)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Shrubland; Montane [Upper Montane]; Montane [Montane]; Forest and Woodland (Treed); Riverine / Alluvial

Non-Diagnostic Classifiers: Circumneutral Water; Floodplain; Montane [Lower Montane]; Stream terrace (undifferentiated); Valley bottom; Temperate [Temperate Continental]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Drainage bottom (undifferentiated)

National Mapping Codes: ESLF 9171

CONCEPT

Summary: This riparian woodland system is comprised of seasonally flooded forests and woodlands found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Mountains. This system contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture in this system may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet), farther north elevation ranges between 900 and 2000 m. This is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderate-wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins. Dominant tree species vary across the latitudinal range, although it usually includes *Abies lasiocarpa* and/or *Picea engelmannii*; other important species include *Pseudotsuga menziesii*, *Picea pungens*, *Picea engelmannii* X *glauca*, *Populus tremuloides*, and *Juniperus scopulorum*. Other trees possibly present but not usually dominant include *Alnus incana*, *Abies concolor*, *Abies grandis*, *Pinus contorta*, *Populus angustifolia*, *Populus balsamifera* ssp. *trichocarpa*, and *Juniperus osteosperma*.

Similar Ecological Systems:

- Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

Related Concepts:

- Blue Spruce: 216 (Eyre 1980) Intersecting. Blue spruce commonly occurs in riparian zones
- Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) Intersecting. Engelmann spruce occurs as a dominant in riparian zones.
- ER Engelmann Spruce Riparian (Ecosystems Working Group 1998) Broader
- Riparian (422) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Abies concolor* - *Picea pungens* - *Populus angustifolia* / *Acer glabrum* Forest (CEGL000255, G2)
- *Abies lasiocarpa* - *Picea engelmannii* / *Alnus incana* Forest (CEGL000296, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Alnus viridis* ssp. *sinuata* Forest (CEGL000297, G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Mertensia ciliata* Forest (CEGL002663, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Oplomanax horridus* Forest (CEGL000322, G3)
- *Abies lasiocarpa* - *Picea engelmannii* / *Salix drummondiana* Forest (CEGL000327, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336, G4)
- *Abies lasiocarpa* / *Carex aquatilis* Forest (CEGL002636, G4)
- *Abies lasiocarpa* / *Trautvetteria caroliniensis* Forest (CEGL000339, G3)
- *Picea engelmannii* - *Populus angustifolia* / *Heracleum maximum* Forest (CEGL000367, G3G4)
- *Picea engelmannii* / *Caltha leptosepala* Forest (CEGL000357, G3?)
- *Picea engelmannii* / *Carex angustata* Forest (CEGL000359, G3)
- *Picea engelmannii* / *Carex scopulorum* var. *prionophylla* Woodland (CEGL002630, G3)
- *Picea engelmannii* / *Cornus sericea* Woodland (CEGL002677, G3)
- *Picea engelmannii* / *Eleocharis quinqueflora* Woodland (CEGL000361, G3)
- *Picea engelmannii* / *Salix drummondiana* Woodland (CEGL005843, G2G3)
- *Picea engelmannii* / *Senecio triangularis* Forest (CEGL000376, G3Q)
- *Picea glauca* Alluvial Black Hills Forest (CEGL002057, G2G3)
- *Picea pungens* / *Alnus incana* Woodland (CEGL000894, G3)
- *Picea pungens* / *Betula occidentalis* Woodland (CEGL002637, G2)
- *Picea pungens* / *Cornus sericea* Woodland (CEGL000388, G4)
- *Picea pungens* / *Dasiphora fruticosa* ssp. *floribunda* Woodland (CEGL000396, G2G3)
- *Picea pungens* / *Equisetum arvense* Woodland (CEGL000389, G3?)

- *Pinus contorta* / *Calamagrostis canadensis* Forest (CEGL000138, G5)
- *Pinus contorta* / *Carex (aquatilis, angustata)* Woodland (CEGL000140, G4Q)
- *Pinus contorta* / *Cornus sericea* Woodland (CEGL005929, G2G3)
- *Pinus contorta* / *Deschampsia caespitosa* Forest (CEGL000147, G3)
- *Populus balsamifera ssp. trichocarpa* - *Picea engelmannii* / *Equisetum arvense* Forest (CEGL005907, G2?)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest (CEGL005909, G2?)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest (CEGL005905, G2G3)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest (CEGL005910, G2?)
- *Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL005908, G2G3)
- *Populus tremuloides* / *Alnus incana* - *Salix* spp. Forest (CEGL001082, G4)
- *Populus tremuloides* / *Alnus incana* / *Betula nana* - *Ribes* spp. Forest (CEGL001149, G1)
- *Populus tremuloides* / *Alnus incana* Forest (CEGL001150, G3)
- *Populus tremuloides* / *Betula occidentalis* Forest (CEGL002650, G3)
- *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574, G3)
- *Populus tremuloides* / *Carex aquatilis* var. *aquatilis* Forest (CEGL003442, G1?)
- *Populus tremuloides* / *Carex obnupta* Forest (CEGL003371, G2)
- *Populus tremuloides* / *Carex pellita* Forest (CEGL000577, G2)
- *Populus tremuloides* / *Cornus sericea* Forest (CEGL000582, G4)
- *Populus tremuloides* / *Corylus cornuta* Forest (CEGL000583, G3)
- *Populus tremuloides* / *Equisetum arvense* Forest (CEGL000584, G4)
- *Populus tremuloides* / *Quercus gambelii* / *Symphoricarpos oreophilus* Forest (CEGL000598, GNR)
- *Populus tremuloides* / *Ranunculus alismifolius* Forest (CEGL000599, G2?)
- *Populus tremuloides* / *Ribes montigenum* Forest (CEGL000600, G2)
- *Populus tremuloides* / *Salix drummondiana* Forest (CEGL002902, G3G4)
- *Populus tremuloides* / *Senecio bigelovii* var. *bigelovii* Forest (CEGL000590, G1?)
- *Populus tremuloides* / *Veratrum californicum* Forest (CEGL000621, G3?)
- *Populus tremuloides* Canyon Formation Forest (CEGL000576, GUQ)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies lasiocarpa* - *Populus tremuloides* Forest Alliance (A.422)
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Picea engelmannii* Seasonally Flooded Woodland Alliance (A.572)
- *Picea engelmannii* Temporarily Flooded Forest Alliance (A.179)
- *Picea engelmannii* Temporarily Flooded Woodland Alliance (A.566)
- *Picea glauca* Temporarily Flooded Forest Alliance (A.172)
- *Picea pungens* Temporarily Flooded Woodland Alliance (A.567)
- *Pinus contorta* Seasonally Flooded Forest Alliance (A.188)
- *Pinus contorta* Temporarily Flooded Forest Alliance (A.175)
- *Pinus contorta* Temporarily Flooded Woodland Alliance (A.562)
- *Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Seasonally Flooded Forest Alliance (A.340)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

DISTRIBUTION

Range: This system is found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Alberta and British Columbia, and west into the Intermountain region and the Colorado Plateau.

Divisions: 204:P; 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Map Zones: 1:C, 6:P, 7:?, 9:C, 10:C, 12:C, 16:P, 17:P, 18:P, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:P, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313B:CC, 331A:C?, 331J:CC, 341A:CP, 341D:CP, 341F:CP, 341G:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261E:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341D:CC

TNC Ecoregions: 4:P, 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 68:C

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Ecosystems Working Group 1998, Kittel 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al.

2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Rondeau 2001, Tuhy et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722840#references

Description Author: NatureServe Western Ecology Team, mod. R. Crawford

Version: 09 Feb 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

SOUTH FLORIDA BAYHEAD SWAMP (CES411.366)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Depressional; Broad-Leaved Evergreen Tree

National Mapping Codes: ESLF 9317

CONCEPT

Summary: This system consists of predominately broad-leaved hardwoods emergent amidst marshes of the south Florida Everglades region. These areas are often called tree islands as they occur on slightly elevated sites above the low-relief marshes and have been considered "perhaps the most striking botanical feature in the Everglades" (Loveless 1959). Individual islands often have a characteristic shape depending upon the size; large islands are often teardrop-shaped, smaller islands are circular (Loveless 1959, Gunderson and Loftus 1993). Patches range in size from \hat{A} ¼ acre to exceeding 300 or more acres. These islands often form an abrupt ecotone with adjacent fire-prone marshes. Fires enter bayhead swamps only under extreme drought conditions and may kill much of the bayhead vegetation and heavily reduce peat accumulation. If left long unburned, bayheads may succeed to hardwood hammocks.

Related Concepts:

- Baygall (FNAI 1990) Undetermined
- Hydric Hammock (FNAI 1990) Undetermined

DESCRIPTION

Environment: This system occurs on sites elevated above surrounding marshes; they are inundated 2-6 months during the year, and often found on Gandy Peat soils (Gunderson and Loftus 1993). Tree islands in the northern Everglades occur on acidic, deep peat sites, while southern examples are higher in pH, and shallower peat.

Vegetation: Although plant communities in this system have quite similar floristic composition across the Everglades region, there are suggestions that pH and peat depth vary between northern and southern examples, factors which may influence species composition (Loveless 1959). Stands often support a luxuriant ground layer of ferns.

Dynamics: These islands often form an abrupt ecotone with adjacent marshes. Although fires often burn through the marshes, they enter bayhead swamps only under extreme drought conditions. Under these conditions, fires may kill much of the bayhead vegetation and heavily reduce peat accumulation. If left long unburned, bayheads may succeed to hardwood hammocks.

MEMBERSHIP

Associations:

- *Conocarpus erectus* - *Metopium toxiferum* - *Acoelorrhaphe wrightii* / *Chrysobalanus icaco* Forest (CEGL007057, G1?)
- *Magnolia virginiana* - *Persea palustris* - *Chrysobalanus icaco* / *Acrostichum danaeifolium* - *Nephrolepis exaltata* Forest (CEGL007015, G1)
- *Magnolia virginiana* - *Persea palustris* - *Chrysobalanus icaco* / *Cladium mariscus* ssp. *jamaicense* Woodland (CEGL007016, G1)
- *Quercus laurifolia* - *Sabal palmetto* / *Myrsine floridana* - *Psychotria nervosa* Forest (CEGL007060, G1?)
- *Rhizophora mangle* - *Taxodium distichum* - *Metopium toxiferum* / *Chrysobalanus icaco* / *Apteris aphylla* Forest (CEGL007454, G1)
- *Roystonea elata* - *Taxodium distichum* - *Quercus laurifolia* / *Psychotria nervosa* / *Nephrolepis* spp. Forest (CEGL007455, G1)
- *Taxodium distichum* / *Persea palustris* - *Fraxinus caroliniana* - *Chrysobalanus icaco* / *Blechnum serrulatum* Forest (CEGL007440, G2?)

Alliances:

- *Conocarpus erectus* - *Metopium toxiferum* Saturated Forest Alliance (A.77)
- *Magnolia virginiana* - *Persea palustris* - *Chrysobalanus icaco* Seasonally Flooded Woodland Alliance (A.474)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest Alliance (A.61)
- *Taxodium distichum* - *Persea palustris* - *Chrysobalanus icaco* Seasonally Flooded Forest Alliance (A.366)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Gunderson and Loftus 1993, Loveless 1959

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723150#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1447 SOUTH FLORIDA CYPRESS DOME (CES411.365)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2447; ESLF 9116; ESP 1447

CONCEPT

Summary: This system is found primarily in the Everglades and Big Cypress regions. This system consists of small forested wetlands in poorly drained depressions which are underlain by an impervious layer that impedes drainage and traps precipitation. They receive their common name from the unique dome-shaped appearance in which trees in the center are higher than those around the sides (Monk and Brown 1965). *Taxodium ascendens* is the dominant tree, with the oldest and largest individuals characteristically occupying the center, and smaller and younger individuals around the margins. Pools of stagnant, highly acidic water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins. The understory flora is typified by species with tropical affinities.

Related Concepts:

- Dome Swamp (FNAI 1990) Broader

DESCRIPTION

Environment: This system occurs in areas of low relief, occupying poorly drained to permanently wet depressions. Pools of stagnant, highly acidic water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins.

Vegetation: In addition to *Taxodium ascendens*, other taxa that may be present include *Annona glabra*, *Chrysobalanus icaco*, *Ficus aurea*, *Persea palustris*, and *Bacopa caroliniana*.

MEMBERSHIP

Associations:

- *Taxodium ascendens* / *Annona glabra* - *Cephalanthus occidentalis* - *Morella cerifera* - *Salix caroliniana* Forest (CEGL007415, G2?)
- *Taxodium ascendens* / *Annona glabra* / *Bacopa caroliniana* Forest (CEGL007414, G2?)
- *Taxodium ascendens* / *Chrysobalanus icaco* - *Ficus aurea* - *Persea palustris* Forest (CEGL007416, G2?)

Alliances:

- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Monk and Brown 1965

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723151#references

Description Author: R. Evans, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1445 SOUTH FLORIDA DWARF CYPRESS SAVANNA (CES411.290)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2445; ESLF 9114; ESP 1445

CONCEPT

Summary: The scrub or dwarf cypress system covers extensive areas of south Florida, especially in the Big Cypress Swamp region of southwest Florida. These stunted stands of *Taxodium ascendens* grow on shallow sands or marl soils above limestone bedrock. Individual trees are usually quite small and widely scattered, with canopy coverage ranging from 30-45% (Flohrschutz 1978). The understory shares much overlap with wet prairies of the region (Drew and Schomer 1984) and is dominated by the following genera: *Rhynchospora*, *Cyperus*, *Muhlenbergia*, and *Cladium*. The open, stunted aspect is maintained in part by stresses imposed by extreme seasonal water level changes and low-nutrient soils (Anonymous 1978). Ewel (1990b) suggests a hydroperiod of approximately 6 months for this type.

Classification Comments: Related vegetation occurs in north Florida on clay soils of Tates Hell Swamp.

Related Concepts:

- Marl Prairie (FNAI 1990) Broader

MEMBERSHIP

Associations:

- *Taxodium ascendens* / *Muhlenbergia filipes* - *Rhynchospora microcarpa* Woodland (CEGL003681, G3)
- *Taxodium ascendens* / *Paspalum monostachyum* - *Rhynchospora microcarpa* - *Cladium mariscus* ssp. *jamaicense* Woodland (CEGL003996, G2G3)
- *Taxodium ascendens* / *Rhynchospora microcarpa* - *Schizachyrium rhizomatum* - *Muhlenbergia filipes* Woodland (CEGL003997, G2G3)

Alliances:

- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Anonymous 1978, Comer et al. 2003, Drew and Schomer 1984, Ewel 1990b, Flohrschutz 1978, Lodge 1994

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723198#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH FLORIDA HYDRIC HAMMOCK (CES411.273)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
National Mapping Codes: ESLF 4330

CONCEPT

Summary: This system includes wet hardwood-dominated hammocks occupying flat lowlands in extreme southern Florida. Examples are underlain by limestone substrate. They are wetlands with high water tables and/or ponded surface water, and often mucky soils. Although often found within or adjacent to floodplains, examples of this system are only infrequently subject to overbank flooding. Like other hydric hammocks of Florida, the vegetation is characterized by mixed hardwood species (FNAI 1997), although examples of this type have somewhat depauperate canopies when compared with more northern examples (A. Johnson pers. comm.). *Quercus virginiana*, *Sabal palmetto*, and *Acer rubrum* may be diagnostic; presumably the flora includes some tropical elements that are likely absent from more northern examples.

Classification Comments: This concept apparently includes low hammocks of Taylor Alexander (A. Johnson pers. comm.).

Related Concepts:

- Hydric Hammock (FNAI 1990) Broader
- Prairie Hammock (FNAI 1990) Finer

DESCRIPTION

Environment: Examples of this system are associated with limestone-rich sites in southern Florida, often adjacent to floodplains.

MEMBERSHIP

Associations:

- *Quercus laurifolia* - *Sabal palmetto* / *Myrsine floridana* - *Psychotria nervosa* Forest (CEGL007060, G1?)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Forest (CEGL004674, G2G3)
- *Sabal palmetto* - *Quercus virginiana* - *Ulmus americana* - *Ficus aurea* / *Acrostichum danaeifolium* - *Nephrolepis exaltata* Forest (CEGL004409, G2?)

Alliances:

- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Saturated Forest Alliance (A.380)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest Alliance (A.61)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Alexander 1967, FNAI 1990, FNAI 1997, Johnson pers. comm., Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.732403#references

Description Author: R. Evans

Version: 25 Mar 2004

Concept Author: R. Evans and A. Johnson

Stakeholders: Southeast
ClassifResp: Southeast

SOUTH FLORIDA MANGROVE SWAMP (CES411.289)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine

National Mapping Codes: ESLF 9304

CONCEPT

Summary: This swamp system occurs along intertidal and supratidal shorelines in southern Florida. The primary species comprising this system are *Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*, and *Conocarpus erectus*, each with essentially tropical affinities and poor survival in cold temperatures. This system attains best development in low wave-energy, depositional environments. Examples occur on soils generally saturated with brackish water at all times and which become inundated during high tides. The brackish environment tends to limit competition from other species. Although at least three broad variants of this system can be recognized, i.e., riverine mangrove forests, fringe mangrove forests, and basin mangrove forests (Lugo et al. 1988), all are included here for now.

Related Concepts:

- Tidal Swamp (FNAI 1990) Equivalent

DESCRIPTION

Environment: Mangroves are essentially tropical species that occur only infrequently in areas where the average annual temperature is below 19 degrees Celsius; fluctuations greater than 10 degrees Celsius and short-duration freezes are detrimental to all species. Low-temperature stress leads to decreased height, leaf area, and increased tree density (Odum and McIvor 1990). *Avicennia* is apparently the most cold hardy species, extending as far north as the Gulf Coast (Sherrod and McMillan 1985) and on the Atlantic Coast nearly to the Florida stateline (30 degrees N latitude) (Savage 1972, Odum et al. 1982). *Rhizophora* and *Laguncularia* reach approximately 29 degrees N latitude on both coasts of Florida (Rehm 1976, Teas 1977, Odum et al. 1982). However, the northern limits of all species fluctuate due to short-term climatic swings making exact delineations impossible. Mangroves are also affected by substrate type and wave energy, with best development in low wave-energy, depositional environments; high wave energy prevents establishment and may destroy their shallow root systems (Odum and McIvor 1990). Examples occur on soils generally saturated with brackish water at all times, and which become inundated during high tides (FNAI 1990). The species sometimes sort along salinity gradients, with *Rhizophora* limited to salinities below 60-65 ppt, while *Avicennia* and *Laguncularia* tolerate levels above 80-95 ppt [see references in Odum and McIvor (1990)]. The species employ different strategies to cope with fluctuations and extremes in salinity. Red mangroves exclude salt by a reverse osmosis process, while black and white mangroves use salt glands to excrete excess salts. However, most species may use combined strategies of salt exclusion and excretion (Albert 1975).

Vegetation: The primary species comprising this system are the true mangroves, *Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*, as well as the close associate *Conocarpus erectus*. The combined stresses of flooding and salinity tend to result in limited competition (FNAI 1990), lack of plant species richness, and relatively simple stand structure (Mendelssohn and McKee 1988). However, other salt-tolerant species may also be present. Broad classifications of mangroves have included six types (Lugo and Snedaker 1974) and more recently three broad variants (Lugo et al. 1988), i.e., riverine mangrove forests, fringe mangrove forests, and basin mangrove forests [see also Mendelssohn and McKee (1988)].

MEMBERSHIP

Associations:

- *Acrostichum aureum* - (*Acrostichum danaeifolium*) Tidal Herbaceous Vegetation (CEGL004899, G3?)
- *Avicennia germinans* - (*Rhizophora mangle*) / *Batis maritima* Basin Forest (CEGL007061, G4?)
- *Avicennia germinans* / *Sarcocornia pacifica* Shrubland (CEGL003802, G3?)
- *Avicennia germinans* Forest (CEGL004827, G5)
- *Conocarpus erectus* - (*Avicennia germinans*) / *Borrighia arborescens* - *Borrighia frutescens* / *Sporobolus virginicus* - *Monanthochloe littoralis* Shrubland (CEGL003805, G3?)
- *Conocarpus erectus* - (*Laguncularia racemosa*) / *Batis maritima* - *Borrighia frutescens* / *Sesuvium portulacastrum* - *Suaeda linearis* Shrubland (CEGL003806, G2?)
- *Conocarpus erectus* - (*Laguncularia racemosa*) / *Cladium mariscus* ssp. *jamaicense* Shrubland (CEGL003798, G2?)
- *Conocarpus erectus* - *Metopium toxiferum* - *Acoelorrhaphe wrightii* / *Chrysobalanus icaco* Forest (CEGL007057, G1?)
- *Conocarpus erectus* - *Rhizophora mangle* - *Laguncularia racemosa* - *Metopium toxiferum* / *Tillandsia* spp. Woodland (CEGL003505, G2)
- *Conocarpus erectus* / *Sporobolus virginicus* - *Spartina spartinae* Woodland (CEGL003506, G1?)
- *Conocarpus erectus* Forest (CEGL007600, G3G5)
- *Laguncularia racemosa* - *Rhizophora mangle* - *Avicennia germinans* - *Conocarpus erectus* Forest (CEGL007601, GNR)
- *Laguncularia racemosa* Basin Forest (CEGL007063, G3?)

- *Rhizophora mangle* - (*Avicennia germinans*, *Laguncularia racemosa*) / *Acrostichum* spp. Forest (CEGL007067, G2G3)
- *Rhizophora mangle* - (*Avicennia germinans*, *Laguncularia racemosa*) Riverine Forest (CEGL007066, G4)
- *Rhizophora mangle* - *Laguncularia racemosa* - *Avicennia germinans* - *Conocarpus erectus* / *Jacquinia keyensis* Forest (CEGL007053, G2?)
- *Rhizophora mangle* / *Eleocharis cellulosa* Shrubland (CEGL003800, G3?)
- *Rhizophora mangle* Fringe Forest (CEGL004764, G3G5)
- *Rhizophora mangle* Medium Island Forest (CEGL007603, G5)
- *Rhizophora mangle* Overwash Island Forest (CEGL004765, G3G5)
- *Rhizophora mangle* Shrubland (CEGL003803, G5)
- *Rhizophora mangle* Tall Fringing Forest (CEGL007602, G5)
- *Sporobolus virginicus* - *Distichlis spicata* Herbaceous Vegetation (CEGL007663, G5)

Alliances:

- *Acrostichum aureum* - *Acrostichum danaeifolium* Tidal Herbaceous Alliance (A.1591)
- *Avicennia germinans* Seasonally Flooded Forest Alliance (A.73)
- *Avicennia germinans* Tidal Forest Alliance (A.80)
- *Avicennia germinans* Tidal Shrubland Alliance (A.733)
- *Conocarpus erectus* - *Metopium toxiferum* Saturated Forest Alliance (A.77)
- *Conocarpus erectus* Saturated Shrubland Alliance (A.732)
- *Conocarpus erectus* Seasonally Flooded Shrubland Alliance (A.729)
- *Conocarpus erectus* Seasonally Flooded Woodland Alliance (A.473)
- *Conocarpus erectus* Tidal Forest Alliance (A.1923)
- *Laguncularia racemosa* Seasonally Flooded Forest Alliance (A.81)
- *Laguncularia racemosa* Tidal Forest Alliance (A.82)
- *Rhizophora mangle* - *Conocarpus erectus* Seasonally Flooded Forest Alliance (A.75)
- *Rhizophora mangle* Semipermanently Flooded Shrubland Alliance (A.731)
- *Rhizophora mangle* Tidal Forest Alliance (A.83)
- *Rhizophora mangle* Tidal Shrubland Alliance (A.735)
- *Sporobolus virginicus* Tidal Herbaceous Alliance (A.1182)

DISTRIBUTION

Range: This system is best developed in southern Florida, extending north to approximately 29 degrees N latitude on both coasts.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Albert 1975, Comer et al. 2003, FNAI 1990, Lugo and Snedaker 1974, Lugo et al. 1988, Mendelssohn and McKee 1988, Odum and McIvor 1990, Odum et al. 1982, Rehm 1976, Savage 1972, Sherrod and McMillan 1985, Soil Conservation Service 1981a, Teas 1977

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723199#references

Description Author: R. Evans

Version: 19 Nov 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH FLORIDA POND-APPLE/POPASH SLOUGH (CES411.486)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: >180-day hydroperiod; Forest and Woodland (Treed); Depressional [Peaty]

National Mapping Codes: ESLF 9195

CONCEPT

Summary: This wetland system of south Florida occupies deep muck soils with long hydroperiods. Examples are dominated by *Fraxinus caroliniana* and/or *Annona glabra*. Aquatic herb species that are also found in other wetland systems of south Florida, such as *Crinum americanum*, *Bacopa caroliniana*, and *Sagittaria graminea*, may also be present (Hilsenbeck et al. 1979, Gunderson and Loope 1982). Examples of this system are important nesting, feeding, and roosting habitats for Everglades wading birds (Hilsenbeck et al. 1979). Large areas of this system that formerly occurred around Lake Okeechobee were cleared for farming around 1900 (Craighead 1971); only small examples still persist in Big Cypress National Preserve and portions of Everglades National Park.

Classification Comments: This system is related to South Florida Slough, Gator Hole, and Willow Head (CES411.485) but occupies lower elevations with longer hydroperiods and has different vegetation. As currently conceived, this system includes the pond-apple - willow forests of Hilsenbeck et al. (1979).

Similar Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Slough (FNAI 1990) Broader
- Strand Swamp (FNAI 1990) Undetermined

DESCRIPTION

Environment: Examples occupy some of the deepest muck soils and relatively lowest soil elevations in the Big Cypress National Preserve (Gunderson and Loope 1982).

Dynamics: The successional dynamics of this system are not clearly understood.

MEMBERSHIP

Associations:

- *Annona glabra* - *Conocarpus erectus* / *Acrostichum aureum* Forest (CEGL007617, G2G3)
- *Annona glabra* / *Crinum americanum* - *Bacopa caroliniana* Forest (CEGL007055, G1G2)
- *Fraxinus caroliniana* / *Crinum americanum* - *Bacopa caroliniana* Forest (CEGL004478, G2G3)

Alliances:

- *Annona glabra* Semipermanently Flooded Forest Alliance (A.76)
- *Fraxinus caroliniana* Seasonally Flooded Forest Alliance (A.344)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Craighead 1971, Gunderson and Loope 1982b, Hilsenbeck et al. 1979

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723100#references

Description Author: R. Evans and C. Nordman

Version: 05 Feb 2003

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1457 SOUTH-CENTRAL INTERIOR / UPPER COASTAL PLAIN WET FLATWOODS (CES203.480)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2457; ESLF 9126; ESP 1457

CONCEPT

Summary: This system represents predominantly wet flatwoods of limited areas of the most inland portions of the East Gulf Coastal Plain in western Kentucky, as well as related broad, flat areas of the western Interior Low Plateau. This part of the Coastal Plain is referred to as the Jackson Purchase or "Jackson Plain." Flatwoods have long been recognized as a distinctive subdivision within this region (Davis 1923, Bryant and Martin 1988). Examples in the Pennyroyal Plain (of the western Interior Low Plateau) have been known for many years and referred to as "pondywoods" or "crawfishy land" (Chester et al. 1995). They are also known from the Shawnee Hills of Kentucky, on Periglacial lakebeds (M. Evans pers. comm. 2006), and from the Moulton Valley of Alabama (A. Schotz pers. comm. 2006). They tend to be confined to relatively small areas near the eastern flank of the region where loess deposits thin out. Unlike South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479) of the same general region (which is typified by complex microtopography), this system occupies broad flats underlain by fragipans. These fragipans impede the downward migration of water, resulting in wet conditions for portions of the year. Fire was an important natural process in this system, probably maintaining relatively open-canopied stands (M. Evans pers. comm.). Stands are dominated by hardwood trees, including *Quercus* spp., *Liquidambar styraciflua*, *Carya* spp., and *Acer rubrum* (Chester et al. 1995). Related wet flatwoods are apparently present in the Moulton Valley of Alabama and these are provisionally placed here.

Classification Comments: The primary range of this system is limited areas of the "Jackson Purchase" or "Jackson Plain" of Kentucky and possibly related areas in adjacent western Tennessee, as well as related broad, flat areas of the western Interior Low Plateau. According to Bryant and Martin (1988) the "Flatwoods" portion of the Jackson Purchase (which is primarily where the "Wet Flatwoods" are located in that area) occupies less than 2% of the total area, but localized occurrences could have been present in other parts of the region. These apparently related wet flatwoods in the western end of the Moulton Valley of Alabama are found in northeastern Franklin and extreme western Lawrence counties, from 10 to 20 km east of Russellville. More information is needed. In Alabama, this system is apparently found in the Moulton Valley region (A. Schotz pers. comm. 2006), which is technically part of TNC Ecoregion 50 but ambiguously placed there.

Similar Ecological Systems:

- South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)

Related Concepts:

- Flatwoods (Evans 1991) Intersecting

DESCRIPTION

Environment: These flatwoods have long been recognized as the primary vegetation type of a distinctive subdivision within the Upper East Gulf Coastal Plain region (Davis 1923, Bryant and Martin 1988), as well as related areas of the western Interior Low Plateau. Within the "Jackson Plain" portion of the Upper East Gulf Coastal Plain, these flatwoods tend to be confined to relatively small areas near the eastern flank of the "Jackson Plain" region where the loess deposits thin out. Unlike drier Post Oak Flatwoods of these areas (which are typified by microtopographic variation), this system occupies broad flats underlain by fragipans. These fragipans impede the downward migration of water resulting in wet conditions for portions of the year. In the Jackson Plain area the soils include Henry silt loam, Routon silt loam (Bryant and Held 2001) and Calloway silt loam (Karathanasis et al. 2003). Fire is probably relatively infrequent in this system (M. Evans pers. comm.). In the Pennyroyal Plain, this system occurs on upland flats and depressions with poor drainage, underlain by limestone; soils include Robertsville silt loam (Chester et al. 1995) and Henry silt loam (M. Evans pers. comm.).

Vegetation: Stands are typically dominated by various combinations of oaks and other hardwoods, including *Quercus pagoda*, *Quercus stellata*, *Carya ovata*, *Prunus serotina*, *Diospyros virginiana*, *Ulmus alata*, *Ulmus americana*, *Quercus palustris* (Bryant 1999), *Quercus michauxii*, *Liquidambar styraciflua*, *Carya* spp., *Nyssa sylvatica*, and *Acer rubrum* (Chester et al. 1995). Most stands of this system have been severely altered or destroyed, and the characteristic herbs are poorly known. *Campsis radicans* may be found, along with *Carex* spp., including *Carex leptalea* and *Carex cherokeensis*. Other herbs may include *Leersia* spp. and *Cardamine bulbosa*. *Quercus phellos* and/or *Quercus lyrata* may also be present in stands of this system in Kentucky (M. Evans pers. comm. 2006). Some stands placed here are dominated by *Quercus falcata* (e.g., at Shiloh National Military Park), others (e.g., in the Moulton Valley of Alabama) by a combination of *Quercus phellos* and *Quercus nigra* (A. Schotz pers. comm. 2006).

Dynamics: Most historic occurrences have been cleared, drained and tilled, and remaining sites are small and degraded. Fire was an important natural process in this system, probably maintaining relatively open-canopied stands (M. Evans pers. comm.). Under such

conditions *Andropogon gerardii* and *Chasmanthium* spp. may have dominated the herbaceous ground cover.

MEMBERSHIP

Associations:

- *Quercus falcata* Flatwoods Forest (CEGL004412, G2?)
- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus phellos* - (*Quercus lyrata*) / *Carex* spp. - *Leersia* spp. Forest (CEGL002102, G3G4Q)

Alliances:

- *Quercus falcata* Forest Alliance (A.243)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

DISTRIBUTION

Range: The primary range of this system is limited areas of the "Jackson Purchase" or "Jackson Plain" of Kentucky and possibly related areas in adjacent western Tennessee, as well as related broad, flat areas of the western Interior Low Plateau. It is assumed to cross the Ohio River into adjacent Indiana. It has been discerned from wetland modeling and confirmed by observation in the Moulton Valley of Alabama.

Divisions: 203:C

Nations: US

Subnations: AL, IL?, IN?, KY, TN

Map Zones: 46:P, 47:C, 48:C, 49:?

USFS Ecomap Regions: 223D:CC, 223E:CC, 223G:CC, 231B:CC, 231H:CC

TNC Ecoregions: 43:C, 44:C, 50:C

SOURCES

References: Bryant 1999, Bryant and Held 2001, Bryant and Martin 1988, Chester et al. 1995, Comer et al. 2003, Davis 1923, Evans 1991, Hendricks et al. 1991, Karathanasis et al. 2003, M. Evans pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, NRCS 1996, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723106#references

Description Author: R. Evans and M. Evans, mod. M. Pyne and C. Nordman

Version: 23 May 2008

Concept Author: R. Evans and M. Evans, mod. M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

SOUTHEASTERN COASTAL PLAIN NATURAL LAKESHORE (CES203.044)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Woody-Herbaceous; Depressional [Pond]; Coastal plain

National Mapping Codes: ESLF 9167

CONCEPT

Summary: This system consists of wetland vegetation along large natural lakeshores in the Outer Coastal Plain of the southeastern United States. Natural lakes are generally rare features throughout most of this region. However, examples range northward to the Atlantic Coastal Plain in southeastern Virginia and North Carolina, but no examples are known from South Carolina and Georgia. However examples are present in Florida, where they are apparently found on smaller lakes than those to the north. Hydroperiod remains relatively constant from year to year, especially when compared to smaller limesink depressions of the region. Vegetation may appear to be zonal in relationship to distance from the lakeshore and may range from open water or floating-leaved aquatics in the deeper waters of the lakes, to emergent marsh zones along the edges. In some cases there are wet hardwood swamps present.

Classification Comments: This system is related to Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) which is found primarily on limesink depressions that are smaller in scale and have greater hydrologic fluctuation. This system is also related to Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245) in that some of the natural lake basins it occurs on are thought to be Carolina bays (Bennett and Nelson 1991).

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Related Concepts:

- Clastic Upland Lake (FNAI 1990) Intersecting
- Flatwoods/Prairie/Marsh Lake (FNAI 1990) Intersecting
- Open Water Lake (Bennett and Nelson 1991) Finer
- Sinkhole Lake (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Adiantum capillus-veneris* / *Conocephalum conicum* Herbaceous Vegetation (CEGL004515, G1Q)
- *Cyrilla racemiflora* - *Lyonia lucida* Shrubland (CEGL003844, G3?)
- *Liquidambar styraciflua* / *Persea palustris* Forest (CEGL004481, G1)
- *Nuphar sagittifolia* - *Eriocaulon aquaticum* Lakeshore Herbaceous Vegetation (CEGL004297, G1)
- *Nymphaea odorata* - *Nuphar lutea* ssp. *advena* - (*Nymphoides aquatica*, *Xyris smalliana*) Herbaceous Vegetation (CEGL004326, G3?)
- *Panicum hemitomon* - *Eleocharis equisetoides* - *Rhynchospora inundata* Herbaceous Vegetation (CEGL004127, G3)
- *Panicum hemitomon* - *Pluchea (camphorata, rosea)* - *Ludwigia* spp. Herbaceous Vegetation (CEGL007792, G3)
- *Taxodium distichum* - *Liquidambar styraciflua* - *Platanus occidentalis* / *Asimina triloba* Forest (CEGL004424, G1?)
- *Taxodium distichum* - *Taxodium ascendens* / *Panicum hemitomon* - *Sclerolepis uniflora* Woodland (CEGL004465, G1)
- *Taxodium distichum* - *Taxodium ascendens* / *Panicum hemitomon* Woodland (CEGL004466, G3?)
- *Taxodium distichum* / *Cephalanthus occidentalis* / *Juncus repens* Woodland (CEGL004653, G1?)

Alliances:

- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Liquidambar styraciflua* - *Taxodium distichum* Seasonally Flooded Forest Alliance (A.322)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nymphoides aquatica* Permanently Flooded Herbaceous Alliance (A.1751)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Taxodium distichum* - (*Taxodium ascendens*) Seasonally Flooded Lakeshore Woodland Alliance (A.652)

DISTRIBUTION

Range: This system is found in the Outer Coastal Plain of Virginia (apparently from a single site, Lake Drummond) and North Carolina, apparently absent from South Carolina and Georgia, but examples are present in Florida (i.e., Ocean Pond on Osceola National Forest).

Divisions: 203:C

Nations: US

Subnations: FL, GA?, NC, SC?, VA

Map Zones: 55:C, 56:C, 58:C, 60:C, 99:C

USFS Ecomap Regions: 232C:CC, 232D:CC, 232G:CC, 232I:CC, 232L:CC

TNC Ecoregions: 53:?, 55:C, 57:C

SOURCES

References: Bennett and Nelson 1991, Comer et al. 2003, FNAI 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722665#references

Description Author: M. Schafale and R. Evans

Version: 31 Mar 2003

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHEASTERN GREAT PLAINS FLOODPLAIN (CES205.710)

CLASSIFIERS

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Deep (>15 cm) Water; Intermediate (5-25 yrs) Flooding Interval; Forest and Woodland (Treed); Herbaceous; Riverine / Alluvial

National Mapping Codes: ESLF 4160

CONCEPT

Summary: This ecological system is found in the floodplains of medium and larger rivers of the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27 respectively, *sensu* Griffith et al. (2004)). Alluvial soils and sedimentation processes typify this system. Periodic, intermediate flooding and deposition (every 5-25 years) dominates the formation and maintenance of this system. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats; however, they are linked by underlying soils and the flooding regime. Canopy dominants may include *Carya illinoensis*, *Ulmus crassifolia*, *Ulmus americana*, *Celtis laevigata*, *Quercus nigra*, *Platanus occidentalis*, *Acer negundo*, *Quercus macrocarpa*, *Morus rubra*, *Fraxinus pennsylvanica*, *Salix nigra*, and *Sapindus saponaria var. drummondii* (= *Sapindus drummondii*). Overgrazing and/or overbrowsing may influence recruitment of overstory species and composition of the understory and herbaceous layers. Shrub species may include *Callicarpa americana*, *Ilex decidua*, *Ilex americana*, *Sideroxylon lanuginosum*, *Diospyros virginiana*, *Juniperus virginiana*, *Cornus drummondii*, and *Viburnum rufidulum*, which may occur as dense patches following disturbance, but are otherwise generally fairly sparse. Vines such as *Berchemia scandens*, *Campsis radicans*, *Vitis* spp., *Parthenocissus quinquefolia*, and *Ampelopsis arborea* may be conspicuous. Herbaceous cover includes *Elymus virginicus*, *Verbesina virginica*, *Chasmanthium latifolium*, *Chasmanthium sessiliflorum*, *Tripsacum dactyloides*, *Symphotrichum drummondii var. texanum*, *Geum canadense*, *Sanicula canadensis*, *Panicum virgatum*, *Galium* spp., and *Carex* sp. Herbaceous cover may be quite high, especially in situations where shrub cover is low. The environment and vegetation of this system become generally and correspondingly drier from east to west with moister representatives (such as communities containing *Quercus phellos*, *Quercus pagoda*, *Quercus alba*, and *Quercus lyrata*) occurring along the eastern and northeastern margins of the range. Representatives of this system may vary in the openness of the habitat and physiognomy.

Classification Comments: More data are needed to determine if this system should be split and a new system developed for the southern parts of Ecoregion 32 and 33 (*sensu* EPA; Griffith et al. 2004), south of the Brazos or Colorado rivers. Further field investigation is needed to better develop the association-level information for this system. This system grades into Edwards Plateau Floodplain (CES303.651) but can be distinguished by the absence or low cover of western species such as *Juglans major*, *Juglans microcarpa*, *Juniperus ashei*, *Mahonia trifoliolata* (= *Berberis trifoliolata*), *Sapindus saponaria var. drummondii*, and the presence or higher cover of more eastern species such as *Maclura pomifera*, *Ilex decidua*, *Ilex vomitoria*, *Quercus nigra*, *Ulmus americana*, and *Juniperus virginiana*. Species common in both systems include *Ulmus crassifolia*, *Carya illinoensis*, *Platanus occidentalis*, and *Celtis laevigata*. More information is needed to better differentiate these systems.

Along the Red River and a few of its tributaries, thin bands of riparian vegetation occurring on sandy floodplain terraces, bluffs and sandbars are significantly different in species composition from riparian communities elsewhere in the region. Although currently classed as part of this system, additional data may warrant classification in a separate system. Occurrences may include *Salix* spp. (especially *Salix exigua*), *Acer saccharinum* (which probably does not occur in any other basin in Texas), *Juniperus virginiana*, and *Populus deltoides*. Adjacent slopes and higher floodplain terraces support woodlands of *Juniperus virginiana*, *Quercus macrocarpa*, *Quercus shumardii*, *Quercus muehlenbergii*, *Fraxinus texensis*, *Cornus drummondii*, and *Viburnum rufidulum*.

Similar Ecological Systems:

- Edwards Plateau Floodplain (CES303.651)

DESCRIPTION

Environment: This system occupies relatively broad flats at low topographic positions, along large streams where alluvial deposition dominates. It is found in the floodplains of medium and larger rivers of the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27 respectively, *sensu* Griffith et al. (2004)). Soils are primarily alluvial and range from sandy to dense clays.

Vegetation: Canopy dominants may include *Carya illinoensis*, *Ulmus crassifolia*, *Ulmus americana*, *Celtis laevigata*, *Quercus nigra*, *Fraxinus americana*, *Platanus occidentalis*, *Acer negundo*, *Quercus macrocarpa*, *Morus rubra*, *Fraxinus pennsylvanica*, *Salix nigra*, and *Sapindus saponaria var. drummondii* (= *Sapindus drummondii*). Overgrazing and/or overbrowsing may influence recruitment of overstory species and composition of the understory and herbaceous layers. Shrub species may include *Callicarpa americana*, *Ilex decidua*, *Ilex americana*, *Sideroxylon lanuginosum*, *Diospyros virginiana*, *Juniperus virginiana*, *Cornus drummondii*, and *Viburnum rufidulum*, which may occur as dense patches following disturbance, but are otherwise generally fairly sparse. Vines such as *Berchemia scandens*, *Campsis radicans*, *Vitis* spp., *Parthenocissus quinquefolia*, and *Ampelopsis arborea* may be conspicuous. Herbaceous cover includes *Elymus virginicus*, *Verbesina virginica*, *Chasmanthium latifolium*, *Chasmanthium*

sessiliflorum, *Tripsacum dactyloides*, *Symphyotrichum drummondii* var. *texanum*, *Geum canadense*, *Sanicula canadensis*, *Panicum virgatum*, *Galium* spp., and *Carex* sp. Herbaceous cover may be quite high, especially in situations where shrub cover is low. In early-successional states, growth rates among species are variable with species such as *Acer negundo*, having rapid growth rate and species such as *Quercus macrocarpa* growing more slowly. There may be an open canopy resulting from flood events and rare fire events. The environment and vegetation of this system become generally and correspondingly drier from east to west with moister representatives (such as communities containing *Quercus phellos*, *Quercus pagoda*, *Quercus alba*, and *Quercus lyrata*) occurring along the eastern and northeastern margins of the range. Representatives of this system may vary in the openness of the habitat and physiognomy. Along the Red River and a few of its tributaries, thin bands of riparian vegetation occurring on sandy floodplain terraces, bluffs and sandbars are significantly different in species composition from riparian communities elsewhere in the region. Occurrences may include *Salix* spp. (especially *Salix exigua*), *Acer saccharinum* (which probably does not occur in any other basin in Texas), *Juniperus virginiana*, and *Populus deltoides*.

Dynamics: Periodic and intermediate flooding is the most significant process controlling this system and is expected every 5 to 25 years. Grazing and conversion to agriculture can significantly impact this system and can lead to the degradation or extirpation of the majority of prairie and wet meadow communities from this system. Fire occurs infrequently relative to surrounding systems. Fuels tend to stay moister due to shady conditions and low topographic position. Other disturbances include ice storm/blowdowns, which are capable of setting back small to large patches; as well as beaver pond flooding, which even though a small-patch event, is expected to cycle throughout the forest over the long term, perhaps at a scale of hundreds or thousands of years.

MEMBERSHIP

Associations:

- *Fraxinus pennsylvanica* - *Ulmus crassifolia* - *Celtis laevigata* Forest (CEGL004618, GNR)
- *Quercus macrocarpa* - *Carya illinoensis* / *Cornus drummondii* - *Frangula caroliniana* Forest (CEGL004196, GNR)
- *Ulmus americana* - *Celtis (laevigata, occidentalis)* - *Fraxinus pennsylvanica* Forest (CEGL002090, G3?)
- *Ulmus crassifolia* - *Carya illinoensis* - *Celtis laevigata* / *Chasmanthium sessiliflorum* - *Carex cherokeensis* Forest (CEGL002388, G2G3)

Alliances:

- *Carya illinoensis* - (*Celtis laevigata*) Temporarily Flooded Forest Alliance (A.282)
- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)

SPATIAL CHARACTERISTICS

Spatial Summary: The scale of occurrences is wider and longer than the equivalent riparian system and can be hundreds to the low tens of thousands of acres.

Adjacent Ecological Systems:

- Southeastern Great Plains Riparian (CES205.709)

Adjacent Ecological System Comments: The equivalent riparian woodland/forest system occurs along upper reaches of streams where streamflows become intermittent and alluvial deposits are thinner. Like other wooded wetland systems, this tends to blend into riparian systems as streams become smaller upstream.

DISTRIBUTION

Range: This system is found along major river floodplains in the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27, respectively, *sensu* Griffith et al. (2004)). Rivers such as the Sulphur (and tributaries such as White Oak and Cuthand creeks), Sabine (and Lake Fork), Trinity (and its major tributaries), Navasota, portions of the Lower and Middle Brazos rivers (and major tributaries), portions of the middle and upper Red River, and portions of the Guadalupe, Colorado, and San Antonio rivers downstream of the Edwards Plateau ecoregion may support this system.

Divisions: 205:C; 303:C

Nations: US

Subnations: OK, TX

Map Zones: 32:C, 35:C, 36:C, 37:C

USFS Ecomap Regions: 255Ac:CCP, 255Ad:CCC, 255Af:CCC, 255Ba:CCC, 255Ca:CCC, 255Cc:CCC, 255Cd:CCC, 255Ea:CCC, 255Eb:CCC, 255Ec:CCC, 255Ed:CCC, 255Ee:CCC, 315Cb:CCP, 315Ed:CCC, 315Ga:CCC

TNC Ecoregions: 32:C

SOURCES

References: Eidson pers. comm., Griffith et al. 2004, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.806778#references

Description Author: M. Pyne and J. Teague

Version: 04 Feb 2009

Concept Author: J. Eidson, M. Pyne, L. Elliott and J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHEASTERN GREAT PLAINS RIPARIAN (CES205.709)

CLASSIFIERS

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Woody-Herbaceous; Herbaceous; Streambed; Flood Scouring

National Mapping Codes: ESLF 4159

CONCEPT

Summary: This ecological system occurs in various situations along small and intermittent streams in the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27, respectively, *sensu* Griffith et al. (2004)). Some trees that may be present in stands of this system include *Celtis laevigata* var. *laevigata*, *Celtis laevigata* var. *reticulata*, *Platanus occidentalis*, *Quercus nigra*, *Quercus phellos*, *Amorpha fruticosa*, *Forestiera acuminata*, *Acer saccharinum*, *Sapindus saponaria*, *Salix nigra*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Carya illinoensis*, and *Ulmus crassifolia*. The environment and vegetation of this system become generally and correspondingly drier from east to west with moister representatives (such as communities containing *Quercus nigra*) occurring in the eastern parts of the range.

Representatives of this system typically occur in stream-scoured situations and vary in the openness of the habitat and physiognomy.

Classification Comments: More data are needed to determine if this system should be split and a new system developed for the southern parts of Ecoregion 32 and 33 (*sensu* EPA; Griffith et al. 2004), south of the Brazos or Colorado rivers. Further field investigation is needed to better develop the association-level information for this system.

Similar Ecological Systems:

- Edwards Plateau Riparian (CES303.652)
- North American Warm Desert Riparian Woodland and Shrubland (CES302.753)
- West Gulf Coastal Plain Small Stream and River Forest (CES203.487)

DESCRIPTION

Environment: This system occurs on minor intermittent streams and tributaries throughout the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27 respectively, *sensu* Griffith et al. (2004)). It is found along medium to very small, intermittent to ephemeral drainages. This type is ubiquitous throughout, but species composition and flood regimes are variable and are thought to be dependent on soil and geologic substrates. Generally, these are less thick alluvium than in floodplain terraces. These are flashy streams, and flooding rather than fire will be the dominant process in this system. Fuels in this system are variable, and fire-return interval is partially determined by that of the adjacent and surrounding matrix upland system, where fuels are present.

Vegetation: Stands of this system are forests or woodlands typically dominated by species such as *Celtis laevigata* var. *laevigata*, *Celtis laevigata* var. *reticulata*, *Platanus occidentalis*, *Quercus nigra*, *Quercus phellos*, *Amorpha fruticosa*, *Sapindus saponaria*, *Salix nigra*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Carya illinoensis*, and *Ulmus crassifolia*. Height of vegetation is variable on an east to west moisture gradient. Herbaceous species can include *Andropogon glomeratus*, *Panicum virgatum*, *Chasmanthium latifolium*, *Chasmanthium sessiliflorum*, *Clematis pitcheri*, *Elymus virginicus*, and *Justicia americana*. Herbaceous species may occur as clumps or as a continuous herbaceous layer, this being controlled by soil development. Some early-successional stands may have *Amorpha fruticosa* as a dominant woody species, and it may comprise up to 50% of the canopy cover. There are many plant communities which make up this system; *Amorpha* is typical in some locales. It is likely that other communities have a shrubby successional stage which may include *Forestiera acuminata*, *Prunus rivularis*, and tree seedlings and saplings of later-successional communities (J. Eidson pers. comm. 2007).

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Southeastern Great Plains Floodplain (CES205.710)

DISTRIBUTION

Range: This system is found along major river floodplains in the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27, respectively, *sensu* Griffith et al. (2004)). Occurrences of this system occupy drainages of the Sulphur (and tributaries such as White Oak and Cuthand creeks), Sabine (and Lake Fork), Trinity (and its major tributaries), Navasota, and portions of the Lower and Middle Brazos rivers (and major tributaries).

Divisions: 205:C; 303:C

Nations: US

Subnations: OK, TX

Map Zones: 32:C, 35:C, 36:C, 37:C

USFS Ecomap Regions: 255Ac:CCP, 255Ad:CCC, 255Af:CCC, 255Ba:CCC, 255Ca:CCC, 255Cc:CCC, 255Cd:CCC, 255Ea:CCC, 255Eb:CCC, 255Ec:CCC, 255Ed:CCC, 255Ee:CCC, 315Cb:CCP, 315Ed:CCC, 315Ga:CCC
TNC Ecoregions: 32:C

SOURCES

References: Eidson pers. comm., Griffith et al. 2004, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.806782#references

Description Author: M. Pyne and J. Teague

Version: 04 Feb 2009

Concept Author: J. Eidson, M. Pyne, L. Elliott and J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN AND CENTRAL APPALACHIAN BOG AND FEN (CES202.300)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Fen; Shrubland (Shrub-dominated); Depressional; Bog

Non-Diagnostic Classifiers: Graminoid

National Mapping Codes: ESLF 9309

CONCEPT

Summary: This system consists of wetlands associated with flat sites in the Southern Blue Ridge, Central Appalachians, Cumberland Mountains, and possibly upper Piedmont and adjacent Ridge and Valley. These sites occur at elevations below 1220 m (4000 feet) in poorly drained bottomlands on soils which are often saturated and mucky. Wetness results from a combination of groundwater input, seepage from adjacent slopes, rainfall and impeded drainage. The amount of seepage water input is variable among examples, and these wetlands are typically primarily depressional. Vegetation is at least partially open, with herbaceous-dominated areas as well as shrub thickets and often forested zones. Vegetation is a complex of zones or patches with a mix of physiognomies. The wettest areas have herbaceous vegetation dominated by *Carex* spp., usually with abundant *Sphagnum*. Scattered trees and shrubs may be present in the herbaceous zones. Most examples also have a dense shrub zone around the edges. Some examples have forest zones as well, around the edges or as a matrix in which numerous small herbaceous openings are embedded. Characteristic tree species are *Tsuga canadensis*, *Acer rubrum*, *Nyssa sylvatica*, and *Pinus rigida*. Characteristic shrubs include *Rhododendron maximum*, *Alnus serrulata*, *Viburnum nudum* var. *nudum*, and *Toxicodendron vernix*.

Classification Comments: This system includes communities locally known as both bogs and fens. The typical distinction between bogs as rainwater-fed wetlands and fens as groundwater-fed is blurred in these systems. Deep weathering of rock in this unglaciated region may make the groundwater more acidic and mineral-poor than in northern fens. Higher rainfall in the southern Appalachians than in adjacent regions may make the role of rainfall greater than in other regions, even where groundwater input occurs. Except for the few examples with clear calcareous groundwater input, the vegetation and flora are more characteristic of northern bogs than of northern fens. However, because of the confusion of the role of groundwater and rainwater, all of these wetlands are placed in the same system.

This system is distinguished from Southern Appalachian Seepage Wetland (CES202.317) by patterns of flora and vegetation. Though both systems have heterogeneous and variable vegetation, they share few or no associations. The setting also differs, with Southern and Central Appalachian Bog and Fen (CES202.300) occurring on flat sites such as valley bottoms, where impeded drainage is important, while the seeps occur on sloping sites where water flow is freer and more groundwater flow is needed to create a wetland. High-elevation wetlands in West Virginia are placed in High Allegheny Wetland (CES202.069).

Similar Ecological Systems:

- High Allegheny Wetland (CES202.069)
- Southern Appalachian Seepage Wetland (CES202.317)

DESCRIPTION

Environment: This system occurs in patches in flat valley bottoms, usually on the outer edges of stream floodplains at elevations below 1220 m (4000 feet). The soil is saturated most or all of the year, at least in the wettest parts, and may be very mucky. Although sites rarely flood, wetness results from a combination of groundwater input, rainfall, seepage from adjacent slopes, and impeded drainage. The groundwater is usually highly acidic and low in dissolved bases, but one or a few examples have somewhat calcareous water input because groundwater flows through mafic rock substrates. Overland flow and stream flooding are presumably only rare events. The geologic substrate is usually alluvium. Often, but not always, there is an adjacent slope with a seep at its base or some visible microtopographic feature, such as a stream levee or ridge, that impedes water drainage out of the area. Some occurrences have substantial microtopography of abandoned stream channels or ridge-and-swale systems that pond water in low areas.

Vegetation: Vegetation is a complex of zones or patches with a mix of physiognomies. The wettest areas have herbaceous vegetation dominated by *Carex* spp., usually with abundant *Sphagnum*. Scattered trees and shrubs may be present in the herbaceous zones. Most examples also have a dense shrub zone around the edges. Some examples have forest zones as well, around the edges or as a matrix in which numerous small herbaceous openings are embedded. Characteristic tree species are *Tsuga canadensis*, *Acer rubrum*, *Nyssa sylvatica*, and *Pinus rigida*. Characteristic shrubs include *Rhododendron maximum*, *Alnus serrulata*, *Viburnum nudum* var. *cassinoides*, *Viburnum nudum* var. *nudum*, and *Toxicodendron vernix*. A number of plant species are shared with northern bogs, including some that are disjunct long distances and occur in the south only in bogs. Other species are narrow endemics, such as *Sarracenia rubra* ssp. *jonesii*. In the more southern examples, some species are shared with bog communities in the Coastal Plain. The very rare richer fen examples have very distinctive vegetation, sharing a number of species with northern rich fens.

Dynamics: The natural dynamics of this system are not well known and are subject to debate. The factors that created and naturally maintain this system are unclear. Most examples show a strong tendency at present for shrubs and trees to increase in density in the open areas, threatening to eliminate the characteristic herb species. This suggests that an important process has been altered or lost.

One hypothesis is that bogs are an ephemeral feature developing from abandoned beaver ponds. Another hypothesis is that they result from a narrow combination of moisture and nutrient conditions, which have been widely altered in an obscure way that has changed ecosystem stability. The cattle grazing that was nearly universal in examples of this system in the past appears to have delayed woody succession but may also have altered the natural characteristics. Fire is sometimes considered as a factor, but most examples do not appear flammable enough to burn. Besides woody encroachment, bogs may be altered by changes in adjacent drainage, such as entrenchment by streams.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest (CEGL007443, G3?)
- *Alnus serrulata* - *Kalmia carolina* - *Rhododendron catawbiense* - *Spiraea alba* / *Carex folliculata* - *Lilium grayi* Shrubland (CEGL003915, G1G2)
- *Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Shrubland (CEGL003909, G2?)
- *Alnus serrulata* - *Rhododendron arborescens* / *Sarracenia oreophila* - *Rhynchospora rariflora* Shrubland (CEGL003914, G1)
- *Alnus serrulata* - *Rhododendron viscosum* - *Rhododendron maximum* / *Juncus gymnocarpus* - *Chelone cuthbertii* Shrubland (CEGL003916, G1G2)
- *Alnus serrulata* - *Viburnum nudum* var. *nudum* - *Chamaedaphne calyculata* / *Woodwardia areolata* - *Sarracenia rubra* ssp. *jonesii* Shrubland (CEGL003918, G1)
- *Alnus serrulata* / *Sanguisorba canadensis* - *Calamagrostis canadensis* Shrubland (CEGL004252, G1)
- *Alnus serrulata* / *Sanguisorba canadensis* - *Parnassia grandifolia* - *Helenium brevifolium* Shrubland (CEGL003917, G1)
- *Carex (atlantica, echinata, leptalea, lurida)* - *Solidago patula* Herbaceous Vegetation (CEGL004156, G1)
- *Carex atlantica* - *Rhynchospora alba* - *Parnassia asarifolia* / *Sphagnum warnstorffii* Herbaceous Vegetation (CEGL004157, G1)
- *Carex atlantica* - *Solidago patula* var. *patula* - *Lilium grayi* / *Sphagnum bartlettianum* Herbaceous Vegetation (CEGL004158, G1)
- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549, GNR)
- *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534, G2?)
- *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* - *Carex atlantica* / *Sphagnum* spp. Herbaceous Vegetation (CEGL007697, G2)
- *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Vegetation (CEGL007771, G2)
- *Carex leptalea* - *Parnassia grandifolia* - *Rhynchospora alba* Herbaceous Vegetation (CEGL004997, G1)
- *Carex stricta* - *Caltha palustris* - *Oxypolis rigidior* - *Symphyotrichum puniceum* Herbaceous Vegetation (CEGL008461, G1?)
- *Cladium mariscoides* - *Sanguisorba canadensis* / *Sphagnum subsecundum* Herbaceous Vegetation (CEGL004167, G1)
- *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation (CEGL006552, GNR)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest (CEGL006277, G2?)
- *Pinus rigida* / *Toxicodendron vernix* / *Gaylussacia baccata* / *Symplocarpus foetidus* Woodland (CEGL003667, G1)
- *Pinus strobus* - *Acer rubrum* / *Spiraea alba* var. *latifolia* / *Sanguisorba canadensis* Woodland (CEGL004994, G1)
- *Rhododendron (maximum, catawbiense)* - *Ilex collina* - *Salix sericea* / *Carex trisperma* - *Eriophorum virginicum* Shrubland (CEGL003913, G1)
- *Rhododendron maximum* / *Sphagnum* spp. Shrubland (CEGL003849, G2G3Q)
- *Spiraea alba* var. *latifolia* - *Cornus racemosa* / *Calamagrostis canadensis* - *Sanguisorba canadensis* - *Carex scoparia* Shrub Herbaceous Vegetation (CEGL006249, G1)
- *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL007565, G2)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* - *Salix sericea* - *Rhododendron (catawbiense, maximum)* Saturated Shrubland Alliance (A.1880)
- *Alnus serrulata* - *Spiraea* spp. / *Sanguisorba canadensis* Saturated Shrub Herbaceous Alliance (A.3026)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Carex (atlantica, echinata)* - *Eriophorum virginicum* - *Rhynchospora capitellata* - *Solidago patula* Saturated Herbaceous Alliance (A.1450)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)
- *Carex ruthii* - *Carex gynandra* Saturated Herbaceous Alliance (A.1898)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Picea rubens* Saturated Forest Alliance (A.198)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Pinus strobus* - *Acer rubrum* Saturated Woodland Alliance (A.582)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, from one to several acres in size.

Size: Occurs as small patches, from about one acre to several acres. The largest examples are swamp forest-bog complexes that may cover 10 or more acres. Except for the small openings in the swamp forest-bog complexes, bog and fen patches tend to occur singly or in small clusters only.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Adjacent Ecological System Comments: Usually associated with Southern and Central Appalachian Cove Forest (CES202.373).

DISTRIBUTION

Range: This system ranges from the southern Appalachians of northern Georgia and South Carolina north to Virginia. It is also found in the Cumberland Mountains of Kentucky.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA

Map Zones: 53:C, 54:C, 57:C, 59:C, 61:C

TNC Ecoregions: 50:C, 51:C, 52:?, 59:C

SOURCES

References: Comer et al. 2003, M. Evans pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723191#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne and S. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN DEPRESSION PONDSHORE (CES203.262)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Woody-Herbaceous; Depressional [Pond]; Coastal plain

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9305

CONCEPT

Summary: This system consists of wetlands in small basins formed in unconsolidated sediments of the Atlantic Coastal Plain, from southeastern Virginia to Florida. Most basins are formed by subsidence of surface sediments caused by solution in underlying limestone. Others may be formed as swales in mainland eolian sands, natural blockage of small drainages by sediment movement, and more obscure causes. Soils are generally sandy, with mucky surfaces in the wettest areas. Vegetation is often zonal in response to variation in duration of flooding in different parts of the depression pond. Vegetation usually ranges from open water or floating-leaved aquatics in the center of the deepest basins, to emergent marsh zones in semipermanent water, to drawdown zones with diverse small graminoid and forb vegetation, to dense shrub or woodland edges. A smaller number of basins may have emergent trees throughout their extent. Hydroperiod can vary substantially from year to year, and vegetation can similarly vary significantly in aspect and dominants. Besides flooding and its variation, fire is an important natural force in the outer drier portions.

Classification Comments: The boundary of this system with adjacent upland or wetland systems occurs where vegetation begins to reflect the influence of regular flooding and basin hydrology. This system shares much of its character with Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245) but generally accommodates all "limesink depressions" as opposed to mineral soil Carolina bay wetlands. Other basins, especially broad, gently sloped basins on the Outer Coastal Plain and steep-sided depressions farther inland, will need to be placed based on the preponderance of evidence. The northern and southern range limits of this system are not well known. It is tentatively placed at the mouth of Chesapeake Bay and in south Georgia. Northern Atlantic Coastal Plain Pond (CES203.518) of Virginia and Maryland and the wet prairies of north-central Florida are closely related systems.

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- Northern Atlantic Coastal Plain Pond (CES203.518)
- Southeastern Coastal Plain Natural Lakeshore (CES203.044)

Related Concepts:

- Depression Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: This system occurs in small basins, primarily in sandy terrain of the Atlantic Coastal Plain, from southeastern Virginia to Florida. Most basins are formed by subsidence of surface sediments caused by solution in underlying limestone. Others may be formed as dune swales in mainland eolian sands, natural blockage of small drainages by sediment movement, and more obscure causes. Basins often occur in complexes of a few to dozens, which vary in size, depth, and steepness of sides. Most or all of these basins are considered groundwater windows, with water levels matching the level of the local water table. Rainfall is probably also a substantial contributor. The water is acidic and is apparently not influenced by the underlying limestone or deeper groundwater.

Hydroperiods vary substantially, with the deepest ponds having permanent water in the center, and the shallowest normally holding water only in the winter and spring. However, water levels can fluctuate substantially over the course of a year and from year to year in response to rainfall and longer term droughts. Soils have a mucky surface in the centers of basins that hold water most or all of the year and are generally sandy in smaller basins and in the outer drawdown zones that are exposed more of the time. Fire is potentially an important, if infrequent, influence in the system, penetrating the portions that are dry when adjacent communities burn. Its northern range limit is generally consistent with the northern limit of longleaf pine (*Pinus palustris*), although this species is not a component.

Vegetation: This system consists of wetland vegetation that is often strongly zoned within single basins and may vary substantially among basins even in close proximity. Most of the associations are herbaceous, but woody associations may be present. The center of the deepest basins generally is open water or floating-leaved aquatics. Semipermanently flooded zones may have marsh vegetation of medium to large emergents. Outer, mineral soil drawdown zones often have a species-rich flora of small to medium graminoids and forbs. These include a number of specialized species that are rare in states, some that are globally rare, and some that are widespread but nowhere common. The aspect of this vegetation may vary substantially from year to year depending on when water level drops. Some basins have a dense shrubby edge zone. Some trees or shrubs tolerant of standing water, especially bald-cypress (*Taxodium distichum*), pond-cypress (*Taxodium ascendens*) or swamp blackgum (*Nyssa biflora*), may grow within the basins, either as scattered individuals, as a distinct zone, or forming an open canopy over the whole basin. Because the basins are isolated from larger water bodies and most dry out at least occasionally, their aquatic fauna does not include fish unless fish have been artificially introduced. These systems are well known as important breeding sites for amphibians, and may support important aquatic invertebrate

communities as well.

Dynamics: Flooding hydrology is the most important dynamic process. Standing water excludes plants not characteristic of the system. Variation in hydroperiod and drawdown drive vegetation changes from year to year. Because ponds are connected to the local water table, hydroperiods respond to seasonal and long-term cycles in rainfall as much as, perhaps more than, single rainfall events. They may also be affected by regional drainage that lowers the water table.

Fire is also an important dynamic process in the drier portions of this system. Fire may be important for preventing invasion of trees such as loblolly pine (*Pinus taeda*) during long-running droughts, as well as for driving variation in herbaceous species.

MEMBERSHIP

Associations:

- *Amphicarpum muehlenbergianum* - (*Panicum hemitomon*) Herbaceous Vegetation (CEGL008588, G2G3)
- *Carex hyalinolepis* Seasonally Flooded Herbaceous Vegetation (CEGL004724, G1G3)
- *Carex striata* var. *striata* - *Xyris fimbriata* - *Lachnanthes carolina* Herbaceous Vegetation (CEGL007718, G2G3)
- *Cyrilla racemiflora* - *Lyonia lucida* Shrubland (CEGL003844, G3?)
- *Cyrilla racemiflora* / *Xyris fimbriata* - *Utricularia purpurea* - *Lycopodiella alopecuroides* Shrubland (CEGL007829, G2?)
- *Dichantherium wrightianum* - *Dichantherium erectifolium* Herbaceous Vegetation (CEGL004105, G2G3)
- *Nymphaea odorata* - *Nuphar lutea* ssp. *advena* - (*Nymphoides aquatica*, *Xyris smalliana*) Herbaceous Vegetation (CEGL004326, G3?)
- *Nyssa biflora* / *Itea virginica* - *Cephalanthus occidentalis* Depression Forest (CEGL007434, G3G4)
- *Nyssa ogeche* / *Ilex myrtifolia* / *Carex turgescens* - *Carex striata* Forest (CEGL004641, G2?)
- *Panicum hemitomon* - *Eleocharis equisetoides* - *Rhynchospora inundata* Herbaceous Vegetation (CEGL004127, G3)
- *Panicum virgatum* - *Andropogon (capillipes, glaucopsis)* - *Aristida palustris* Herbaceous Vegetation (CEGL004100, G2?)
- *Pinus serotina* / *Cyrilla racemiflora* - *Lyonia lucida* - *Vaccinium fuscum* Woodland (CEGL004434, G2G3)
- *Quercus phellos* - *Nyssa biflora* / *Panicum hemitomon* - *Carex* spp. - *Woodwardia virginica* Forest [Provisional] (CEGL004104, G2G3)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Vegetation (CEGL004132, G3?)
- *Rhynchospora alba* Saturated Herbaceous Vegetation (CEGL004463, G1?)
- *Rhynchospora filifolia* - *Juncus abortivus* Herbaceous Vegetation (CEGL004131, G2?)
- *Rhynchospora inundata* - *Eriocaulon decangulare* - *Panicum virgatum* - *Muhlenbergia expansa* Herbaceous Vegetation (CEGL004509, G1)
- *Saccharum baldwinii* - *Carex glaucescens* - *Rhynchospora corniculata* Herbaceous Vegetation (CEGL007745, G2G3)
- *Saccharum giganteum* - *Ludwigia sphaerocarpa* - *Panicum verrucosum* Herbaceous Vegetation (CEGL007744, G2G3)
- *Spartina bakeri* - *Woodwardia virginica* - *Saccharum giganteum* Herbaceous Vegetation (CEGL007713, G3?)
- *Sphagnum cuspidatum* Nonvascular Vegetation (CEGL004384, G2?)
- *Taxodium ascendens* / (*Nyssa biflora*) / *Leucothoe racemosa* - *Lyonia lucida* - *Morella cerifera* Depression Forest (CEGL007420, G3)
- *Taxodium ascendens* / *Cyrilla racemiflora* - *Zenobia pulverulenta* Woodland (CEGL003734, G2)
- *Taxodium ascendens* / *Ilex myrtifolia* Depression Forest (CEGL007418, G3?)
- *Vaccinium formosum* - *Vaccinium fuscum* / *Sphagnum cuspidatum* Shrubland (CEGL003907, G3?)
- *Woodwardia virginica* / *Sphagnum cuspidatum* Herbaceous Vegetation (CEGL004475, G2?)

Alliances:

- *Aristida palustris* - *Andropogon (capillipes, glaucopsis)* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Carex hyalinolepis* Seasonally Flooded Herbaceous Alliance (A.1366)
- *Carex striata* Seasonally Flooded Herbaceous Alliance (A.1426)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Cyrilla racemiflora* Seasonally Flooded Shrubland Alliance (A.1925)
- *Dichantherium (erectifolium, wrightianum)* - *Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Nymphoides aquatica* Permanently Flooded Herbaceous Alliance (A.1751)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Alliance (A.1383)
- *Rhynchospora alba* Saturated Herbaceous Alliance (A.1461)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
- *Sphagnum cuspidatum* Seasonally Flooded Nonvascular Alliance (A.1821)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)
- *Vaccinium formosum* - *Vaccinium fuscum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)
- *Woodwardia virginica* Seasonally Flooded Herbaceous Alliance (A.1713)

SPATIAL CHARACTERISTICS

Size: Depressions often occur in complexes, in a matrix of upland or saturated wetland systems. Individual depressions range from about 100 square meters to a hectare or two. Complexes may occupy several hectares within the space of several square kilometers.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Adjacent Ecological System Comments: Most often associated with Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281), but any upland or saturated wetland system can potentially surround them.

DISTRIBUTION

Range: This system is found from southeastern Virginia to Florida, primarily in the Outer Coastal Plain, but occasional depressions in the Inner Coastal Plain and Sandhills could be included.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723224#references

Description Author: M. Schafale and R. Evans

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN LARGE RIVER FLOODPLAIN FOREST (CES203.066)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]

National Mapping Codes: ESLF 9313

CONCEPT

Summary: This system represents a geographic subset of Kuchler's (1964) Southern Floodplain Forest. Examples may be found along large rivers of the Atlantic Coastal Plain, especially the Roanoke, Great Pee Dee, Congaree/Santee, Savannah, and Altamaha rivers. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphologic features present within the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993). Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding. However, herbaceous and shrub vegetation may be present in certain areas as well.

Classification Comments: This system has some overlap in associations with CES203.489, but many more are not in common. In addition "...most, if not all, associations in the system are shared with Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250). The main difference is in the scale of landscape pattern, but the extent and relief of fluvial landforms like natural levees and backswamps and the general flooding dynamics also differ" (M. Schafale pers. comm.).

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)--East Gulf equivalent.
- Northern Atlantic Coastal Plain Stream and River (CES203.070)

DESCRIPTION

Environment: Examples of this system are generally forested with stands of bottomland hardwood species and other trees tolerant of flooding. Local composition varies depending upon actual position within the floodplain, disturbance history, and underlying soils and geology. Although most examples of this system may be thought of as acidic, some examples of this system flow through regions with sufficient calcareous influence to effect vegetation composition.

Vegetation: Trees dominating stands of this system can include *Acer negundo*, *Acer rubrum* var. *rubrum*, *Acer rubrum* var. *drummondii*, *Acer saccharinum*, *Betula nigra*, *Carya aquatica*, *Celtis laevigata*, *Fraxinus caroliniana*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Nyssa aquatica*, *Nyssa biflora*, *Nyssa ogeche*, *Platanus occidentalis*, *Populus deltoides*, *Quercus laurifolia*, *Quercus michauxii*, *Salix nigra*, and *Ulmus americana*. Some disturbed stands may contain *Pinus taeda*. Shrubs and small trees can include *Alnus serrulata*, *Asimina triloba*, *Carpinus caroliniana*, *Cephalanthus occidentalis*, *Cornus foemina*, *Decodon verticillatus*, *Hypericum prolificum*, *Ilex decidua*, *Itea virginica*, *Lindera benzoin*, *Lyonia lucida*, *Planera aquatica*, *Sabal minor*, *Salix caroliniana*, *Sebastiania fruticosa*, and *Arundinaria gigantea* ssp. *gigantea*. Vines can include *Ampelopsis arborea*, *Vitis* spp., and others. Herbs can include *Boehmeria cylindrica*, *Carex abscondita*, *Carex albolutescens*, *Carex bromoides*, *Carex grayi*, *Carex intumescens*, *Carex jorii*, *Carex lupulina*, *Carex retroflexa*, *Chasmanthium laxum*, *Commelina virginica*, *Glyceria septentrionalis*, *Hydrocotyle ranunculoides*, *Leersia lenticularis*, *Lemna minor*, *Onoclea sensibilis*, *Saururus cernuus*, *Typha latifolia*, and *Zizaniopsis miliacea*, as well as the epiphytes *Tillandsia bartramii* and *Tillandsia usneoides*, and the aquatic exotic *Alternanthera philoxeroides*.

MEMBERSHIP

Associations:

- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer saccharinum* / *Leersia lenticularis* - *Commelina virginica* Forest (CEGL007727, G3?)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Betula nigra* / *Salix nigra* / *Hypericum prolificum* - *Ampelopsis arborea* Forest (CEGL007794, G3?)
- *Celtis laevigata* - *Fraxinus pennsylvanica* - *Acer negundo* - (*Juglans nigra*) / *Asimina triloba* / *Carex grayi* Forest (CEGL004740, G3G5)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Fraxinus pennsylvanica* - *Quercus laurifolia* - *Quercus lyrata* - *Carya aquatica* Forest (CEGL004695, G3G4)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Carpinus caroliniana* / *Boehmeria cylindrica* Forest (CEGL007806, G4?)

- *Fraxinus pennsylvanica* / *Cornus foemina* / *Carex bromoides* Forest (CEGL007742, G3G4)
- *Fraxinus pennsylvanica* / *Leersia lenticularis* - *Carex lupulina* Forest (CEGL007728, G2G3)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Liquidambar styraciflua* - *Quercus (laurifolia, nigra)* - (*Pinus taeda*) / *Arundinaria gigantea* / *Carex abscondita* Forest (CEGL007732, G3G4)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - (*Liquidambar styraciflua*) / *Itea virginica* / *Saururus cernuus* Forest (CEGL007847, G4?)
- *Nyssa biflora* - (*Taxodium distichum*) Semi-natural Forest (CEGL004640, GNA)
- *Nyssa biflora* - *Acer rubrum* var. *rubrum* / *Lyonia lucida* Forest (CEGL007864, G3G4)
- *Nyssa biflora* - *Liquidambar styraciflua* / *Glyceria septentrionalis* - *Hydrocotyle ranunculoides* Forest (CEGL007743, G3G4)
- *Nyssa ogeche* - (*Nyssa biflora*, *Taxodium ascendens*) Forest (CEGL007392, G4)
- *Nyssa ogeche* - *Nyssa aquatica* Forest (CEGL007393, G3)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest (CEGL004606, G4)
- *Pinus taeda* Temporarily Flooded Forest (CEGL007142, G4?)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Platanus occidentalis* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Lindera benzoin* - *Ilex decidua* / *Carex retroflexa* Forest (CEGL007730, G4?)
- *Populus deltoides* - *Salix caroliniana* Forest (CEGL007343, G4G5)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Populus deltoides* / *Acer negundo* / *Boehmeria cylindrica* Forest (CEGL007731, G3G5)
- *Quercus laurifolia* - *Quercus lyrata* / *Carpinus caroliniana* - *Persea palustris* / *Vaccinium elliotii* Forest (CEGL004737, G4?)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus lyrata* - *Carya aquatica* Forest (CEGL007397, G4G5)
- *Quercus lyrata* - *Liquidambar styraciflua* Forest (CEGL008583, G3G4)
- *Quercus lyrata* - *Quercus laurifolia* - *Taxodium distichum* / *Saururus cernuus* Forest (CEGL004735, G3G5)
- *Quercus michauxii* / *Carpinus caroliniana* - *Ilex opaca* / *Leucothoe racemosa* Forest (CEGL007737, G2G3)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* - *Fraxinus pennsylvanica* Forest (CEGL007734, G3G4)
- *Salix nigra* Temporarily Flooded Shrubland (CEGL003901, G4?)
- *Taxodium distichum* - *Betula nigra* / *Cyrilla racemiflora* - *Sebastiania fruticosa* Forest (CEGL004505, G3?)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)
- *Taxodium distichum* - *Nyssa biflora* / *Fraxinus caroliniana* / *Lyonia lucida* Forest (CEGL004733, G3G4)
- *Taxodium distichum* - *Nyssa biflora* / *Sabal palmetto* / *Tillandsia (bartramii, usneoides)* Forest (CEGL003850, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Zizaniopsis miliacea* Coastal Plain Slough Herbaceous Vegetation (CEGL004139, G4?)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest Alliance (A.433)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)

- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata - (Carya aquatica)* Seasonally Flooded Forest Alliance (A.328)
- *Quercus michauxii - Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Taxodium distichum - Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)
- *Typha (angustifolia, latifolia) - (Schoenoplectus spp.)* Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizaniopsis miliacea* Seasonally Flooded Temperate Herbaceous Alliance (A.1395)

DISTRIBUTION

Range: This system is found on the Atlantic Coastal Plain, from North Carolina south to Georgia, especially (from north to south) the Roanoke, Great Pee Dee, Congaree/Santee, and Savannah rivers. This includes Omernik Level 4 Ecoregions 63n, 65p, 75i (in part) (EPA 2004).

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: EPA 2004, Kuchler 1964, Schafale pers. comm., Sharitz and Mitsch 1993, Southeastern Ecology Working Group n.d., Wharton et al. 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.754563#references

Description Author: M. Pyne and M. Schafale, mod. C.W. Nordman and M. Pyne

Version: 04 Feb 2009

Concept Author: M. Pyne, M. Schafale

Stakeholders: Southeast

ClassifResp: Southeast

1501 SOUTHERN ATLANTIC COASTAL PLAIN NONRIVERINE SWAMP AND WET HARDWOOD FOREST (CES203.304)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat; Needle-Leaved Tree; Broad-Leaved Tree

Non-Diagnostic Classifiers: Organic Peat (>40 cm); Mineral: W/ A-Horizon >10 cm

FGDC Crosswalk: Vegetated, Tree-dominated

National Mapping Codes: EVT 2501; ESLF 9310; ESP 1501

CONCEPT

Summary: This system consists of poorly drained, organic or mineral soil flats of the outer Atlantic Coastal Plain. These areas are saturated by rainfall and seasonal high water tables without influence of river or tidal flooding. Fire is generally infrequent but may be important for some associations. Vegetation consists of hardwood or mixed forests of *Taxodium distichum*, *Nyssa* spp., bottomland oaks, *Acer rubrum*, or other wetland trees of similar tolerance. The lower strata have affinities with pocosin or baygall systems rather than the river floodplain systems that have affinities with the canopy. The combination of hardwood/deciduous canopy dominants and nonriverine, non-seepage hydrology distinguishes this system from other Coastal Plain systems. Stands with a high cover of *Chamaecyparis thyoides* formerly occupied much of the acreage of this system. This phase is presently only present in high-quality examples, and it helps distinguish this system from other Coastal Plain systems. Disturbed and fire-disrupted examples (those dominated by *Nyssa* spp., bottomland oaks, *Acer rubrum*) may be hard to distinguish from other wetland forests based purely on canopy composition.

Classification Comments: This system contains two to three distinctive subgroups within it. A wetter group has communities containing significant amounts of *Taxodium* or *Nyssa*. A drier group has communities with *Quercus* as a significant component. Within this group the calcareous association (CEGL007316) is very distinctive floristically.

The combination of canopy species with nonriverine hydrology distinguishes this system from all others. This system is distinguished from the various floodplain systems, with which the canopy shares affinities, by the distinctive hydrology and the differences in nutrient dynamics and other ecosystem process that follow from it. The overall flora is usually distinct and reflects these differences in nutrient status. The invertebrate fauna is likely very distinct. This system is distinguished from Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267), which can share organic soils and a number of shrub and herb species, by the canopy dominants and the lack of *Pinus serotina* and evergreen hardwoods as major canopy components. Fire frequency is an important difference. It is unclear if fire frequency determines the difference in vegetation or if the different flammability of the vegetation determines the fire regime.

The boundary between this system and Southern Coastal Plain Hydric Hammock (CES203.501) of Florida and Georgia may need clarification. Similarly, the boundary between this and Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522) has not been precisely delineated. Great Dismal Swamp is included with this system (CES203.304).

Similar Ecological Systems:

- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)--replaces this system to the north (both are found in Virginia and in mapzone 60).
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)
- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)

Related Concepts:

- Non-alluvial swamp forest (Nelson 1986) Finer
- Peatland Atlantic White Cedar Forest (Schafale 2003b) Finer
- Peatland Atlantic White Cedar Forest (Schafale and Weakley 1990) Finer

DESCRIPTION

Environment: This system occurs on flat areas of the outer Atlantic Coastal Plain from southeastern Virginia to Georgia, where soils are seasonally to nearly semipermanently saturated because of low relief, poor soil drainage, and seasonal high water table. The largest areas are on broad interfluvial flats, but substantial areas occur on organic deposits in drowned river valleys in the Embayed Region of North Carolina and Virginia, beyond the reach of the influence of wind tides. Hydrology is dominated by rainfall and sheetflow, and overbank flooding, tidal flooding, and seepage are a secondary influence, if at all. Soils may be loamy to clayey, or may be shallow to deep organic. A distinctive small subset has soils with limestone near the surface, influencing soil chemistry. Natural fire is infrequent in this system, and varies from a minor to a significant influence on vegetational composition and structure. Infrequency of fire may be an important factor in differentiating this system from Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267) and the various wet longleaf pine forest systems.

In a phase or component of this system on mucky peat soils (Terric or Typic Medisaprists) up to 3 m deep and occasionally on mucky

sand or wet mineral soils with an organic epipedon, Atlantic white-cedar (*Chamaecyparis thyoides*) was the most common dominant species; it occurred in a fire-generated patch mosaic in which the various patch dominants are a variable combination of Atlantic white-cedar, swamp blackgum (*Nyssa sylvatica*), pond pine (*Pinus serotina*), red maple (*Acer rubrum*) and *Taxodium*, most frequently pond cypress (*Taxodium ascendens*). While this is fire-dominated, it is only found in substantially fire-sheltered portions of the landscape where scarps or water bodies prevent easy access by fire, resulting in a long fire-return interval. The original vegetation constituted a true shifting mosaic. The original extent was up to 1 million acres of which at least 400,000 acres were Atlantic white-cedar in Mapzones 58 and 60. This is a long-interval, fire-dependent, forested peatland with its greatest extent found on the Pamlico Terrace of Virginia and North Carolina. The largest sites lie at less than 9 m (30 feet) above sea level (C. Frost pers. comm.).

Vegetation: Vegetation is a closed-canopy forest of wetland trees. The wetter sites are dominated by combinations of *Taxodium distichum*, *Nyssa biflora*, and occasionally *Nyssa aquatica*, *Pinus taeda*, *Chamaecyparis thyoides*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*. Less wet sites have canopies of wetland oaks such as *Quercus laurifolia*, *Quercus michauxii*, and *Quercus pagoda*. Most communities have a well-developed shrub layer that has more floristic affinities with pocosins or baygalls than with river floodplain communities that have similar canopies. The shrub layer is usually dominated by *Clethra alnifolia*, *Leucothoe axillaris*, or species shared with pocosins. The herb layer is not usually well-developed but may be dense where shrubs are atypically sparse. Wetland ferns, such as *Osmunda regalis* and *Woodwardia areolata*, and *Carex* spp. usually dominate. In the Atlantic white-cedar-related phase of this system, stands that regenerated from crown fire often have nearly pure cover of *Chamaecyparis thyoides*. The most common subcanopy species are *Acer rubrum*, *Persea palustris*, and *Magnolia virginiana*. Typical shrubs include *Ilex glabra*, *Ilex coriacea*, *Leucothoe racemosa*, *Itea virginica*, and *Lyonia lucida*. Herbs, chiefly ferns and sedges, are typically sparse, but mosses may be common (C. Frost pers. comm.).

Dynamics: Fire is an important influence in a subset of this system. Communities dominated by *Chamaecyparis thyoides* depend on fire for regeneration of the canopy trees. The occurrence of fires on the time scale of several decades to a century or more may determine the mosaic of *Chamaecyparis* forests and other associations. Some areas may once have been canebrakes, with dominance of *Arundinaria* determined by more frequent fire. In the oak-dominated communities and in wetter *Taxodium* and *Nyssa* communities, fire is probably of little ecological significance because the vegetation is not flammable. Without fire as a major factor, most communities probably occur naturally as old-growth multi-aged forests dominated by gap-phase regeneration. Hurricanes may create larger canopy gaps occasionally. Examples in drowned river valleys are subject to influence by rising sea level and can be expected to evolve into tidal swamp systems, sometimes fairly quickly.

In specific relation to the *Chamaecyparis*-dominated phase of this system, succession pathways depend on water table depth at time of replacement fire. Having the water table at the surface results in regeneration of *Chamaecyparis thyoides* from the seedbank. If the water table is slightly to moderately below the surface, the seedbank is destroyed and succession is dominated by some combination of *Acer rubrum*, *Nyssa biflora*, *Pinus taeda*, and related taxa. If the water table is well below the surface, the seedbank is destroyed and a deeper hole is created in the peat. In this case, succession is dominated by *Taxodium distichum* and a deeper water area is created with *Chamaecyparis thyoides* only on the edge.

MEMBERSHIP

Associations:

- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Carya cordiformis* - *Quercus pagoda* - *Quercus shumardii* - *Carya myristiciformis* / *Sabal minor* - *Cornus asperifolia* Forest (CEGL007316, G1)
- *Chamaecyparis thyoides* / *Persea palustris* / *Lyonia lucida* - *Ilex coriacea* Forest (CEGL006146, G2)
- *Liquidambar styraciflua* / *Ulmus americana* / *Scirpus lineatus* - *Rhynchospora (corniculata, miliacea, mixta)* Marl Swamp Forest [Provisional] (CEGL004088, G2G3)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa biflora* - *Acer rubrum* var. *trilobum* - *Liriodendron tulipifera* / *Magnolia virginiana* - *Asimina triloba* / *Clethra alnifolia* Forest (CEGL004428, G2)
- *Nyssa biflora* - *Liquidambar styraciflua* - *Acer rubrum* var. *trilobum* / *Clethra alnifolia* Forest (CEGL004679, G2?)
- *Pinus taeda* - *Acer rubrum* - *Liquidambar styraciflua* / *Arundinaria gigantea* ssp. *tecta* Forest (CEGL004649, GNA)
- *Pinus taeda* - *Chamaecyparis thyoides* - *Acer rubrum* - *Nyssa biflora* / *Lyonia lucida* - *Clethra alnifolia* Forest (CEGL007558, G2G3)
- *Quercus laurifolia* - *Nyssa biflora* / *Clethra alnifolia* - *Leucothoe axillaris* Forest (CEGL007447, G2G3)
- *Quercus michauxii* - *Quercus pagoda* / *Clethra alnifolia* - *Leucothoe axillaris* Forest (CEGL007449, G2)
- *Quercus pagoda* - *Quercus michauxii* - *Quercus alba* / *Arundinaria gigantea* ssp. *tecta* - *Sabal minor* / *Chasmanthium laxum* Forest (CEGL007849, G2?)
- *Quercus virginiana* - *Quercus nigra* - *Quercus pagoda* - *Liquidambar styraciflua* / *Sabal minor* - *Ilex vomitoria* Forest (CEGL007851, G1G2Q)
- *Taxodium distichum* - *Nyssa biflora* / *Berchemia scandens* - *Toxicodendron radicans* / *Woodwardia areolata* Forest (CEGL004429, G2G3)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Pinus taeda* - *Chamaecyparis thyoides* - *Acer rubrum* - *Nyssa biflora* Saturated Forest Alliance (A.444)
- *Pinus taeda* - *Liquidambar styraciflua* - *Acer rubrum* Saturated Forest Alliance (A.445)
- *Quercus laurifolia* - *Nyssa biflora* Saturated Forest Alliance (A.352)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus virginiana* - *Quercus nigra* Saturated Forest Alliance (A.379)
- *Taxodium distichum* - *Nyssa biflora* - (*Nyssa aquatica*) Saturated Forest Alliance (A.355)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as large patches in the Embayed Region of North Carolina and Virginia, as small patches most other places.

Size: Size distribution may vary across the range. In the Embayed Region of North Carolina and Virginia, this system can cover thousands of contiguous acres. Elsewhere in the region, occurrences tend to be much smaller, usually tens of acres. The drier, oak-dominated associations are now known only from remnants with artificial boundaries. Historical stands ranged in size from the Great Dismal Swamp of Virginia and North Carolina, which included the largest Atlantic white-cedar stand of 112,000 acres, associated with a considerable acreage of swamp blackgum and bald-cypress, as well as smaller peatlands of only a 50-100 acres. The scale of disturbances included fires, ranging in size from 50 to >10,000 acres, and winds, especially those associated with hurricanes, in which effects were more limited, typically consisting of locally intense small blowdowns of a few acres each.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Adjacent Ecological System Comments: May be bordered by tidal swamps, Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267), upland hardwoods, or less frequently by longleaf pine systems.

DISTRIBUTION

Range: This system ranges from southeastern Virginia to Georgia. This system is most abundant in the Embayed Region of northeastern North Carolina and southeastern Virginia (south of the James River), where it covers large expanses.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Frost 1987, Frost pers. comm., Schafale 2003b, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723187#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 04 Feb 2009

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN TIDAL WOODED SWAMP (CES203.240)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine

National Mapping Codes: ESLF 9194

CONCEPT

Summary: This system encompasses the tidally flooded areas in lower river floodplains and edges of estuaries of the Atlantic Coastal Plain from southeastern Virginia southward to northern Florida that have sufficiently fresh water and short enough flooding to be able to support tree canopies. *Taxodium*, *Nyssa*, or *Fraxinus* generally dominate. Swamps may be either regularly flooded by lunar tides or irregularly flooded by wind tides.

Classification Comments: This system is distinguished from all adjacent systems by the combination of tidal flooding and tree-dominated vegetation. It is related to East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299) but is distinguished because of differences in the tidal flooding regime between the Gulf and Atlantic and because of biogeographic differences.

Similar Ecological Systems:

- East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)
- Northern Atlantic Coastal Plain Tidal Swamp (CES203.282)

DESCRIPTION

Environment: This system occurs in lower reaches of river floodplains and along estuary shorelines, in places regularly or irregularly flooded by lunar or wind tides. The water has little salt content, due to distance from the ocean and/or strong freshwater input. Soils may be mineral or organic. Soils are generally permanently saturated even when the tide is low. The transition of the hydrology to flood dominance rather than tidal dominance may be very gradual.

Vegetation: Vegetation is forest or woodland with canopies of the most water-tolerant tree species, generally *Taxodium distichum*, *Nyssa* spp., or *Fraxinus* spp. Lower strata generally are denser and more species-rich than those of river or nonriverine swamps, containing species from those systems as well as a variety of shrubs and herbs shared with freshwater marshes. *Morella cerifera* and *Rosa palustris* are often characteristic.

Dynamics: Tidal flooding, regular or irregular, is the ecological factor that makes this system distinct. River floods may also seasonally affect this system. Infrequent intrusion of saltier water, which is stressful or fatal to many of the plant species, is an important periodic disturbance created by storms. Natural fire is not frequent in these systems, but may sometimes be important in determining the boundary between tidal swamps and tidal marshes. This system generally appears to be in a shifting relationship with tidal freshwater marshes of the same region. Most marshes have standing dead trees in them, suggesting they recently were swamps. But some marshes are being invaded with trees and may be turning into swamps. Rising sea level is driving shifts in the communities of this system, causing more inland swamps to develop into this system and causing parts of this system to turn into marshes. In areas not too strongly affected by salt intrusion, drowning by rising sea level, or fire, the communities can be expected to exist as old-growth, multi-aged forests.

MEMBERSHIP

Associations:

- *Acer rubrum* / *Sambucus canadensis* / *Ampelopsis arborea* - *Sicyos angulatus* Forest (CEGL004698, G2)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) - *Pinus taeda* / *Morella cerifera* - *Juniperus virginiana* var. *silicicola* Tidal Forest (CEGL004483, G1G2)
- *Juniperus virginiana* var. *silicicola* / *Morella cerifera* / *Kosteletzkya virginica* - *Bacopa monnieri* Woodland (CEGL007166, G1?)
- *Morella cerifera* - *Toxicodendron radicans* / *Spartina bakeri* Shrubland (CEGL004789, G3?)
- *Nyssa aquatica* Tidal Forest (CEGL008561, G3?)
- *Nyssa biflora* - (*Taxodium distichum*, *Nyssa aquatica*) / *Morella cerifera* - *Rosa palustris* Tidal Forest (CEGL004484, G3G4)
- *Nyssa biflora* - *Nyssa aquatica* - *Taxodium distichum* / *Saururus cernuus* Forest (CEGL004696, GNR)
- *Pinus taeda* - *Nyssa biflora* - *Taxodium distichum* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL004651, G2?)
- *Taxodium distichum* / *Carex hyalinolepis* Woodland (CEGL004654, G2?)
- *Taxodium distichum* / *Typha angustifolia* Woodland (CEGL004231, G2G3)
- *Taxodium distichum* / *Zizania aquatica* - *Carex canescens* ssp. *disjuncta* Woodland (CEGL004655, G1Q)
- *Taxodium distichum* Tidal Woodland [Provisional] (CEGL003739, GNR)

Alliances:

- *Fraxinus pennsylvanica* - *Acer rubrum* - *Ulmus americana* Tidal Forest Alliance (A.356)
- *Juniperus virginiana* var. *silicicola* Tidal Woodland Alliance (A.1887)
- *Morella cerifera* - *Rosa palustris* Tidal Shrubland Alliance (A.806)

- *Nyssa biflora* - (*Nyssa aquatica*, *Taxodium distichum*) Tidal Forest Alliance (A.357)
- *Taxodium distichum* Tidal Woodland Alliance (A.659)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurrences are generally large patches, ranging to small patches.

Size: Occurrences tend to be wide to narrow bands along rivers, streams, or shorelines. The largest patches, on large rivers, are thousands of acres, broken only by stream channels. Small occurrences are also common, with a zone of this system occurring in most streams that reach the ocean or estuaries.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)
- Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: In most rivers, this system grades upstream to floodplain systems and downstream to fresh or salt marsh systems. In the Embayed Region of North Carolina and Virginia, it often grades to Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304) inland within peat-filled drowned river valleys.

DISTRIBUTION

Range: This system is found from southeastern Virginia southward to northern Florida along the Atlantic Coast.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232I:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723245#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1450 SOUTHERN ATLANTIC COASTAL PLAIN WET PINE SAVANNA AND FLATWOODS (CES203.536)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2450; ESLF 9119; ESP 1450

CONCEPT

Summary: This system of pine-dominated savannas and/or flatwoods ranges from southern South Carolina to northeastern Florida where it was the former matrix system, centered in southeastern Georgia, near the coast. This general area has been referred to as the Longleaf Pine Wiregrass Savannas region (Platt 1999) and the Sea Island Flatwoods Ecoregion (75f of Griffith et al. (2001, 2002)). Examples of this system and component community associations share the common features of wet, seasonally saturated, mineral soils and historic exposure to frequent low-intensity fire. They occur on a wide range of soil textures, which is an important factor in distinguishing different associations. The vegetation is naturally dominated by *Pinus palustris* or, on wetter sites, *Pinus elliottii* or less commonly *Pinus serotina*. Understory conditions may be dramatically altered by fire frequency and seasonality. In natural condition (frequent fires, including a growing-season component) there tends to be a dense ground cover of herbs and low shrubs; grasses can dominate, but there is often a large diversity of other herbs and shrubs.

Similar Ecological Systems:

- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Intersecting
- Wet Flatwoods (FNAI 1990) Intersecting

DESCRIPTION

Environment: This system occurs on wet mineral soil sites, in the middle and outer Coastal Plain. Landforms include low areas in relict beach ridge systems and eolian sand deposits, and poorly drained clayey, loamy, or sandy flats.

Vegetation: The best examples are typically open woodlands naturally dominated by *Pinus palustris* or *Pinus elliottii* and/or *Pinus serotina* on wetter sites. In many areas past logging and subsequent lack of frequent growing-season fire have led to much greater dominance by *Pinus elliottii*. In natural condition, there is typically a dense ground cover of herbs and low shrubs; grasses can dominate, but there is often a large diversity of other herbs and shrubs. The shrubs are mainly *Serenoa repens*, *Ilex glabra*, and *Ilex coriacea* along with various ericaceous species. These shrub species become especially prominent on sites not frequently burned.

Dynamics: Frequent low-intensity fire is important. Lightning has been an important source of ignition for these fires, especially historically.

MEMBERSHIP

Associations:

- *Pinus elliottii* var. *elliottii* - *Taxodium ascendens* / *Hypericum brachyphyllum* / *Sporobolus pinetorum* - *Dichantherium scabriusculum* Woodland (CEGL004969, G2?)
- *Pinus elliottii* var. *elliottii* / *Serenoa repens* - *Ilex glabra* Woodland (CEGL003643, G4?)
- *Pinus palustris* - (*Pinus elliottii* var. *elliottii*) / *Sporobolus pinetorum* - *Oclemena reticulata* - (*Sporobolus curtissii*) Woodland (CEGL004967, G2)
- *Pinus palustris* - *Pinus elliottii* var. *elliottii* / *Ctenium aromaticum* - *Aristida beyrichiana* - (*Sporobolus floridanus*) Woodland (CEGL004790, G1G2)
- *Pinus palustris* - *Pinus elliottii* var. *elliottii* / *Styrax americanus* / *Sporobolus floridanus* Woodland (CEGL004497, G1)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* - (*Serenoa repens*) Woodland (CEGL004791, G3G4)
- *Pinus palustris* / *Serenoa repens* - *Ilex glabra* Woodland (CEGL003653, G2G3)
- *Pinus palustris* / *Serenoa repens* - *Vaccinium myrsinites* / *Aristida beyrichiana* - *Sporobolus curtissii* Woodland (CEGL004486, G2G3)

Alliances:

- *Pinus elliottii* - *Taxodium ascendens* Saturated Woodland Alliance (A.692)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)

DISTRIBUTION

Range: Southern South Carolina to northeastern Florida.

Divisions: 203:C

Nations: US

Subnations: FL, GA, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232C:CC, 232J:CC

TNC Ecoregions: 56:C

SOURCES

References: Comer et al. 2003, Griffith et al. 2001, Griffith et al. 2002, Platt 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723066#references

Description Author: R. Evans and C. Nordman

Version: 02 Feb 2007

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN BLACKWATER RIVER FLOODPLAIN FOREST (CES203.493)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Blackwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9340

CONCEPT

Summary: This system occurs along certain river and stream drainages of the southern Coastal Plain of Florida, Alabama, Mississippi, and southwestern Georgia that are characterized by dark waters high in particulate and dissolved organic materials, and that generally lack floodplain development. In most cases these are streams that have their headwaters in sandy portions of the Outer Coastal Plain. Consequently, they carry little mineral sediment or suspended clay particles and are not turbid except after the heaviest rain events. The water is classically dark in color due to concentrations of tannins, particulates, and other materials derived from drainage through swamps or marshes (FNAI 1990). In comparison with spring-fed rivers and brownwater rivers of the region, this system tends to be much more acidic in nature and generally lacks extensive and continuous floodplain and levees; steep banks alternating with floodplain swamps are more characteristic (FNAI 1990). This system includes mixed rivers, with a mixture of blackwater and spring-fed tributaries such as the Suwannee River. Canopy species typical of this system are obligate to facultative wetland species such as *Taxodium distichum* (bald-cypress), *Nyssa aquatica* (water tupelo), and *Chamaecyparis thyoides* (Atlantic white-cedar).

Classification Comments: A new ecological system is needed for Florida spring-fed streams/rivers, such as the Wakulla River, Ichetucknee River, etc.

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* / *Magnolia virginiana* - *Cliftonia monophylla* / *Orontium aquaticum* - *Sphagnum* spp. Forest (CEGL007151, G2G3)
- *Nyssa aquatica* - *Fraxinus pennsylvanica* - *Taxodium distichum* / *Sabal minor* Forest (CEGL008463, GNR)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - *Acer rubrum* var. *rubrum* / *Lyonia lucida* Forest (CEGL007864, G3G4)
- *Nyssa ogeche* - (*Nyssa biflora*, *Taxodium ascendens*) Forest (CEGL007392, G4)
- *Nyssa ogeche* - *Magnolia virginiana* / *Crinum americanum* Forest (CEGL004704, G3?)
- *Pinus elliotii* - *Quercus nigra* - *Chamaecyparis thyoides* / *Cyrilla racemiflora* - *Vaccinium* spp. Forest (CEGL008556, G2)
- *Pinus elliotii* var. *elliottii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003638, G2G3Q)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Quercus laurifolia* / *Carpinus caroliniana* / *Justicia ovata* Forest (CEGL007348, G4?)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)
- *Taxodium distichum* - *Nyssa biflora* / *Sabal palmetto* / *Tillandsia (bartramii, usneoides)* Forest (CEGL003850, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Magnolia virginiana* - *Nyssa (biflora, ogeche)* Seasonally Flooded Forest Alliance (A.377)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus elliotii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain of Alabama, Mississippi, southwestern Georgia, Florida, and adjacent portions of central Florida.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS

Map Zones: 46:C, 55:C, 56:C

USFS Ecomap Regions: 232B:CC, 232C:CC, 232D:CC, 232G:CC, 232J:CC, 232K:CC, 232L:CC, 234A:CC

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, FNAI 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723093#references

Description Author: R. Evans and A. Schotz

Version: 06 Feb 2003

Concept Author: R. Evans and A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN HYDRIC HAMMOCK (CES203.501)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping

National Mapping Codes: ESLF 9192

CONCEPT

Summary: This ecological system occupies flat lowlands along the southern and outermost portions of the Coastal Plain of the southeastern United States, usually over limestone substrates. The vegetation of this system is characterized by mixed hardwood species, often with hydric oak species common. In Florida, examples of this system are often found adjacent to the floodplain of spring-fed rivers with relatively constant flows. In some areas, such as the Big Bend region of Florida, they occupy large areas of broad, shallow, mucky or seepy wetlands but generally do not receive overbank flooding. In Alabama, this system is apparently confined to floodplains of the Mobile-Tensaw, where examples are topographically higher than the surrounding floodplains.

Classification Comments: The original name of this system was too geographically restrictive and was broadened to Southern Coastal Plain to better reflect the range of this system. Confirmed in South Atlantic Coastal Plain portion of Florida by Ann Johnson (pers. comm.).

Similar Ecological Systems:

- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)
- Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275)

Related Concepts:

- Hydric Hammock (FNAI 1990) Broader

DESCRIPTION

Environment: Examples of this system are associated with limestone-rich sites. Soils may range from sand to clay to organic (FNAI 1990). In Florida, examples of this system are often found adjacent to the floodplain of spring-fed rivers with relatively constant flows. In some areas, such as the Big Bend region of Florida, they occupy large areas of broad, shallow, mucky or seepy wetlands but generally do not receive overbank flooding (A. Johnson pers. comm.). In Alabama, this system is apparently confined to floodplains of the Mobile-Tensaw, where examples are topographically higher than the surrounding floodplains (A. Schotz pers. comm.).

Vegetation: The vegetation of this system is characterized by mixed hardwood species, often with hydric oak species common (FNAI 1997, A. Johnson pers. comm.). Stands may be dominated by a variety of wetland and upland tree species, including *Chamaecyparis thyoides*, *Sabal palmetto*, and *Quercus laurifolia*, as well as *Quercus virginiana*, *Magnolia virginiana*, and *Ulmus americana*. Some shrubs and understory trees include *Ilex cassine* and *Morella cerifera*.

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* - *Sabal palmetto* Forest (CEGL008598, G2)
- *Fraxinus caroliniana* - *Sabal palmetto* - *Ulmus americana* / *Cephalanthus occidentalis* Forest (CEGL008592, G3?)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Forest (CEGL004674, G2G3)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest (CEGL007040, G3?)
- *Sabal palmetto* / *Ilex cassine* - *Morella cerifera* Saturated Woodland (CEGL003527, G3?)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Fraxinus caroliniana* Seasonally Flooded Forest Alliance (A.344)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Saturated Forest Alliance (A.380)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest Alliance (A.61)
- *Sabal palmetto* Saturated Woodland Alliance (A.488)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)

DISTRIBUTION

Range: As currently documented, this system occurs in Florida, Georgia and rarely in southern Alabama. In Alabama, this system is apparently confined to floodplains of the Mobile-Tensaw (A. Schotz pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS?

Map Zones: 55:C, 56:C, 99:C

USFS Ecomap Regions: 232B:CC, 232C:CC, 232D:CC, 232G:CC, 232J:CC, 232K:CC, 232L:CC

TNC Ecoregions: 53:C, 55:C, 56:C

SOURCES

References: Comer et al. 2003, FNAI 1990, FNAI 1997, Johnson pers. comm., Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723087#references

Description Author: R. Evans, mod. C.W. Nordman and M. Pyne

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN NONRIVERINE BASIN SWAMP (CES203.384)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Herbaceous; Depressional

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]; Organic Peat (>40 cm)

National Mapping Codes: ESLF 9323

CONCEPT

Summary: This system occupies large, seasonally inundated basins with peaty substrates in the southern and outermost portions of the Coastal Plain of the southeastern United States. These basins are nonriverine and do not receive overbank flooding. The southern range of this system extends into central Florida especially along the Atlantic Coast in Volusia and Brevard counties (A. Johnson pers. comm.). Examples are generally forested; the vegetation is characterized by *Taxodium distichum*, *Nyssa biflora*, evergreen "bay" shrubs and/or mixed hardwoods. Emergent *Pinus elliotii* may also be present. Some characteristic shrubs include *Cliftonia monophylla*, *Cyrilla racemiflora*, *Lyonia lucida*, and *Smilax laurifolia*.

Classification Comments: Manifestations of this in the Atlantic and Gulf coastal plains are not differentiated at this time. There may be some minor floristic differences, particularly between the northernmost and southernmost examples, but these are not thought to warrant any subdivision of the type. Examples of this system differ from Southern Coastal Plain Hydric Hammock (CES203.501) by the absence of oaks (especially swamp laurel oak and live oak) and other less flood-tolerant species such as sweetgum (A. Johnson pers. comm.). In addition, this type is found in basins with peaty substrates as opposed to limestone-influenced substrates.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest (CES203.520)--has a similar name but only comes south to Virginia.
- Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)
- Southern Coastal Plain Hydric Hammock (CES203.501)

Related Concepts:

- Basin Swamp (FNAI 1990) Equivalent

DESCRIPTION

Environment: This system occupies large, seasonally inundated basins with peaty substrates. These basins are nonriverine and do not receive overbank flooding.

Vegetation: Examples are generally forested; the vegetation is characterized by *Taxodium distichum*, *Nyssa biflora*, evergreen "bay" shrubs, and/or mixed hardwoods (FNAI 1997). Emergent *Pinus elliotii* may also be present. Some characteristic shrubs include *Cliftonia monophylla*, *Cyrilla racemiflora*, *Lyonia lucida*, and *Smilax laurifolia*. Some examples (e.g., Okefenokee Swamp) have extensive open herbaceous areas dominated by various combinations of *Panicum hemitomon*, *Sagittaria* spp., *Dulichium arundinaceum*, *Sarracenia* spp., *Carex glaucescens*, *Carex striata*, *Orontium aquaticum*, *Woodwardia virginica*, *Eriophorum virginicum*, *Eriocaulon compressum*, and *Peltandra virginica*. In addition, other floating and emergent aquatic plants are present including *Nuphar lutea* ssp. *orbiculata*, *Nymphaea odorata* ssp. *odorata*, *Nymphoides aquatica*, *Habenaria repens*, and *Utricularia* spp. (Wharton 1978). These herbaceous zones are called "prairies" or "sphagnum bogs" depending on their composition.

MEMBERSHIP

Associations:

- *Cliftonia monophylla* / *Lyonia lucida* - *Smilax laurifolia* Forest (CEGL007042, G4)
- *Nuphar lutea* ssp. *orbiculata* Herbaceous Vegetation (CEGL004327, G3)
- *Nymphoides aquatica* Herbaceous Vegetation (CEGL004621, GNR)
- *Nyssa biflora* - *Magnolia virginiana* - (*Pinus elliotii* var. *elliotii*) / *Morella* (*carolinensis*, *inodora*) Forest (CEGL007156, G4?)
- *Nyssa biflora* / *Ilex myrtifolia* / *Carex glaucescens* - *Eriocaulon compressum* Forest (CEGL004720, G2G3)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Pinus serotina* - *Pinus elliotii* var. *elliotii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003674, G3?Q)
- *Pinus serotina* / *Lyonia lucida* - *Ilex glabra* - (*Cyrilla racemiflora*) Shrubland (CEGL003846, G3)
- *Taxodium distichum* - *Nyssa biflora* - *Acer rubrum* - *Magnolia virginiana* Saturated Forest (CEGL003804, G2G3)

Alliances:

- *Cliftonia monophylla* Saturated Forest Alliance (A.58)
- *Lyonia lucida* - *Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nymphoides aquatica* Permanently Flooded Herbaceous Alliance (A.1751)

- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Taxodium distichum* - *Nyssa biflora* - (*Nyssa aquatica*) Saturated Forest Alliance (A.355)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Southern Coastal Plain Hydric Hammock (CES203.501)

Adjacent Ecological System Comments: Southern Coastal Plain Hydric Hammock (CES203.501) may occur upslope.

DISTRIBUTION

Range: This system is found in the southern portions of the Atlantic and East Gulf coastal plains, extending down the Florida peninsula.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA?, MS, SC

Map Zones: 55:C, 56:C, 58:C, 99:C

USFS Ecomap Regions: 232B:CC, 232C:CC, 232D:CC, 232G:CC, 232J:CC, 232K:CC, 232L:CC

TNC Ecoregions: 53:C, 55:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003, FNAI 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723132#references

Description Author: R. Evans, mod. M. Pyne

Version: 02 Oct 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1460 SOUTHERN COASTAL PLAIN NONRIVERINE CYPRESS DOME (CES203.251)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Depressional; Needle-Leaved Tree

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2460; ESLF 9129; ESP 1460

CONCEPT

Summary: This system consists of small forested wetlands, typically dominated by *Taxodium ascendens*, with a characteristic and unique dome-shaped appearance in which trees in the center are higher than those around the sides (Monk and Brown 1965). Examples are known from the Southern Coastal Plain (Omernik Ecoregion 75 and adjacent 65) (EPA 2004) of Florida and Georgia, extending into Alabama, Mississippi and Louisiana. Examples occupy poorly drained depressions which are most often embedded in a matrix of pine flatwoods. The oldest and largest individual trees typically occupy the center of these domed wetlands, with smaller and younger individuals around the margins. Pools of stagnant, highly acidic water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins. These sites are underlain by an impervious clay pan which impedes drainage and traps precipitation. Some examples may have thick (50-100 cm) organic layers. In addition to *Taxodium ascendens*, other woody species may include *Nyssa biflora*, *Hypericum chapmanii*, *Hypericum myrtifolium*, *Ilex myrtifolia*, *Leucothoe racemosa*, *Morella cerifera*, *Cephalanthus occidentalis*, *Liquidambar styraciflua*, *Clethra alnifolia*, *Lyonia lucida*, and *Styrax americanus*.

Classification Comments: The original range of this system was thought to include only the East Gulf Coastal Plain (TNC Ecoregion 53) and was named accordingly. Examples were later confirmed in central Florida (TNC Ecoregion 55) and the South Atlantic Coastal Plain portion of Florida (A. Johnson pers. comm.) (TNC Ecoregion 56), whereupon the name was broadened to Southern Coastal Plain Nonriverine Cypress Dome. Cypress "stringers" are included here as well; these are more-or-less linear features that are parts of disconnected drainageways that arise in a pine flatwoods landscape (e.g., CEGLO07419). The vegetation of the "stringers" is somewhat analogous to that of the edges of the true "dome swamps."

Related Concepts:

- Dome Swamp (FNAI 1990) Undetermined

DESCRIPTION

Environment: This system occurs in areas of low relief, occupying poorly drained to permanently wet depressions in uplands such as pine flatwoods. Pools of stagnant, highly acidic water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins (Monk and Brown 1965). Some examples may have thick (50-100 cm) organic layers (Drew et al. 1998).

Vegetation: According to Drew et al. (1998), dominant plant taxa include *Taxodium ascendens*, *Nyssa biflora*, *Cephalanthus occidentalis*, *Liquidambar styraciflua*, *Clethra alnifolia*, *Lyonia lucida*, and *Styrax americanus*. A few less typical upland depression ponds in Florida dominated by *Nyssa sylvatica* are also accommodated in this system for now (A. Johnson pers. comm.). Other species found in this system can include *Nyssa ursina*, *Hypericum chapmanii*, *Hypericum myrtifolium*, *Ilex myrtifolia*, *Leucothoe racemosa*, *Morella cerifera*, *Lobelia floridana*, *Polygala cymosa*, *Carex striata*, and *Carex turgescens*.

MEMBERSHIP

Associations:

- *Crataegus aestivalis* Forest (CEGL004639, G2G3)
- *Hypericum chapmanii* - *Ilex myrtifolia* - (*Nyssa ursina*) Shrubland (CEGL003867, G1)
- *Taxodium ascendens* - *Nyssa biflora* / *Carex striata* - *Rhynchospora* (*careyana*, *cephalantha*, *microcephala*) Stringer Woodland (CEGL004089, G3)
- *Taxodium ascendens* / (*Nyssa biflora*) / *Leucothoe racemosa* - *Lyonia lucida* - *Morella cerifera* Depression Forest (CEGL007420, G3)
- *Taxodium ascendens* / *Aristida palustris* Depression Woodland (CEGL004090, G2G3)
- *Taxodium ascendens* / *Carex striata* - *Iris tridentata* - (*Woodwardia virginica*) Depression Woodland (CEGL004087, G3)
- *Taxodium ascendens* / *Ilex myrtifolia* / *Carex* (*striata*, *turgescens*) Stringer Forest (CEGL007419, G3?Q)
- *Taxodium ascendens* / *Ilex myrtifolia* / *Hypericum myrtifolium* / *Lobelia floridana* - *Polygala cymosa* Woodland (CEGL004959, G3)
- *Taxodium ascendens* / *Ilex myrtifolia* Depression Forest (CEGL007418, G3?)

Alliances:

- *Crataegus* (*aestivalis*, *opaca*, *rufula*) Seasonally Flooded Forest Alliance (A.320)
- *Hypericum* (*chapmanii*, *fasciculatum*) Seasonally Flooded Shrubland Alliance (A.844)

- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)

DISTRIBUTION

Range: This system is found primarily in Florida and adjacent areas of Georgia, extending into Alabama, Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 55:C, 56:C, 99:C

USFS Ecomap Regions: 232B:CC, 232C:CC, 232D:CC, 232G:CC, 232J:CC, 232K:CC, 232L:CC, 234A:CC

TNC Ecoregions: 53:C, 55:C, 56:C

SOURCES

References: Comer et al. 2003, Drew et al. 1998, EPA 2004, Johnson pers. comm., Monk and Brown 1965

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723234#references

Description Author: R. Evans, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1461 SOUTHERN COASTAL PLAIN SEEPAGE SWAMP AND BAYGALL (CES203.505)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); East Gulf Coastal Plain; Seepage-Fed Sloping; Broad-Leaved Evergreen Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2461; ESLF 9130; ESP 1461

CONCEPT

Summary: This wetland system consists of forested wetlands in acidic, seepage-influenced habitats of the East Gulf Coastal Plain, extending into central Florida. These are mostly evergreen forests generally found at the base of slopes or other habitats where seepage flow is concentrated. Resulting moisture conditions are saturated or even inundated. The vegetation is characterized by *Magnolia virginiana* and *Nyssa biflora*. Examples occur in the outer portions of the Coastal Plain within the range of *Persea palustris*, and where *Magnolia virginiana* is an important or even dominant species. To the north this system grades into East Gulf Coastal Plain Northern Seepage Swamp (CES203.554), where evergreen species are largely replaced by deciduous species in the canopy. Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water, and tend to occur on highly acidic, nutrient-poor soils.

Classification Comments: Some authors have treated *Persea palustris* (of wetlands) and *Persea borbonia* (of uplands) as one taxon under a broadly conceived *Persea borbonia*. We recognize the two distinct taxa, following Godfrey (1988), Kartesz (1999) and Weakley (2005).

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)

Related Concepts:

- Baygall (FNAI 1990) Undetermined
- Bayhead Swamp (Smith 1996a) Intersecting

DESCRIPTION

Environment: These wetlands may occur in poorly developed upland drainages, narrow ravine bottoms, bases of steepheads, and small headwaters stream bottoms. In most cases, these wetlands are embedded in uplands with deep sandy soils. When this system is associated with streams, they tend to be low gradient, with narrow, often braided channels and diffuse drainage patterns.

Vegetation: The vegetation is characterized by *Magnolia virginiana* and *Nyssa biflora*. Examples occur in the outer portions of the Coastal Plain within the range of *Persea palustris*, and where *Magnolia virginiana* is an important or even dominant species.

Dominant trees in some stands may include *Quercus laurifolia*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*. In addition, some stands may be dominated by *Cyrilla racemiflora* and/or *Cliftonia monophylla*. Other shrubs include *Ilex coriacea*, *Leucothoe axillaris*, *Lyonia lucida*, *Morella caroliniensis*, *Morella inodora*, and *Viburnum nudum var. nudum*. Herbs include *Carex atlantica ssp. capillacea*, *Carex glaucescens*, *Carex lonchocarpa*, *Chasmanthium ornithorhynchum*, *Polygala cymosa*, *Solidago patula var. strictula*, and *Sphagnum* spp.

Dynamics: Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water and tend to occur on highly acidic, nutrient-poor soils.

MEMBERSHIP

Associations:

- (*Pinus elliottii*) / *Cyrilla racemiflora* - *Persea palustris* - *Magnolia virginiana* - *Smilax laurifolia* Shrubland (CEGL004974, G2?)
- *Chamaecyparis thuyoides* - *Pinus elliottii var. elliottii* / *Nyssa biflora* - *Acer rubrum var. trilobum* / *Serenoa repens* Forest (CEGL007145, G2)
- *Cyrilla racemiflora* - *Cliftonia monophylla* Shrubland (CEGL003847, G4)
- *Gordonia lasianthus* - *Magnolia virginiana* - *Persea palustris* / *Sphagnum* spp. Forest (CEGL007044, G4)
- *Liquidambar styraciflua* - *Quercus laurifolia* / *Magnolia virginiana* / *Carex lonchocarpa* Forest (CEGL004631, G3G4)
- *Liriodendron tulipifera* - *Nyssa biflora* - *Magnolia virginiana* / *Toxicodendron vernix* - *Morella caroliniensis* / *Osmunda regalis* Forest (CEGL004772, G3G4)
- *Magnolia virginiana* - *Nyssa biflora* - *Magnolia grandiflora* / *Ilex coriacea* - *Viburnum nudum var. nudum* / *Solidago patula var. strictula* Forest (CEGL007473, G2G3)
- *Magnolia virginiana* - *Nyssa biflora* / *Carpinus caroliniana* / *Thelypteris noveboracensis* - *Athyrium filix-femina* Forest (CEGL004722, G3G4)
- *Magnolia virginiana* - *Persea palustris* / *Lyonia lucida* Forest (CEGL007049, G3?)
- *Magnolia virginiana* / *Illicium floridanum* Forest (CEGL007047, G2)
- *Nyssa biflora* - (*Acer rubrum*) / *Ilex opaca* / *Leucothoe axillaris* / *Carex atlantica ssp. capillacea* Forest (CEGL004427, G2G3)

- *Nyssa biflora* - *Magnolia virginiana* - (*Pinus elliotii* var. *elliotii*) / *Morella (caroliniensis, inodora)* Forest (CEGL007156, G4?)
- *Pinus elliotii* var. *elliotii* - *Magnolia virginiana* - *Taxodium ascendens* - *Nyssa biflora* / *Polygala cymosa* - *Carex glaucescens* Forest (CEGL007556, G2G3)
- *Pinus serotina* - *Pinus elliotii* var. *elliotii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003674, G3?Q)
- *Quercus laurifolia* - *Magnolia virginiana* - *Nyssa biflora* / *Chasmanthium ornithorhynchum* Forest (CEGL007472, G2?)
- *Quercus laurifolia* - *Nyssa biflora* East Gulf Coastal Plain Saturated Forest [Provisional] (CEGL004754, GNR)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Liquidambar styraciflua* Saturated Forest Alliance (A.350)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Quercus laurifolia* - *Nyssa biflora* Saturated Forest Alliance (A.352)

DISTRIBUTION

Range: This system occurs in the East Gulf Coastal Plain, extending into central Florida and southwestern Georgia, and includes the southern parts of Alabama and Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 55:C, 56:C, 99:C

USFS Ecomap Regions: 231H:CC, 232B:CC, 232C:CC, 232D:CC, 232G:CC, 232J:CC, 232K:CC, 232L:CC, 234A:CC

TNC Ecoregions: 43:C, 53:C, 55:C

SOURCES

References: Comer et al. 2003, Godfrey 1988, Kartesz 1999, Weakley 2005

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723083#references

Description Author: R. Evans and M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT LARGE FLOODPLAIN FOREST (CES202.324)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9324

CONCEPT

Summary: This system consists of vegetated communities along Piedmont rivers, south of the James River in Virginia, where flooding and flood-related environmental factors affect vegetational composition and dynamics. Well-developed examples of this system occur in the Triassic basins. The vegetation includes both non-forested bar and scour communities and the more extensive forested floodplain communities. Forests are generally differentiated by depositional landforms such as levees, sloughs, ridges, terraces, and abandoned channel segments. The system is affected by flooding through wetness, scouring, deposition of material, and input of nutrients.

Classification Comments: This system is distinguished from Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) by having well-developed fluvial landforms which differentiate vegetation. The smaller rivers are less differentiated both because the fluvial landforms are smaller and because the flooding regime is more variable. This system is distinguished from upland systems by the significant presence of plants indicative of alluvial or bottomland settings. This suite of species is absent or occurs incidentally in upland sites.

Piedmont floodplain systems are generally quite distinct from those of the Coastal Plain, with more limited development of floodplains and depositional features, because of the steeper river gradients and harder rocks. The near absence of *Taxodium distichum*, *Nyssa* spp., and other species largely confined to the Coastal Plain corresponds well to the geologic boundary in most places. The floodplains on Triassic sediments have some similarity to those in the Coastal Plain because of their more extensive floodplain development. The break with South-Central Interior Large Floodplain (CES202.705) is less sharp. The presence of Appalachian mesophytic species is often the best indicator.

Distinctive subgroups within this system, which could potentially be the basis for further subdivision, include the Triassic Basin floodplains and the distinction between forests and non-forested communities. The non-forested communities, maintained by periodic severe disturbance, have very different dynamics as well as vegetation structure, but are always associated with the forests and share the flooding regime. Triassic Basin floodplains have large floodplains with small streams. They likely have differences in flooding regime, including longer duration of flooding. Swamp forests, where periods of standing water are an important environmental influence, occupy larger portions of Triassic Basin floodplains than of other floodplains.

Similar Ecological Systems:

- South-Central Interior Large Floodplain (CES202.705)
- Southern Piedmont Mesic Forest (CES202.342)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

DESCRIPTION

Environment: Occurs near rivers, on floodplains and terraces affected by river flooding and on emergent bars and banks within channels. The site usually includes distinct depositional landforms, including levees, sloughs, ridges, terraces, and abandoned channel segments. The substrate is primarily alluvium. Soils are usually sandy to loamy, but include local clayey and gravelly areas. Soils are generally fertile, among the most nutrient-rich in the Piedmont region. Emergent and vegetated bars of gravel to cobbles are included here as well, as are scoured bedrock areas. Floods are generally of short duration, and wetness is a major influence only within channels and where water is ponded in local depressions. The geologic substrate may be of any kind. A special case is the soft Triassic sedimentary rocks of the Piedmont, where even small streams develop large floodplains with well-developed fluvial landforms and therefore fall into this category.

Vegetation: Most of the extent of the system is forest vegetation. The forest canopy is usually dominated by a mix of characteristic alluvial and bottomland species such as *Platanus occidentalis*, *Betula nigra*, *Acer negundo*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Quercus michauxii*, and *Quercus pagoda*. Some more widespread species such as *Liriodendron tulipifera* and *Acer rubrum* are also abundant. Mesophytic species such as *Fagus grandifolia* are a component on the driest areas. Successional areas are often dominated by *Pinus taeda*, *Pinus virginiana*, *Liquidambar styraciflua*, or *Liriodendron tulipifera*. Lower strata in the forests are similarly dominated by bottomland species, but may contain more mesophytic species. *Lindera benzoin*, *Xanthorhiza simplicissima*, *Elymus hystrix*, *Elymus canadensis*, *Chasmanthium latifolium*, and *Boehmeria cylindrica* are among the characteristic species. Non-forested vegetation is generally limited to small patches or bands along the channel, and is quite variable in structure and composition. Partly submerged bars may be dominated by *Justicia americana*. Frequently reworked gravel bars may be dominated by young *Salix nigra*, *Platanus occidentalis*, or *Betula nigra*, or they may have sparse vegetation of a wide variety of annual and perennial herbs of weedy habits. The few extensive bedrock-scour areas in gorges have distinctive vegetation dominated by perennial

herbs rooted in pockets and crevices.

Dynamics: The distinctive dynamics of river flooding are presumably the primary reason for the distinctive vegetation of this system, though not all of the factors are well known. The large rivers have the largest watersheds in the region, but the gradients of most of these rivers limit floods to fairly short duration. Flooding is most common in the winter, but may occur in other seasons. The sorting of plant communities by depositional landforms of different height suggest that wetness or depth of flood waters may be of significance, though it has much less influence than in the Coastal Plain. Flood waters have significant energy, and scouring and reworking of sediment are an important factor in bar and bank communities. However, in the forested floodplains, flood disturbances that kill established woody plants are rare, and canopy population dynamics are dominated by wind throw. In addition to disturbance, floods bring nutrient input, deposit sediment, and disperse plant seeds.

Wind disturbance is at least as important in this system as other Piedmont forests, perhaps more important than in uplands because of frequently wet soils, less dense soils, and more shallow-rooted trees. Fire does not appear to be a dominant factor, and most floodplain vegetation is not very flammable. However, historical references to canebrakes dominated by *Arundinaria gigantea* suggest that fire may have once been more possible and more important in at least some portions.

These systems are commonly subject to a variety of indirect modern human influences beyond those that affect most forests. A large fraction of the large Piedmont rivers have been dammed, and power generation and regulation of water flow create unnatural flood regimes. Extensive erosion of uplands, caused by poor agricultural practices dating back to colonial times, transported large amounts of sediment into floodplains. As in uplands, large floodplains often have substantial areas in cultivation. River bottoms were the focus of agriculture among Native Americans, so some of these systems have a long history of human clearing. A number of exotic plant species have invaded floodplains, more than in any other Piedmont system.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Acer barbatum* / *Asimina triloba* / *Toxicodendron radicans* / *Carex blanda* Forest (CEGL007321, G3?)
- *Liriodendron tulipifera* / *Asimina triloba* / *Arundinaria gigantea* ssp. *gigantea* Forest (CEGL004419, G3G5)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest (CEGL007551, GNR)
- *Quercus pagoda* - *Quercus phellos* - *Quercus lyrata* - *Quercus michauxii* / *Chasmanthium latifolium* Forest (CEGL007356, G2?)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)
- *Quercus virginiana* - *Pinus taeda* / *Ilex vomitoria* / *Chasmanthium sessiliflorum* Forest [Provisional] (CEGL004095, G3?)

Alliances:

- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)

SPATIAL CHARACTERISTICS

Spatial Summary: Naturally a large patch system, occurring in narrow to broad linear patches along rivers. Widespread heavy human alteration has left mostly small patch remnants, with only a few large patches.

Size: Examples probably originally extended for miles along rivers, forming patches of hundreds to thousands of acres. Intense modern human alteration has made this a rare system, with examples now mostly limited to small patches. Some examples of hundreds to over 1000 acres remain.

Adjacent Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Always associated with a riverine aquatic system. Usually bordered by Southern Piedmont Mesic Forest (CES202.342). Some adjacent uplands may have drier systems, and locally may have rock outcrop systems.

DISTRIBUTION

Range: This system is widespread in the Piedmont, from Alabama to southern Virginia. The northern boundary in Virginia is not well determined.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 61:C

USFS Ecomap Regions: 231A:CC, 231I:CC

TNC Ecoregions: 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723177#references

Description Author: M. Schafale and R. Evans
Version: 12 Dec 2002
Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast
ClassifResp: Southeast

SOUTHERN PIEDMONT SMALL FLOODPLAIN AND RIPARIAN FOREST (CES202.323)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9312

CONCEPT

Summary: This system consists of vegetated communities along streams and small rivers in the Piedmont of the southeastern United States where flooding and flood-related environmental factors affect vegetational composition and dynamics. The vegetation includes both non-forested bar and scour communities and the more extensive forested floodplain communities. The forests of these smaller floodplains and bottomlands are not differentiated by depositional landforms such as levees, sloughs, ridges, terraces, and abandoned channel segments, because these features are small and flooding regimes are variable. The system is affected by flooding through wetness, scouring, deposition of material, and input of nutrients.

Classification Comments: This system is distinguished from Southern Piedmont Large Floodplain Forest (CES202.324) by lacking well-developed fluvial landforms which differentiate vegetation. The smaller rivers are less differentiated both because the fluvial landforms are smaller and because the flooding regime is more variable. The large floodplains created by small streams in Triassic sediments are included with Southern Piedmont Large Floodplain Forest (CES202.324). Both of the Piedmont floodplain systems are distinguished from upland systems by the significant presence of plants indicative of alluvial or bottomland settings. This suite of species is absent or occurs on incidentally in upland sites.

Piedmont floodplain systems are generally quite distinct from those of the Coastal Plain, with more limited development of floodplains and depositional features, because of the steeper river gradients and harder rocks. The near absence of *Taxodium distichum*, *Nyssa* spp., and other species largely confined to the Coastal Plain corresponds well to the geologic boundary in most places. The break with South-Central Interior Large Floodplain (CES202.705) is less sharp. The presence of Appalachian mesophytic species is often the best indicator. The floodplains of the westernmost Piedmont generally belong to South-Central Interior Large Floodplain (CES202.705).

Similar Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- South-Central Interior Large Floodplain (CES202.705)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Mesic Forest (CES202.342)

DESCRIPTION

Environment: Occurs near streams and small rivers, on floodplains and terraces affected by river flooding and on emergent bars and banks within channels. Depositional landforms, including levees, sloughs, ridges, terraces, and abandoned channel segments may be present, but are smaller than the scale of the communities of the floodplain. The substrate is primarily alluvium. Soils are usually sandy to loamy, but include local clayey and gravelly areas. Soils are generally fertile, among the most nutrient-rich in the Piedmont region. Alluvial soils may be as important a factor as ongoing flooding in differentiating these systems from adjacent uplands. Emergent and vegetated bars of gravel to cobbles occur occasionally but are generally not extensive or as distinctive as they are on larger rivers. Floods are generally of short duration, and wetness is a major influence only within channels and where water is ponded in local depressions. The geologic substrate may be of any kind, but areas on Triassic sediments tend to have large floodplain systems even on fairly small streams.

Vegetation: Almost all of the extent of the system is naturally forested. The forest canopy is usually a mix of mesophytic and widespread species such as *Liriodendron tulipifera*, *Liquidambar styraciflua*, and *Acer rubrum*, along with characteristic alluvial and bottomland species such as *Platanus occidentalis*, *Betula nigra*, *Acer negundo*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Quercus michauxii*, and *Quercus pagoda*. *Fagus grandifolia* may be present in drier portions, mixed with the other species. Successional areas are often strongly dominated by *Pinus taeda*, *Pinus virginiana*, *Liquidambar styraciflua*, or *Liriodendron tulipifera*. Lower strata in the forests may be either primarily of mesophytic species shared with moist uplands systems, or a mix of mesophytic and bottomland species. Non-forested vegetation is generally limited to very small patches or bands along the channel, and seldom forms distinct communities.

Dynamics: The distinctive dynamics of stream flooding are presumably the primary reason for the distinctive vegetation of this system, though not all of the factors are well known. Small rivers and streams, with small watersheds, have more variable flooding regimes than larger rivers. Floods tend to be of short duration and unpredictably variable as to season and depth. Flood waters may have significant energy in higher gradient systems, but scouring and reworking of sediment rarely affect more than small patches. They are important in maintaining the small non-forested patches. In the forested floodplains, flood disturbances that kill established woody plants are rare, and canopy population dynamics are dominated by wind throw. In addition to disturbance, floods bring nutrient

input, deposit sediment, and disperse plant seeds.

Wind disturbance is at least as important in this system as other Piedmont forests, perhaps more important than in uplands because of frequently wet soils, less dense soils, and more shallow-rooted trees. Fire does not appear to be a dominant factor, and most floodplain vegetation is not very flammable. However, historical references to canebrakes dominated by *Arundinaria gigantea* suggest that fire may have once been more possible and more important in at least some portions.

These systems are less commonly subject than large rivers to alteration of flood regimes by upstream impoundments, but alterations in their watersheds may alter flood intensity and duration. Extensive erosion of uplands, caused by poor agricultural practices dating back to colonial times, transported large amounts of sediment into floodplains. A number of exotic plant species have invaded floodplains, more than in any other Piedmont system.

MEMBERSHIP

Associations:

- *Carpinus caroliniana* - *Ilex decidua* Shrubland (CEGL006484, G1?)
- *Fagus grandifolia* - *Quercus alba* / *Kalmia latifolia* - *Rhododendron canescens* - *Symplocos tinctoria* Forest (CEGL008551, G3?)
- *Fagus grandifolia* - *Quercus* spp. / *Kalmia latifolia* - *Hamamelis virginiana* / *Galax urceolata* Forest (CEGL004549, G2G4Q)
- *Hymenocallis coronaria* - *Justicia americana* Herbaceous Vegetation (CEGL004285, G1)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Lindera benzoin* / *Arisaema triphyllum* Forest (CEGL004418, G4)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Pinus taeda* - *Liriodendron tulipifera* / *Lindera benzoin* / *Carex crinita* Forest (CEGL007546, GNA)
- *Platanus occidentalis* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Lindera benzoin* - *Ilex decidua* / *Carex retroflexa* Forest (CEGL007730, G4?)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Quercus phellos* - *Quercus* (*palustris*, *lyrata*) / *Ilex decidua* / *Carex typhina* - (*Carex grayi*) Forest (CEGL006498, G3?)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)
- *Quercus virginiana* - *Pinus taeda* / *Ilex vomitoria* / *Chasmanthium sessiliflorum* Forest [Provisional] (CEGL004095, G3?)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* Temporarily Flooded Shrubland (CEGL003901, G4?)
- *Schizachyrium scoparium* - *Solidago plumosa* Herbaceous Vegetation (CEGL004459, G1)

Alliances:

- *Carpinus caroliniana* - *Ilex decidua* Temporarily Flooded Shrubland Alliance (A.3037)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Pinus taeda* - *Liriodendron tulipifera* Temporarily Flooded Forest Alliance (A.434)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Quercus* (*michauxii*, *pagoda*, *shumardii*) - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus* (*phellos*, *laurifolia*) Seasonally Flooded Forest Alliance (A.327)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Schizachyrium scoparium* Temporarily Flooded Herbaceous Alliance (A.1346)

SPATIAL CHARACTERISTICS

Spatial Summary: Naturally a small- to medium-patch or narrow linear system, following streams.

Size: Examples probably originally extended for miles in branching networks of smaller stream systems, and might extend for miles along the larger streams. Patches might be hundreds and potentially even thousands of contiguous acres, but most intact remnants are 100 acres or less.

Adjacent Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Always associated with an intermittent stream, perennial stream, or small river aquatic system. Usually bordered by Southern Piedmont Mesic Forest (CES202.342). Some adjacent uplands may have drier systems, and locally may have rock outcrop systems.

DISTRIBUTION

Range: This system is widespread in the Piedmont, from Alabama to southern Virginia. The northern boundary in Virginia is roughly the watershed of the James River.

Divisions: 202:C
Nations: US
Subnations: AL, GA, NC, SC, VA
Map Zones: 54:C, 59:C, 61:C
TNC Ecoregions: 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723178#references

Description Author: M. Schafale and R. Evans

Version: 12 Dec 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast
ClassifResp: Southeast

SOUTHWEST FLORIDA PERCHED BARRIERS TIDAL SWAMP AND LAGOON (CES203.540)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine [Haline]

National Mapping Codes: ESLF 9347

CONCEPT

Summary: This system includes tidal wetlands along the western coast of Florida from approximately Tampa Bay south to Charlotte Harbor. In this region, instead of the tidal marshes found to the north, these are mangrove forests with canopies up to 10 m tall (Montague and Wiegert 1990). Odum and McIvor (1990) show a diagram displaying the community zonation present in this system at Tampa Bay. A narrow high marsh zone of *Batis* and *Juncus* grades into low swamps with *Laguncularia racemosa*, *Avicennia germinans*, and *Rhizophora mangle*. Interpretation of the vegetation is difficult due to extensive human alteration. For example, Lewis et al. (1979) estimated that 44% loss of intertidal vegetation in the Tampa Bay region had taken place.

Classification Comments: The use of the term "perched" in the name refers to the elevated nature of the barrier islands, which are built on remnant limestone reefs.

MEMBERSHIP

Associations:

- *Avicennia germinans* / *Spartina alterniflora* Shrubland (CEGL003801, G2?)
- *Conocarpus erectus* - (*Laguncularia racemosa*) / *Batis maritima* - *Borrhichia frutescens* / *Sesuvium portulacastrum* - *Suaeda linearis* Shrubland (CEGL003806, G2?)

Alliances:

- *Avicennia germinans* Tidal Shrubland Alliance (A.733)
- *Conocarpus erectus* Saturated Shrubland Alliance (A.732)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 232D:CC, 411A:CC

TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003, Lewis et al. 1979, Montague and Wiegert 1990, Odum and McIvor 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723062#references

Description Author: R. Evans

Version: 06 Feb 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

TAMAULIPAN ARROYO SHRUBLAND (CES301.992)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermittent Flooding; Lowland [Lowland]; Shrubland (Shrub-dominated); Arroyo; Tropical/Subtropical [Tropical Xeric]; Riverine / Alluvial

National Mapping Codes: ESLF 9158

CONCEPT

Summary: This Tamaulipan riparian shrubland system is restricted to drainages in upland areas or ramaderos that are intermittently flooded. The dense shrub canopy is a mix of species often dominated by *Acacia farnesiana*, *Celtis pallida*, *Haematoxylum brasiletto*, *Prosopis glandulosa*, or *Tecoma stans*.

Similar Ecological Systems:

- Edwards Plateau Limestone Shrubland (CES303.041)

MEMBERSHIP

Associations:

- *Acacia farnesiana* - (*Prosopis glandulosa*) Woodland (CEGL002131, G5)

Alliances:

- *Acacia farnesiana* Woodland Alliance (A.660)

DISTRIBUTION

Divisions: 301:C

Nations: MX, US

Subnations: MXCO(MX), MXNU(MX), MXTM(MX), TX

Map Zones: 36:C

TNC Ecoregions: 30:C

SOURCES

References: Comer et al. 2003, Jahrsdoerfer and Leslie 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722713#references

Description Author: NatureServe Western Ecology Team

Version: 21 Mar 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1467 TAMAULIPAN FLOODPLAIN (CES301.990)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermediate (5-25 yrs) Flooding Interval; Lowland [Lowland]; Forest and Woodland (Treed); Tropical/Subtropical [Tropical Xeric]; Riverine / Alluvial

Non-Diagnostic Classifiers: Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2467; ESLF 9136; ESP 1467

CONCEPT

Summary: This ecological system is limited to riparian areas of the lower Rio Grande Valley and Rio Corona in southern Texas and northeastern Mexico. Stands occur on riverbanks, floodplains and deltas. These woodlands are a unique mix of species from southeastern North America and subtropical Central America and are often dominated by *Acacia farnesiana*, *Carya ovata*, *Celtis laevigata*, *Diospyros texana*, *Ebenopsis ebano*, *Ehretia anacua*, *Fraxinus berlandieriana*, *Populus deltoides*, or *Ulmus crassifolia*, and many other tree species present to locally dominant, with *Carya illinoensis*, *Carya texana*, *Quercus stellata*, and *Quercus fusiformis* more common in the northern extent. The highly variable understory is dependent on canopy density and may include dense shrub or herbaceous layers.

DESCRIPTION

Vegetation: The vegetation of these woodlands is a unique mix of species from southeastern North America and subtropical Central America. Stands are often dominated by *Acacia farnesiana*, *Carya ovata*, *Celtis laevigata*, *Diospyros texana*, *Ebenopsis ebano*, *Ehretia anacua*, *Fraxinus berlandieriana*, *Populus deltoides*, or *Ulmus crassifolia*, and many other tree species present to locally dominant, with *Carya illinoensis*, *Carya texana*, *Quercus stellata*, and *Quercus fusiformis* more common in the northern extent.

MEMBERSHIP

Associations:

- *Acacia farnesiana* - (*Prosopis glandulosa*) Woodland (CEGL002131, G5)
- *Acacia farnesiana* - *Parkinsonia aculeata* Temporarily Flooded Forest (CEGL007755, G4)
- *Celtis laevigata* - *Ulmus crassifolia* - (*Fraxinus berlandieriana*) / *Rivina humilis* - *Chromolaena odorata* Forest (CEGL007752, G1G2)
- *Celtis laevigata* - *Ulmus crassifolia* - (*Fraxinus* spp.) / *Celtis pallida* / *Elymus virginicus* Forest (CEGL007782, G3G4)
- *Ebenopsis ebano* - *Ehretia anacua* / *Condalia hookeri* Forest (CEGL002054, G1)
- *Ebenopsis ebano* - *Phaulothamnus spinescens* Shrubland (CEGL002169, G2)
- *Phragmites australis* Riverbank Herbaceous Vegetation (CEGL004115, G3)
- *Salix interior* / *Phragmites australis* Temporarily Flooded Shrubland (CEGL007753, GNR)
- *Salix nigra* - *Celtis laevigata* var. *laevigata* / *Baccharis neglecta* Forest (CEGL007754, GNR)

Alliances:

- *Acacia farnesiana* - *Parkinsonia aculeata* Temporarily Flooded Forest Alliance (A.1908)
- *Acacia farnesiana* Woodland Alliance (A.660)
- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Ebenopsis ebano* - *Phaulothamnus spinescens* Shrubland Alliance (A.723)
- *Ebenopsis ebano* Forest Alliance (A.41)
- *Phragmites australis* Temporarily Flooded Herbaceous Alliance (A.1345)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)

DISTRIBUTION

Range: Riparian areas of the lower Rio Grande Valley and Rio Corona in southern Texas and northeastern Mexico.

Divisions: 301:C

Nations: MX, US

Subnations: MXCO(MX), MXNU(MX), MXTM(MX), TX

Map Zones: 36:C

TNC Ecoregions: 30:C, 31:P

SOURCES

References: Comer et al. 2003, Correll and Johnston 1970, Diamond 1987, Jahrsdoerfer and Leslie 1988, McLendon 1991, Webster 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722715#references

Description Author: NatureServe Western Ecology Team

Version: 04 Feb 2009

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

TAMAULIPAN PALM GROVE RIPARIAN FOREST (CES301.991)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Lowland]; Forest and Woodland (Treed); Tropical/Subtropical [Tropical Xeric]; Riverine / Alluvial; Palm Tree; *Sabal mexicana*

National Mapping Codes: ESLF 9152

CONCEPT

Summary: This ecological system is limited to riparian areas along the lower Rio Grande and Rio Corona in southern Texas and northeastern Mexico. Stands occur on riverbanks and floodplains. The characteristic species are the neotropical *Sabal mexicana* with *Ebenopsis ebano*, *Ehretia anacua*, *Leucaena pulverulenta*, and many other riparian species such as *Acacia farnesiana*, *Carya ovata*, *Celtis laevigata*, *Diospyros texana*, *Fraxinus berlandieriana*, *Populus deltoides*, or *Ulmus crassifolia*. The understory is dominated by neotropical species. Palm groves were once common in the lower Rio Grande Valley 80 miles from the Gulf, but have since largely been converted to agriculture.

DESCRIPTION

Vegetation: The characteristic species in stands of this system are the neotropical *Sabal mexicana* with *Ebenopsis ebano*, *Ehretia anacua*, *Leucaena pulverulenta*, and many other riparian species such as *Acacia farnesiana*, *Carya ovata*, *Celtis laevigata*, *Diospyros texana*, *Fraxinus berlandieriana*, *Populus deltoides*, or *Ulmus crassifolia*. The understory is dominated by neotropical species.

MEMBERSHIP

Associations:

- *Sabal mexicana* - *Ebenopsis ebano* Forest (CEGL002056, G2)

Alliances:

- *Ebenopsis ebano* Forest Alliance (A.41)

DISTRIBUTION

Range: This ecological system is limited to riparian areas along the lower Rio Grande and Rio Corona in southern Texas and northeastern Mexico.

Divisions: 301:C

Nations: MX, US

Subnations: MXTM(MX), TX

Map Zones: 36:C

TNC Ecoregions: 30:C, 31:P

SOURCES

References: Comer et al. 2003, Diamond 1987, Jahrsdoerfer and Leslie 1988, Webster 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722714#references

Description Author: NatureServe Western Ecology Team

Version: 21 Mar 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

TEXAS-LOUISIANA COASTAL PRAIRIE SLOUGH (CES203.542)

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Woody Wetland**Spatial Scale & Pattern:** Linear**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Forest and Woodland (Treed); West Gulf Coastal Plain; Riverine / Alluvial**National Mapping Codes:** ESLF 9348**CONCEPT****Summary:** This system includes small streams and sloughs that course through the coastal prairie in Louisiana and Texas.**DISTRIBUTION****Range:** This system is found in the coastal prairie region of Louisiana and Texas.**Divisions:** 203:C**Nations:** US**Subnations:** LA, TX**Map Zones:** 36:C, 37:C**TNC Ecoregions:** 31:C**SOURCES****References:** Comer et al. 2003**Full References:**See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723060#references**Description Author:** J. Teague, mod. M. Pyne**Version:** 17 Jan 2006**Concept Author:** J. Teague**Stakeholders:** Southeast**ClassifResp:** Southeast

WEST GULF COASTAL PLAIN FLATWOODS POND (CES203.547)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: West Gulf Coastal Plain; Depressional; Graminoid

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9349

CONCEPT

Summary: This system represents predominantly graminoid-dominated flatwoods ponds of the West Gulf Coastal Plain of eastern Texas and western Louisiana. These ponds are generally circular or elliptical, flat-bottomed depressions on flat terraces in the Outer Coastal Plain. The slowly permeable soils trap local runoff and precipitation resulting in higher water tables than surrounding areas. Water depth may be 3-5 feet in the winter and even deeper toward the center of some examples (Bridges 1988, Bridges and Orzell 1989a). Examples range from shallow to several meters in depth; the large and deeper examples may exhibit distinct vegetation zonation. Most examples have a layer of tall wetland grasses and sedges above a layer of semi-aquatic herbs. Many lack a significant woody layer due in part to periodic fires originating in the pine savanna matrix. However, scattered, often stunted *Nyssa biflora* and stems of *Cephalanthus occidentalis* may be present. The following species are characteristic of this type: *Eriocaulon compressum*, *Xyris fimbriata*, *Eleocharis equisetoides*, *Eleocharis quadrangulata*, as well as two additional species, *Carex verrucosa* and *Rhynchospora cephalantha*, which are more frequent in other pond types. Some other species frequently found in this type include *Eriocaulon compressum*, *Rhynchospora corniculata*, *Panicum hemitomon*, *Ludwigia sphaerocarpa*, *Xyris laxifolia* var. *iridifolia* (= *Xyris iridifolia*), and *Sagittaria graminea*. Other herbaceous species may include *Gratiola brevifolia*, *Hydrolea ovata*, *Proserpinaca pectinata*, *Pluchea rosea*, *Ludwigia pilosa*, *Bacopa caroliniana*, *Xyris* sp., and *Rhynchospora capitellata*.

Similar Ecological Systems:

- West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)

DESCRIPTION

Environment: This system tends to occur as inclusions within wetland pine savannas in depression ponds or ancient stream channels and sloughs. Local runoff and rainfall collect in these depressions with slowly permeable soils. Resulting water tables persist for long periods after rain, at higher levels than surrounding parts of the landscape. Water in this pond type is often 3-5 feet deep in winter, and even deeper areas (with floating aquatic vegetation) may occur in the center of some sites (Bridges 1988, Bridges and Orzell 1989a). They tend to occur as inclusions within wetland pine savannas, but may also be bordered by upland depression swamps. The depressions are typically closed, with no surface outlet. Water collects from local rainfall and runoff from small watersheds. There is typically no input from streamflow and little or no outflow (Bridges and Orzell 1989a).

Vegetation: Plant species dominance varies greatly depending upon water depth and the spread of colonial, rhizomatous species, and may also be related to geographic isolation of individual ponds and variations in local fire regimes. Most examples have a layer of tall wetland grasses and sedges above a layer of semi-aquatic herbs. Scattered woody plants, especially *Nyssa biflora*, may be present. In some instances woody stems may develop sufficient density to be classified as woodlands.

Dynamics: Water table fluctuations are probably the most important factor affecting examples of this system (Bridges and Orzell 1989a). Water collects in these depressions after rainfall events but generally not as a result of overbank flooding. Water tends to be deepest during the wintertime when precipitation is concentrated (although other factors may also be important, such as the amount of evapotranspiration). Standing water may be evident from approximately November through May, and sporadically afterwards. This system is located within the frequently burned longleaf pine matrix and is kept at an herbaceous or mostly herbaceous state by fire.

MEMBERSHIP

Associations:

- *Aristida palustris* - *Panicum virgatum* - *Eriocaulon compressum* - *Eleocharis equisetoides* Herbaceous Vegetation (CEGL004577, G2G3)
- *Aristida palustris* - *Panicum virgatum* - *Eriocaulon decangulare* var. *decangulare* - *Rhynchospora elliottii* Herbaceous Vegetation (CEGL004576, G2G3)
- *Nymphoides aquatica* - *Nymphaea odorata* - *Gratiola brevifolia* Herbaceous Vegetation (CEGL004601, G3?)
- *Nyssa biflora* - *Crataegus opaca* - (*Fraxinus caroliniana*) / *Rhynchospora mixta* Woodland (CEGL007873, G2?)
- *Nyssa biflora* / *Panicum hemitomon* - *Woodwardia virginica* Woodland (CEGL004586, G3?)
- *Panicum hemitomon* - *Eriocaulon compressum* - *Rhynchospora corniculata* Herbaceous Vegetation (CEGL004578, G2)

Alliances:

- *Aristida palustris* - *Andropogon (capillipes, glaucopsis)* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Nymphoides aquatica* Permanently Flooded Herbaceous Alliance (A.1751)
- *Nyssa biflora* Seasonally Flooded Woodland Alliance (A.648)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)

SPATIAL CHARACTERISTICS

Size: Most are quite small features; although specific data are not available, most are believed to be less than 1 acre in size.

Adjacent Ecological Systems:

- West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)

DISTRIBUTION

Range: West Gulf Coastal Plain of eastern Texas and western Louisiana.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 36:?, 37:C, 44:?

TNC Ecoregions: 31:?, 40:C, 41:C

SOURCES

References: Bridges 1988, Bridges and Orzell 1989a, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723055#references

Description Author: R. Evans

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

WEST GULF COASTAL PLAIN LARGE RIVER FLOODPLAIN FOREST (CES203.488)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); West Gulf Coastal Plain; Riverine / Alluvial [Brownwater]; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9197

CONCEPT

Summary: This system represents a geographic subset of Kuchler's (1964) Southern Floodplain Forest found west of the Mississippi River. Examples may be found along large rivers of the West Gulf Coastal Plain and Upper West Gulf Coastal Plain, especially the Trinity, Neches, Sabine, and others. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphic features present within the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993). Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding, including bald-cypress and water tupelo. However, herbaceous and shrub vegetation may be present in certain areas as well.

Classification Comments: It is unclear to what system the Brazos and Colorado rivers belong. A new system is apparently required to accommodate these and other rivers in the Coastal Plain south and west of Galveston Bay. Or would they go into West Gulf Coastal Plain Near-Coast Large River Swamp (CES203.459)?

Similar Ecological Systems:

- Red River Large Floodplain Forest (CES203.065)
- West Gulf Coastal Plain Small Stream and River Forest (CES203.487)

Related Concepts:

- Floodplain Hardwood Forest (Marks and Harcombe 1981) Finer
- Swamp Cypress Tupelo Forest (Marks and Harcombe 1981) Finer

DESCRIPTION

Environment: Some of the major geomorphic features associated with different community types within this system include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993).

Vegetation: Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding, including *Taxodium distichum* and *Nyssa aquatica*. Some other trees which may be associated with examples of this system include *Acer rubrum* var. *drummondii*, *Betula nigra*, *Carya aquatica*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Platanus occidentalis*, *Gleditsia aquatica*, *Nyssa aquatica*, *Nyssa biflora*, *Pinus taeda*, *Populus deltoides*, *Quercus laurifolia*, *Quercus lyrata*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus phellos*, *Quercus similis*, *Quercus texana*, *Salix nigra*, *Ulmus americana*, and *Ulmus crassifolia*. Smaller areas of herbaceous- and shrub-dominated vegetation may also be present in certain areas. Shrubs and small trees include *Alnus serrulata*, *Arundinaria gigantea*, *Carpinus caroliniana*, *Cephalanthus occidentalis*, *Clethra alnifolia*, *Cornus foemina*, *Crataegus viridis*, *Forestiera acuminata*, *Ilex decidua*, *Itea virginica*, *Morella cerifera*, *Planera aquatica*, *Sabal minor*, and *Sebastiania fruticosa*. Vines may include *Berchemia scandens* and *Smilax bona-nox*. Herbaceous species may include *Boehmeria cylindrica*, *Carex complanata*, *Carex debilis*, *Carex intumescens*, *Carex jorii*, *Leersia virginica*, *Lycopus virginicus*, *Mikania scandens*, *Saccharum baldwinii*, and *Typha latifolia*. Aquatic and floating herbs include *Lemna minor*, *Nelumbo lutea*, *Nuphar lutea* ssp. *advena*, and *Nymphaea odorata*.

MEMBERSHIP

Associations:

- *Betula nigra* - *Liquidambar styraciflua* - *Platanus occidentalis* - *Quercus nigra* Forest (CEGL007898, G4Q)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Betula nigra* - *Platanus occidentalis* / *Berchemia scandens* / (*Arundinaria gigantea*) - *Boehmeria cylindrica* Temporarily Flooded Riverfront Forest [Provisional] (CEGL007983, G5)
- *Forestiera acuminata* - (*Planera aquatica*, *Cephalanthus occidentalis*) Shrubland (CEGL003911, G3?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Gleditsia aquatica* - *Carya aquatica* Forest (CEGL007426, G3?)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest [Provisional] (CEGL007387, GNR)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Platanus occidentalis* - *Liquidambar styraciflua* - (*Ulmus americana*) / (*Crataegus viridis*) Forest (CEGL007335, G3G4)

- *Populus deltoides* - *Salix nigra* / *Ilex vomitoria* Forest (CEGL004613, G3?)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Quercus laurifolia* - *Liquidambar styraciflua* - *Nyssa biflora* - *Acer rubrum* / *Sabal minor* Forest (CEGL007804, G3?)
- *Quercus laurifolia* - *Quercus (lyrata, phellos)* - *Nyssa biflora* West Gulf Floodplain Forest (CEGL003854, G3?)
- *Quercus lyrata* - (*Quercus phellos*, *Taxodium distichum*) / *Carex intumescens* - *Lycopodium virginicum* Semipermanently Saturated Overflow Bottom Forest [Provisional] (CEGL007989, G4?)
- *Quercus lyrata* - *Carya aquatica* - (*Quercus texana*) / *Forestiera acuminata* Forest (CEGL002423, G3?)
- *Quercus lyrata* - *Liquidambar styraciflua* / *Forestiera acuminata* Forest (CEGL002424, G4?)
- *Quercus michauxii* - *Liquidambar styraciflua* - *Quercus texana* - *Quercus lyrata* Forest (CEGL007906, G3G4)
- *Quercus nigra* - *Liquidambar styraciflua* - (*Pinus taeda*) / *Ilex opaca* - *Vaccinium fuscatum* / *Carex debilis* Temporarily Flooded Forest (CEGL007984, G4?)
- *Quercus nigra* - *Quercus phellos* - (*Pinus taeda*) / *Crataegus marshallii* / *Smilax smallii* Forest (CEGL007985, G5)
- *Quercus pagoda* - *Quercus michauxii* - *Carya (glabra, ovata)* / *Carpinus caroliniana* / *Smilax bona-nox* / *Carex complanata* Mesic Floodplain Forest [Provisional] (CEGL007981, G3?)
- *Quercus pagoda* / *Ulmus crassifolia* - *Celtis laevigata* / *Carex cherokeensis* Forest (CEGL007952, G2G3)
- *Quercus palustris* - (*Quercus lyrata*) - *Fraxinus pennsylvanica* / *Acer rubrum* var. *drummondii* / *Carex* spp. Forest (CEGL008597, G3?)
- *Quercus phellos* - (*Quercus lyrata*) / *Carex jorii* - *Saccharum baldwinii* Floodplain Forest (CEGL008469, G2G3)
- *Quercus phellos* - (*Quercus similis*) - *Ulmus crassifolia* Forest (CEGL007921, G3G4)
- *Quercus phellos* - *Liquidambar styraciflua* / *Ilex decidua* - *Carpinus caroliniana* / *Lysimachia radicans* Forest (CEGL007370, G3?)
- *Quercus phellos* - *Quercus nigra* / *Sabal minor* - *Sebastiania fruticosa* Forest (CEGL007869, G2G3)
- *Quercus texana* - (*Carya aquatica*, *Taxodium distichum*) / *Cornus foemina* / *Symphyotrichum lanceolatum* - *Leersia virginica* Seasonally Flooded Floodplain Forest [Provisional] (CEGL007988, G3?)
- *Quercus texana* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* - (*Gleditsia triacanthos*) Forest (CEGL004619, G4G5)
- *Salix nigra* Large River Floodplain Forest (CEGL007410, G3G5)
- *Taxodium distichum* - (*Nyssa aquatica*) - *Carya aquatica* / *Planera aquatica* Permanently Flooded River Channel (Low Bank) Forest [Provisional] (CEGL007992, G4?)
- *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Forest (CEGL002421, G3G5)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)

Alliances:

- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Forestiera acuminata* Semipermanently Flooded Shrubland Alliance (A.1012)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus texana* - (*Quercus lyrata*) Seasonally Flooded Forest Alliance (A.331)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* - *Nyssa biflora* - (*Nyssa aquatica*) Saturated Forest Alliance (A.355)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

DISTRIBUTION

Range: This system occurs along large rivers of the West and Upper West Gulf coastal plains, especially the Trinity, Neches, Sabine, and others, as well as the portion of the Red River represented by Keys et al. (1995) (231Em) at the Oklahoma-Texas border.

Divisions: 203:C

Nations: US

Subnations: AR, LA, OK, TX

Map Zones: 37:C, 44:C

TNC Ecoregions: 31:C, 40:C, 41:C

SOURCES

References: Comer et al. 2003, Keys et al. 1995, Kuchler 1964, Marks and Harcombe 1981, Sharitz and Mitsch 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723098#references

Description Author: R. Evans and T. Foti, mod. M. Pyne

Version: 30 Jan 2006

Concept Author: R. Evans and T. Foti

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

WEST GULF COASTAL PLAIN NEAR-COAST LARGE RIVER SWAMP (CES203.459)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: West Gulf Coastal Plain; Riverine / Alluvial; Tidal / Estuarine

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9314

CONCEPT

Summary: These swamp forests are found along rivers flowing through the Gulf Coast Prairies and Marshes region of the Outer Coastal Plain of western Louisiana and adjacent Texas. Included are areas where the rivers enter bays and estuaries along the northern Gulf of Mexico that are somewhat tidally influenced. This is restricted to EPA 34g (Texas-Louisiana Coastal Marshes) from Vermillion Bay in Louisiana west to, and including Galveston Bay and Trinity Bay in Texas (EPA 2004).

DESCRIPTION

Environment: The environment of this system consists of rivers flowing through the Gulf Coast Prairies and Marshes ecoregion of the Outer Coastal Plain of western Louisiana and adjacent Texas. This includes somewhat tidally influenced areas where the rivers enter bays and estuaries along the northern Gulf of Mexico.

Vegetation: Stands of vegetation included in this system are typically dominated by *Taxodium distichum*, *Nyssa aquatica*, or perhaps a combination of these species. These are forested areas in an area primarily dominated by marshes.

MEMBERSHIP

Associations:

- *Nyssa aquatica* Floodplain Forest [Placeholder] (CEGL007389, GNR)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)

Alliances:

- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

DISTRIBUTION

Range: This system is found along rivers flowing through the Gulf Coast Prairies and Marshes (TNC Ecoregion 31) of the Outer Coastal Plain of western Louisiana and adjacent Texas. This is restricted to EPA 34g (Texas-Louisiana Coastal Marshes) from Vermillion Bay in Louisiana west to, and including Galveston Bay and Trinity Bay in Texas (EPA 2004).

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 36:C, 37:C

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003, EPA 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723127#references

Description Author: J. Teague and R. Evans, mod. M. Pyne

Version: 22 Sep 2008

Concept Author: J. Teague and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1506 WEST GULF COASTAL PLAIN NONRIVERINE WET HARDWOOD FLATWOODS (CES203.548)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); West Gulf Coastal Plain; Hardpan; Depressional; Silt Soil Texture

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated

National Mapping Codes: EVT 2506; ESLF 9350; ESP 1506

CONCEPT

Summary: This ecological system represents predominantly wet hardwood flatwoods of the West Gulf Coastal Plain of southern Arkansas, eastern Texas, and western Louisiana. Examples may be somewhat more common in the inland portions of the region but are also found in the Outer Coastal Plain as well. These areas are usually found on Pleistocene high terraces (EPA 35c) primarily associated with the Red and Mississippi rivers that are located above the current floodplain. Hydrology is controlled by local rainfall events and not overbank flooding. Soils are fine-textured, and hardpans may be present in the subsurface. The limited permeability of these soils contributes to perched water tables during fairly substantial portions of the year (when precipitation is greatest and evapotranspiration is lowest). Saturation occurs not from overbank flooding but typically whenever precipitation events occur. The local landscape is often a complex of ridges and swales, usually occurring in close proximity. There is vegetation variability related to soil texture and moisture and disturbance history. Most examples support hardwood forests or swamps, which are often heavily oak-dominated. Important species are tolerant of inundation. They include *Quercus michauxii*, *Quercus phellos*, *Quercus laurifolia*, and *Liquidambar styraciflua*, with sparse coverage of wetland herbs such as *Carex glaucescens*. Some swales support unusual pockets of *Fraxinus caroliniana* and *Crataegus* spp. Some examples can contain *Pinus taeda*.

Classification Comments: This system may grade upslope into West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278) and down into West Gulf Coastal Plain Flatwoods Pond (CES203.547). Apparently, this system occurs within the historic range of longleaf pine [see USFS ecomap attributions]. Within this range, more information is needed to identify the toposequence between longleaf pine-dominated flatwoods/savannas/uplands and hardwood/loblolly-dominated flatwoods. The distribution of this system in the South Central Plains Flatwoods and Southern Tertiary Uplands (EPA 35e and f) needs to be better defined.

Similar Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- West Gulf Coastal Plain Flatwoods Pond (CES203.547)
- West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278)

Related Concepts:

- Flatland Hardwood Forest (Marks and Harcombe 1981) Undetermined

DESCRIPTION

Environment: This system is found on the wettest inclusions of Pleistocene terraces in the West Gulf Coastal Plain of southern Arkansas, eastern Texas, and western Louisiana.

Vegetation: Stands are typically dominated by hardwoods, including *Quercus michauxii*. Important species are tolerant of inundation. They include *Quercus michauxii*, *Quercus phellos*, *Quercus laurifolia*, and *Liquidambar styraciflua*, with sparse coverage of wetland herbs such as *Carex glaucescens*. Some swales support unusual pockets of *Fraxinus caroliniana* and *Crataegus* spp. Some examples can contain *Pinus taeda*.

Dynamics: The predominant ecological processes affecting this system are related to soil texture and moisture and disturbance history. These are wetlands that hold standing water for variable periods during the year after rainfall events. The wettest examples were likely not affected to a large degree by fires; however, they are often embedded in pyrogenic landscapes which did burn frequently (R. Evans pers. obs., T. Foti pers. comm.). The difference in the dynamics between this system and the "non-wet" (dry-mesic, xero-hydric) flatwoods of the region (CES203.278) is their different structure: the wetter type occurs as a closed forest, the dry/mesic one as a more open forest or woodland (with an open canopy, a full herbaceous expression, and few shrubs). The fire regime is different as well: the xero-hydric type is short-interval, low-intensity, low-severity versus medium- to long-interval, low-intensity, high-severity for the wet one (D. Zollner pers. comm. 2006).

MEMBERSHIP

Associations:

- (*Quercus laurifolia*) / *Crataegus opaca* - *Crataegus viridis* Forest (CEGL007386, G1)
- *Fraxinus caroliniana* Seasonally Flooded Forest (CEGL004753, G2G3)
- *Nyssa biflora* - *Quercus laurifolia* / *Sphagnum* spp. Depression Forest (CEGL007390, G3?)
- *Quercus laurifolia* - *Liquidambar styraciflua* - *Nyssa biflora* - *Acer rubrum* / *Sabal minor* Forest (CEGL007804, G3?)
- *Quercus laurifolia* - *Quercus phellos* - *Quercus nigra* / *Viburnum dentatum* - (*Sebastiania fruticosa*) / *Carex glaucescens* Upper West Gulf Flatwoods Forest (CEGL007961, G2G3)

- *Quercus lyrata* - *Quercus phellos* - *Ulmus americana* / *Rhynchospora* spp. Forest (CEGL007549, G2G3)
- *Quercus phellos* - *Quercus similis* / *Crataegus marshallii* - *Crataegus spathulata* / *Chasmanthium laxum* Forest (CEGL007363, G3?)
- *Quercus phellos* / *Chasmanthium laxum* - *Carex (flaccosperma, intumescens)* - *Hymenocallis lirioides* Flatwoods Forest (CEGL007371, G3G4)
- *Quercus phellos* / *Chasmanthium laxum* Forest (CEGL008576, G3?)
- *Taxodium distichum* - *Nyssa biflora* - *Magnolia virginiana* - *Acer rubrum* Forest (CEGL007902, G2?)

Alliances:

- *Crataegus (aestivalis, opaca, rufula)* Seasonally Flooded Forest Alliance (A.320)
- *Fraxinus caroliniana* Seasonally Flooded Forest Alliance (A.344)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Red River Large Floodplain Forest (CES203.065)
- West Gulf Coastal Plain Flatwoods Pond (CES203.547)
- West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278)

Adjacent Ecological System Comments: This system may grade upslope into West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278) and down into West Gulf Coastal Plain Flatwoods Pond (CES203.547).

DISTRIBUTION

Range: This system is found in the West Gulf Coastal Plain, Upper West Gulf Coastal Plain, and Mississippi River Alluvial Plain (P. Faulkner pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 36:?, 37:C, 44:C, 45:C, 98:P

USFS Ecomap Regions: 231E:CC, 232F:CC

TNC Ecoregions: 31:?, 40:C, 41:C, 42:C

SOURCES

References: Comer et al. 2003, Foti pers. comm., Marks and Harcombe 1981, R. Evans pers. comm., Zollner pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723054#references

Description Author: R. Evans, mod. M. Pyne and J. Teague

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1462 WEST GULF COASTAL PLAIN SEEPAGE SWAMP AND BAYGALL (CES203.372)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: West Gulf Coastal Plain; Seepage-Fed Sloping; Broad-Leaved Tree

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated)

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2462; ESLF 9131; ESP 1462

CONCEPT

Summary: This West Gulf Coastal Plain ecological system consists of forested wetlands (often densely wooded) in acidic, seepage influenced wetland habitats. These wetlands may occur in poorly developed upland drainages, toe-slopes, and small headwaters stream bottoms. These environments are prone to long duration standing water, and tend to occur on highly acidic, nutrient-poor soils. The vegetation is characterized by an overstory of *Magnolia virginiana*, *Nyssa sylvatica*, *Nyssa biflora*, and *Acer rubrum*, although there is some variation according to latitude. Understory vegetation throughout the region consistently supports the vine *Smilax laurifolia* and a dense abundance of ferns, such as *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, and *Woodwardia areolata*. In most cases, these wetlands are embedded in uplands with deep sandy soils. When these communities are associated with streams, they tend to be low gradient, with narrow, often braided channels and diffuse drainage patterns. Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. The limited examples in Oklahoma are somewhat depauperate and lack some of the more southern and eastern taxa (e.g., *Magnolia virginiana*, *Nyssa biflora*).

Related Concepts:

- Bay-Gallberry Holly Bogs (Ajilusgi 1979) Equivalent
- Oklahoma Acid Hillside Seep (Hoagland 2000) Equivalent
- Wetland Baygall Shrub Thicket (Marks and Harcombe 1981) Equivalent

DESCRIPTION

Environment: This system occurs on saturated soils associated with springs and seepage flow at the headwaters and margins of topographically flat creek bottoms of low velocity in the West Gulf Coastal Plain. The creek channels themselves tend to be highly meandering, often with multiple channels and extremely shallow banks. Nixon et al. (1983a) measured stream depths of 0.3-0.6 m and widths of less than 1 meter in a study of this system. Examples are invariably embedded within deep sandy slopes and uplands, and may also occur in association with flatwoods drainages (Martin et al. 1990, Martin and Smith 1991, Smith 1996a). The deep, poorly drained, strongly acidic, loamy fine sand soils have a high organic matter content (Brooks et al. 1993). Van Kley (1999a) indicates that these habitats, sometimes mapped as the Betis soil series and Guyton soil complex, are notably low in calcium and magnesium. Soils of other examples may be mapped as Lovelady (Arenic Glossudalf), Rentzel (Arenic Plinthaquic Paleudult), Corrigan (Typic Albaqualf), Melhomes (Humaqueptic Psammaquent), and Osier (Typic Psammaquent). This system is known from the Pleistocene Terraces and Tertiary uplands in Louisiana, Texas, Arkansas and to a limited extent in Oklahoma. Geologic formations where this system occurs include: Bentley (Intermediate Pleistocene Terraces), Willis (High Pleistocene Terraces), Fleming (Miocene), Catahoula (Oligocene), Cockfield (Eocene), Sparta (Eocene), Carrizo (Eocene), Wilcox (Eocene), and possibly the Vicksburg (Oligocene) and other formations.

Vegetation: The vegetation is characterized by *Magnolia virginiana*, *Nyssa sylvatica*, *Nyssa biflora*, and *Acer rubrum*, although there is some variation according to latitude. Southerly examples generally consist of broad-leaved evergreen forests, while more northerly examples support more mixed evergreen-deciduous forests. In addition, evergreen species are especially pronounced in the shrub layer of southern examples. Species such as *Cyrilla racemiflora* and *Ilex coriacea* are not found in northern parts of the West Gulf Coastal Plain. Understory vegetation throughout the region consistently supports an abundance of ferns, such as *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, and *Woodwardia areolata*.

MEMBERSHIP

Associations:

- (*Magnolia virginiana*) / *Ilex coriacea* - *Morella caroliniensis* Shrubland (CEGL003530, G3?)
- *Acer rubrum* (var. *drummondii*) - *Nyssa* spp. - *Liquidambar styraciflua* - *Quercus nigra* / *Osmunda* spp. Saturated Forest (CEGL007982, G3?)
- *Dichantheium scoparium* - *Boehmeria cylindrica* / *Sphagnum* spp. - *Polytrichum commune* Herbaceous Vegetation (CEGL004916, G2Q)
- *Magnolia virginiana* - *Nyssa* (*biflora*, *sylvatica*) - *Acer rubrum* / *Morella caroliniensis* / *Woodwardia areolata* Forest (CEGL007904, G3?)
- *Nyssa* (*biflora*, *sylvatica*) - *Magnolia virginiana* - *Quercus laurifolia* / *Cyrilla racemiflora* - *Ilex coriacea* - *Rhododendron oblongifolium* Forest (CEGL007474, G3?)
- *Quercus laurifolia* - (*Quercus nigra*, *Nyssa biflora*) / *Diospyros virginiana* Forest (CEGL007871, G3?)

- *Viburnum nudum* var. *nudum* - *Morella cerifera* - *Smilax laurifolia* Shrubland (CEGL007874, G1?)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Dichantheium scoparium* Saturated Herbaceous Alliance (A.1457)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)

DISTRIBUTION

Range: This system is restricted to eastern Texas, western Louisiana, southern Arkansas, and extreme southeastern Oklahoma.

Divisions: 203:C

Nations: US

Subnations: AR, LA, OK, TX

Map Zones: 37:C, 44:P

USFS Ecomap Regions: 231E:CC, 232F:CC, 234C:PP, 234E:PP

TNC Ecoregions: 40:C, 41:C

SOURCES

References: Ajilusgi 1979, Brooks et al. 1993, Comer et al. 2003, Hoagland 2000, Marks and Harcombe 1981, Martin and Smith 1991, Nixon et al. 1983a, Smith 1996a, Soil Conservation Service 1990, Van Kley 1999a

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723144#references

Description Author: R. Evans, mod. M. Pyne and J. Teague

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

WEST GULF COASTAL PLAIN SMALL STREAM AND RIVER FOREST (CES203.487)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermittent Flooding; Forest and Woodland (Treed); West Gulf Coastal Plain; Riverine / Alluvial

National Mapping Codes: ESLF 9196

CONCEPT

Summary: This is a predominantly forested system of the West Gulf Coastal Plain associated with small rivers and creeks. In contrast to West Gulf Coastal Plain Large River Floodplain Forest (CES203.488), examples of this system have fewer major geomorphic floodplain features. Those features that are present tend to be smaller and more closely intermixed with one another, resulting in less obvious vegetational zonation. Bottomland hardwood tree species are typically important and diagnostic, although mesic hardwood species are also present in areas with less inundation, such as upper terraces and possibly second bottoms. As a whole, flooding occurs annually, but the water table usually is well below the soil surface throughout most of the growing season. Areas impacted by beaver impoundments are also included in this system.

Similar Ecological Systems:

- Southeastern Great Plains Riparian (CES205.709)
- West Gulf Coastal Plain Large River Floodplain Forest (CES203.488)

Related Concepts:

- Floodplain Hardwood Pine Forest (Marks and Harcombe 1981) Intersecting

DESCRIPTION

Environment: This system is associated with small rivers and creeks in the West Gulf Coastal Plain.

Vegetation: Some canopy trees in stands of this system include *Betula nigra*, *Celtis laevigata*, *Diospyros virginiana*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Liquidambar styraciflua*, *Pinus taeda*, *Platanus occidentalis*, *Quercus laurifolia*, *Quercus lyrata* (in longer hydroperiod stands), *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus phellos*, *Quercus texana*, *Taxodium distichum*, *Ulmus americana*, *Ulmus crassifolia*, and *Ulmus rubra*. Rarely, *Fagus grandifolia*, *Magnolia virginiana*, *Quercus alba*, *Quercus muehlenbergii*, *Ulmus alata*, and/or *Pinus palustris* may appear with *Chasmanthium sessiliflorum* in mesic, upper terrace examples. Shrubs and understory trees may include (depending on length of hydroperiod) *Carpinus caroliniana*, *Cephalanthus occidentalis*, *Cornus obliqua*, *Crataegus marshallii*, *Ilex opaca*, *Ostrya virginiana*, *Salix nigra*, and *Vaccinium fuscatum*. In addition, *Arundinaria gigantea* may be present. Vines may include *Berchemia scandens*, *Smilax bona-nox*, and *Toxicodendron radicans*. Some herbs may include *Bidens aristosa*, *Boehmeria cylindrica*, *Carex cherokeensis*, *Carex debilis*, *Carex digitalis*, *Carex jorii*, *Chasmanthium latifolium*, *Geum canadense*, *Glyceria striata*, *Leersia virginica*, and *Polygonum hydropiperoides*.

MEMBERSHIP

Associations:

- *Betula nigra* - *Liquidambar styraciflua* - *Platanus occidentalis* - *Quercus nigra* Forest (CEGL007898, G4Q)
- *Cephalanthus occidentalis* - *Cornus obliqua* - *Salix nigra* / *Smilax bona-nox* - *Toxicodendron radicans* / *Carex jorii* - *Polygonum hydropiperoides* Semipermanently Flooded Beaver Pond Shrubland [Provisional] (CEGL007990, G3)
- *Fagus grandifolia* - *Magnolia virginiana* - (*Pinus palustris*) / *Chasmanthium sessiliflorum* Sandhill Streamhead Forest (CEGL007976, G2G3)
- *Fagus grandifolia* - *Pinus taeda* - (*Liquidambar styraciflua*, *Magnolia grandiflora*, *Quercus alba*) Small Stream Forest (CEGL007320, G3)
- *Fagus grandifolia* - *Quercus* (*laurifolia*, *nigra*) - *Pinus taeda* Forest (CEGL008574, G3?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - (*Quercus texana*) - *Gleditsia triacanthos* / *Toxicodendron radicans* / *Bidens aristosa* - *Leersia virginica* Seasonally Flooded Floodplain Forest [Provisional] (CEGL007987, GNR)
- *Maclura pomifera* - *Diospyros virginiana* / *Glyceria striata* - (*Carex cherokeensis*) Woodland (CEGL007779, G2?)
- *Magnolia grandiflora* - *Fagus grandifolia* - *Quercus alba* - *Pinus taeda* Forest (CEGL007903, G3G4)
- *Pallavicinia lyellii* - *Sphagnum* sp. Nonvascular Vegetation (CEGL004779, G3)
- *Pinus taeda* - *Liquidambar styraciflua* - *Quercus* (*nigra*, *phellos*) / *Carpinus caroliniana* - *Crataegus marshallii* Stream Bottom Forest (CEGL004911, G3)
- *Pinus taeda* - *Quercus phellos* - *Quercus nigra* Forest (CEGL007910, G4)
- *Pinus taeda* Temporarily Flooded Forest (CEGL007142, G4?)
- *Populus deltoides* - *Salix nigra* / *Ilex vomitoria* Forest (CEGL004613, G3?)
- *Quercus laurifolia* - *Liquidambar styraciflua* - *Nyssa biflora* - *Acer rubrum* / *Sabal minor* Forest (CEGL007804, G3?)
- *Quercus michauxii* - *Quercus nigra* - *Pinus taeda* / *Carpinus caroliniana* Forest (CEGL007901, G3?)
- *Quercus muehlenbergii* - *Liquidambar styraciflua* / (*Arundinaria gigantea*) / *Carex cherokeensis* - *Chasmanthium latifolium* Mesic Riparian Forest (CEGL007780, G3?)

- *Quercus nigra* - *Liquidambar styraciflua* - (*Pinus taeda*) / *Ilex opaca* - *Vaccinium fuscatum* / *Carex debilis* Temporarily Flooded Forest (CEGL007984, G4?)
- *Quercus nigra* - *Quercus phellos* / *Carya myristiciformis* - *Sabal minor* / *Carex cherokeensis* Forest (CEGL007954, G2G3)
- *Quercus nigra* - *Ulmus alata* / *Ostrya virginiana* Stream Terrace Forest [Provisional] (CEGL007953, GNR)
- *Quercus pagoda* - *Liquidambar styraciflua* - *Pinus taeda* Forest (CEGL007899, G3?)
- *Quercus pagoda* - *Quercus similis* - *Carya glabra* - *Quercus sinuata* var. *sinuata* / *Crataegus triflora* Forest (CEGL007359, G1)
- *Quercus pagoda* / *Ulmus crassifolia* - *Celtis laevigata* / *Carex cherokeensis* Forest (CEGL007952, G2G3)
- *Quercus texana* - *Quercus lyrata* Forest (CEGL007407, G3G4)
- *Taxodium distichum* - *Fraxinus pennsylvanica* Gallery Forest (CEGL007928, G2Q)
- *Ulmus americana* - *Fraxinus pennsylvanica* - *Celtis laevigata* / *Glyceria striata* - (*Carex cherokeensis*) Riparian Blackland Woodland (CEGL007778, G1?)
- *Ulmus crassifolia* - *Celtis laevigata* - (*Ulmus rubra*) / *Carex digitalis* - *Geum canadense* Forest (CEGL007950, G2G3)

Alliances:

- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Maclura pomifera* Woodland Alliance (A.1917)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus texana* - (*Quercus lyrata*) Seasonally Flooded Forest Alliance (A.331)
- *Sphagnum* spp. - *Pallavicinia lyellii* Saturated Nonvascular Alliance (A.1823)
- *Taxodium distichum* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.298)
- *Ulmus americana* - *Celtis laevigata* Woodland Alliance (A.1916)

DISTRIBUTION

Range: West Gulf Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: AR, LA, OK, TX

Map Zones: 36:?, 37:C, 44:C

TNC Ecoregions: 31:P, 40:C, 41:C

SOURCES

References: Comer et al. 2003, Marks and Harcombe 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723099#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1451 WEST GULF COASTAL PLAIN WET LONGLEAF PINE SAVANNA AND FLATWOODS (CES203.191)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); West Gulf Coastal Plain; Extensive Wet Flat; Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2451; ESLF 9120; ESP 1451

CONCEPT

Summary: This system was the historical matrix vegetation of the outer portions of the West Gulf Coastal Plain in Louisiana and eastern Texas, occurring most frequently on relatively recent geologic formations within the range of longleaf pine. These areas are characterized by poorly drained upland soils with high water tables (Bridges and Orzell 1990). In natural condition, monospecific stands of *Pinus palustris* and species-rich herbaceous layers characterize this system. Widespread alterations following European settlement, including changes to natural fire regimes, have produced drastic changes to this system, and few large examples are extant. Examples appear to be somewhat more common in western Louisiana than eastern Texas.

Classification Comments: In Louisiana, two Natural Heritage communities (variants) of this system are recognized (Smith 1996b). These two variants are the longleaf pine flatwoods (which are mesic to dry-mesic [non-wetland] stands) and the true pine savannas which occupy poorly drained and seasonally saturated/flooded depressional areas and low flats. These two types form an interdigitated mosaic (Smith 1996b), which constitutes this system as here described and defined.

Similar Ecological Systems:

- West Gulf Coastal Plain Stream Terrace Sandyland Longleaf Pine Woodland (CES203.891)
- West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293)

Related Concepts:

- Longleaf-Blackgum Savannas (Ajilusgi 1979) Equivalent
- Wetland Pine Savanna (Marks and Harcombe 1981) Undetermined

DESCRIPTION

Environment: This system represents the presumed matrix vegetation of the outer (seaward) portions of the West Gulf Coastal Plain in Louisiana and eastern Texas, on relatively recent (Pleistocene) geologic formations within the range of longleaf pine. In Louisiana, these are mapped as the Intermediate Terrace and the upper Prairie Terrace (Snead and McCulloh 1984), and in Texas as the Lissie Formation and the upper Beaumont Formation (Sellards et al. 1932). The Intermediate Terrace of Snead and McCulloh (1984) includes terraces formerly designated as the Montgomery, Irene, and most of the Bentley. Within the range of longleaf pine, this system is bounded on the landward side by West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293).

MEMBERSHIP

Associations:

- *Pinus palustris* / *Eryngium integrifolium* - *Rhynchospora* spp. - (*Ctenium aromaticum*) Woodland (CEGL003646, G2G3)
- *Pinus palustris* / *Rhynchospora elliottii* - *Lobelia flaccidifolia* - *Platanthera nivea* - (*Helenium drummondii*) Woodland (CEGL007802, G2G3)
- *Pinus palustris* / *Schizachyrium scoparium* - *Schizachyrium tenerum* - *Silphium gracile* Woodland (CEGL003581, G2)
- *Pinus palustris* / *Sporobolus silveanus* - *Muhlenbergia capillaris* - *Chaetopappa asteroides* Woodland (CEGL003654, G1)

Alliances:

- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Texas-Louisiana Coastal Prairie (CES203.550)
- West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293)

DISTRIBUTION

Range: This system is endemic to western Louisiana and eastern Texas.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 37:C

USFS Ecomap Regions: 232E:CC, 232F:CC

TNC Ecoregions: 31:C, 41:C

SOURCES

References: Ajilusgi 1979, Bridges and Orzell 1990, Comer et al. 2003, Marks and Harcombe 1981, Sellards et al. 1932, Smith 1996b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723249#references

Description Author: R. Evans, mod. M. Pyne

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

WESTERN GREAT PLAINS FLOODPLAIN (CES303.678)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Deep (>15 cm) Water; Long (>25 yrs) Flooding Interval; Floodplain; Forest and Woodland (Treed); Herbaceous; Riverine / Alluvial

National Mapping Codes: ESLF 9153

CONCEPT

Summary: This ecological system is found in the floodplains of medium and large rivers of the western Great Plains. It occurs on the lower reaches of the North and South Platte, Platte, Arkansas, and Canadian rivers. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system. These are the perennial big rivers of the region with hydrologic dynamics largely driven by snowmelt in the mountains, instead of local precipitation events. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats; however, they are linked by underlying soils and the flooding regime. Dominant species include *Populus deltoides* and *Salix* spp. Grass cover underneath the trees is an important part of this system and is a mix of tallgrass species, including *Panicum virgatum* and *Andropogon gerardii*. *Tamarix* spp. and less desirable grasses and forbs can invade degraded areas within the floodplains, especially in the western portion of the province. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. Another factor is that groundwater depletion and lack of fire have created additional species changes. In most cases, the majority of the wet meadow and prairie communities may be extremely degraded or extirpated from the system.

Classification Comments: All the riparian/floodplain/alluvial systems of the Great Plains region need to be revisited for naming conventions, along with better definitions of conceptual boundaries. There is much apparent overlap in their concepts and distribution, and the names add to the confusion. In particular, the difference between "riparian" and "floodplain" usage in the names needs revisiting and possible changing. These systems include Northwestern Great Plains Floodplain (CES303.676), Northwestern Great Plains Riparian (CES303.677), Western Great Plains Floodplain (CES303.678), and Western Great Plains Riparian (CES303.956). Need to review if there needs to be another split of this system into a Central Great Plains floodplain system and a Southern Great Plains floodplain system. Will need to review in conjunction with Northwestern Great Plains Floodplain (CES303.676).

Similar Ecological Systems:

- Northwestern Great Plains Floodplain (CES303.676)
- South-Central Interior Large Floodplain (CES202.705)

Related Concepts:

- Bluestem Prairie (601) (Shiflet 1994) Intersecting
- Bur Oak: 236 (Eyre 1980) Intersecting
- Cottonwood - Willow: 235 (Eyre 1980) Broader

DESCRIPTION

Environment: This system is found primarily along floodplains of medium and large rivers. Soils are primarily alluvial and range from sandy to dense clays.

Vegetation: Dominant woody species occurring within this system include *Populus deltoides* and *Salix* spp. Understory species constitute an important component of this system and include a mixture of tallgrass prairie species, including *Panicum virgatum* and *Andropogon gerardii*. Sparsely vegetated areas, such as gravel and sand flats, are also included within this system.

Dynamics: Periodic and intermediate flooding (i.e., every 5-25 years) constitutes the major process influencing this system. Grazing and conversion to agriculture can significantly impact this system and can lead to the degradation or extirpation of the majority of prairie and wet meadow communities from this system.

MEMBERSHIP

Associations:

- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Elaeagnus angustifolia* Semi-natural Woodland (CEGL005269, GNA)
- *Ericameria nauseosa* / *Pseudoroegneria spicata* Shrubland (CEGL001330, G3Q)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix (exigua, interior)* Woodland (CEGL000659, G3G4)
- *Populus deltoides* - *Salix nigra* Woodland (CEGL004919, G3G4Q)
- *Populus deltoides* - *Ulmus americana* - *Celtis laevigata* Forest (CEGL002096, G3)
- *Populus deltoides* / *Carex pellita* Woodland (CEGL002649, G2)
- *Populus deltoides* / *Muhlenbergia asperifolia* Forest (CEGL000678, G3)
- *Populus deltoides* / *Panicum virgatum* - *Schizachyrium scoparium* Woodland (CEGL001454, G2)

- Riverine Gravel Flats Great Plains Sparse Vegetation (CEGL005223, GNR)
- Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049, G4G5)
- *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203, G5)
- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus pungens* - *Suaeda calceoliformis* Alkaline Herbaceous Vegetation (CEGL002040, G3G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Typha (angustifolia, domingensis, latifolia)* - *Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032, G3G4)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)
- *Ulmus (americana, rubra)* - *Quercus muehlenbergii* Forest (CEGL002091, GNR)
- *Ulmus americana* - *Celtis (laevigata, occidentalis)* - *Fraxinus pennsylvanica* Forest (CEGL002090, G3?)

Alliances:

- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Elaeagnus angustifolia* Semi-natural Woodland Alliance (A.3566)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Populus deltoides* ssp. *wislizeni* Temporarily Flooded Forest Alliance (A.312)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- Sand Flats Temporarily Flooded Sparsely Vegetated Alliance (A.1864)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found along major river floodplains in the southern and central portions of the Western Great Plains Division. This system occurs on the middle to lower reaches of the North and South Platte, Platte, Arkansas, and Canadian rivers. Major river floodplains of eastern Wyoming and Montana are included in Northwestern Great Plains Floodplain (CES303.676) and not this system.

Divisions: 205:C; 303:C

Nations: US

Subnations: CO, KS, NE, OK, SD, TX

Map Zones: 22:C, 25:?, 26:C, 27:C, 28:P, 31:C, 32:C, 33:C, 34:C, 35:C, 36:C, 38:C, 43:C

USFS Ecomap Regions: 251B:CC, 251F:CP, 251H:CC, 315A:CC, 315B:CC, 315F:CC, 331B:CC, 331C:CC, 331H:CC, 331I:CC, 332B:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC, M331F:C?, M331I:C?

TNC Ecoregions: 27:C, 28:C, 32:C, 33:C, 37:C

SOURCES

References: Comer et al. 2003, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722980#references

Description Author: S. Menard and K. Kindscher, mod. K.A. Schulz

Version: 23 Jan 2008

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

HERBACEOUS WETLAND

ACADIAN COASTAL SALT MARSH (CES201.578)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); Tidal / Estuarine; Graminoid; *Spartina* (*patens*, *alterniflora*)

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Long (>500 yrs) Persistence; Herbaceous; Organic Peat (>40 cm); Mineral: W/ A-Horizon >10 cm

National Mapping Codes: ESLF 9278

CONCEPT

Summary: This system covers marshes of the Gulf of Maine, along the immediate ocean shore and near estuary mouths, where salinity regime is polyhaline. Sometimes called "salt meadows," these marshes display strong graminoid dominance, with patchy forbs. *Spartina patens* and *Spartina alterniflora* are the major dominants. These marshes may be extensive where the local topography allows their development; they are generally not associated with sand beach and dune systems, being more characteristic of the primarily rocky portions of the Gulf of Maine coast. Where the coastal topography becomes more dissected, they are more commonly seen as a fairly narrow fringe along tidal shorelines. These marshes are typically less extensive and with some different floristic elements than the marshes southward along the Atlantic Coast from Cape Cod to Chesapeake Bay.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)

MEMBERSHIP

Associations:

- *Ascophyllum nodosum* - *Fucus vesiculosus* Tidal Algal Nonvascular Vegetation (CEGL006341, GNR)
- *Ruppia maritima* Acadian/Virginian Zone Temperate Herbaceous Vegetation (CEGL006167, GNR)
- *Salicornia* (*virginica*, *bigelovii*, *maritima*) - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308, G5)
- *Spartina alterniflora* / (*Ascophyllum nodosum*) Acadian/Virginian Zone Herbaceous Vegetation (CEGL004192, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus gerardii*) Herbaceous Vegetation (CEGL006006, G5)

Alliances:

- *Ascophyllum nodosum* - *Fucus vesiculosus* Tidal Algal Nonvascular Alliance (A.3011)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)

DISTRIBUTION

Range: This system occurs along the coastline of the Gulf of Maine, from north of Cape Cod north and east to the Bay of Fundy.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: MA, ME, NB, NH, NS

Map Zones: 65:C, 66:C

USFS Ecomap Regions: 211Cb:CCC, 211Db:CCC, 211Dc:CCC, 221Aa:CCC, 221Ak:CCC

TNC Ecoregions: 62:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723027#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East

ClassifResp: East

ACADIAN ESTUARY MARSH (CES201.579)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Brackish (Mesohaline); Tidal / Estuarine; Graminoid; *Spartina* (*patens*, *alterniflora*)

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Herbaceous; Organic Peat (>40 cm); Mineral: W/ A-Horizon >10 cm

National Mapping Codes: ESLF 9292

CONCEPT

Summary: These marshes are found along mesohaline reaches of estuaries of the Gulf of Maine. Emergent and submergent vegetation characterizes this system. Dominance ranges from extensive grasslands (tall *Schoenoplectus* spp., etc.) to sparsely vegetated mudflats, all tidally influenced. These marshes grade into the salt marsh system at the mouth of estuaries. They are typically less extensive and more floristically depauperate than the marshes southward along the Atlantic Coast to Chesapeake Bay.

Classification Comments: Differences between marshes in Division 202 and Division 201 may be sufficient to distinguish them as separate systems; however, data on estuarine marshes in Division 201 (Laurentian-Acadian) is very sketchy and should be better documented before such a split is made.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Brackish Tidal Marsh (CES203.894)--occurs to the south.
- Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.516)--occurs upriver to the limit of tidal influence.

MEMBERSHIP

Associations:

- *Alnus* (*incana* ssp. *rugosa*, *serrulata*) - *Cornus amomum* Shrubland (CEGL006337, GNR)
- *Amaranthus cannabinus* Tidal Herbaceous Vegetation (CEGL006080, G3G5)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Vegetation (CEGL004473, G2G4)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Stuckenia pectinata* - *Potamogeton perfoliatus* - (*Zannichellia palustris*) Tidal Herbaceous Vegetation (CEGL006027, G3G5)
- *Typha angustifolia* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201, G4G5)

Alliances:

- *Alnus* (*incana*, *serrulata*, *maritima*) Tidal Shrubland Alliance (A.1024)
- *Amaranthus cannabinus* Tidal Herbaceous Alliance (A.1706)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Alliance (A.1710)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Stuckenia pectinata* - *Zannichellia palustris* Permanently Flooded Herbaceous Alliance (A.1768)
- *Typha* (*angustifolia*, *domingensis*) Tidal Herbaceous Alliance (A.1472)

DISTRIBUTION

Range: This system is found along the coastline of the Gulf of Maine, from Cape Cod north and east to the Bay of Fundy, extending upstream in estuaries to the brackish water limit.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: MA, ME, NB, NH

Map Zones: 65:C, 66:C

USFS Ecomap Regions: 211Cb:CCC, 211Db:CCC, 211Dc:CCC, 221Aa:CCC, 221Ak:CCC

TNC Ecoregions: 62:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723026#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East
ClassifResp: East

ATLANTIC COASTAL PLAIN EMBAYED REGION SEAGRASS BED (CES203.243)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9295

CONCEPT

Summary: This system of seagrass beds occurs primarily in the embayed regions of North Carolina and southeastern Virginia. The vast series of barriers provides ample area for colonization of hydromorphic herbaceous vegetation in protected sounds and lagoons which are subject to wind tides only. Local habitats range from small guts, shallow tributary creeks, and large marsh pools along freshwater and oligohaline sections of tidal rivers to shallow estuarine bays, tidal creeks, and salt marsh pools. This system lies outside the climatic range for most tropical species, especially *Thalassia testudinum* and *Cymodocea filiformis*. These species are largely replaced by *Zostera marina*. This region is the northern terminus for *Halodule beaudettei*, and most typical beds of the region can be characterized as *Zostera - Halodule* (Thayer et al. 1984).

Classification Comments: Northern Atlantic Coastal Plain Seagrass Bed (CES203.246) is a related system with a range to the north of this type that is generally characterized as *Zostera - Ruppia* (Thayer et al. 1984).

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
- Northern Atlantic Coastal Plain Seagrass Bed (CES203.246)

DESCRIPTION

Environment: Water salinity ranges from oligohaline at the mouths of tidal rivers to brackish waters.

Vegetation: According to Fleming et al. (2001), *Ceratophyllum demersum* is the most important and abundant species found along the freshwater margins of this system, where associates include *Utricularia* spp., *Elodea nuttallii*, *Spirodela polyrrhiza*, and *Wolffiella gladiata*. Shallow waters may support sparse to dense surface cover of *Nymphaea odorata* or, rarely, *Nelumbo lutea*. More saline areas support *Ruppia maritima*, *Zostera marina*, *Zannichellia palustris*, and *Stuckenia pectinata*. Aquatic algae are frequent to abundant associates. In portions of the area where *Zostera* and *Halodule* co-occur, each attains maximum biomass at different times of the year (Thayer et al. 1984).

Dynamics: The dynamics of tidal, aquatic communities dominated by vascular plants are complex and poorly understood. The distribution and abundance of vascular plants in these habitats are probably controlled by responses to water chemistry, water clarity and light penetration, the impact of currents and boat wakes, and herbivory by aquatic animals (Fleming et al. 2001).

MEMBERSHIP

Associations:

- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Ruppia maritima* Carolinian Zone Herbaceous Vegetation (CEGL004335, G4G5)
- *Zostera marina* Herbaceous Vegetation (CEGL004336, G4G5)

Alliances:

- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Zostera marina* Permanently Flooded - Tidal Herbaceous Alliance (A.1766)

DISTRIBUTION

Range: This system is found in the embayed regions of North Carolina and southeastern Virginia southward to Cape Fear. South of Cape Fear seagrasses are largely absent until the St. Johns region of Florida (Kenworthy pers. comm.).

Divisions: 203:C

Nations: US

Subnations: NC, VA

Map Zones: 58:C, 60:C

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2001, Thayer et al. 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723242#references

Description Author: R. Evans

Version: 23 Sep 2002

Stakeholders: East, Southeast

ATLANTIC COASTAL PLAIN EMBAYED REGION TIDAL FRESHWATER MARSH (CES203.259)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9276

CONCEPT

Summary: Embayed region tidal freshwater marshes are characterized by fresh to oligohaline waters which are driven by irregular wind tides, with minimal lunar tidal influence. They are the predominant marsh system in the drowned creeks and inland estuary shores of the embayed region of northeastern North Carolina and adjacent Virginia. This system typically occurs as complexes of several associations dominated by large graminoids such as *Spartina patens*, *Cladium mariscus ssp. jamaicense*, *Schoenoplectus pungens*, *Typha angustifolia*, *Typha latifolia*, and *Juncus roemerianus*, sometimes with species-rich associations of shorter graminoids, forbs, and floating or submerged aquatics. While some association dominants are tolerant of brackish water, they are associated with plants restricted to oligohaline or freshwater. Irregular flooding and fire are both important forces in this system, and rising sea level is a particularly important driver of long-term trends.

Classification Comments: The distinction between this system and other tidal freshwater marsh systems is based on the distinctive dynamics of the irregular wind tidal flooding.

DESCRIPTION

Environment: The embayed region of the Mid-Atlantic Coastal Plain stretches along northeastern North Carolina and adjacent areas of Virginia. Estuaries in drowned river valleys are unusually extensive here. The barrier islands along the coast are unusually continuous and the ocean's tidal range modest. This produces estuaries where irregular wind tides are the dominant hydrological process. The water is oligohaline to fresh over most of the tidal areas, with brackish water near the coast and saltwater only on or near the barrier island inlets. Rainfall may be an important influence in marsh interiors for significant periods of time between high wind tides. Soils appear to be essentially always saturated, with shallow flooding for periods of several days at all times of year. Due to limited sediment transport, marsh soils are primarily organic. Marshes occur in small to large patches or bands along the drowned creeks and rivers. Most give way to tidal swamps inland and upstream, but some occur on islands. Those near the transition to brackish water may grade to wind tide-influenced brackish marshes downstream.

Vegetation: This system consists largely of wetland vegetation dominated by large graminoid herbs that are tolerant of constant saturation but intolerant of too much salt. *Spartina patens*, *Cladium mariscus ssp. jamaicense*, *Schoenoplectus pungens*, *Typha angustifolia*, and *Typha latifolia* dominate large areas. *Juncus roemerianus* is sometimes a dominant, especially in areas that have become fresh in the last 100 years as a result of coastal inlet changes. All of these dominants are accompanied by at least a few other plants intolerant of saltwater. Vegetation dominated by smaller graminoids, wetland forbs, submerged or floating aquatics, shrubs, or open stands of trees may also be present. Individual marshes usually are mosaics or zoned complexes of patches of the component associations.

Dynamics: Hydrology is the most important driving process, with the constant saturation determining the potential vegetation, and the variable flooding and variations in salinity in the fresh to brackish range a primary disturbance. Rising sea level is an important driver of longer term vegetation trends, including expansion into adjacent swamp areas. Fire is also an important natural process in all but the smallest and most isolated patches. Frost (pers. comm.) estimates that many marshes burned as often as every three years in presettlement times and were an important source of ignition for adjacent communities. Marshes that have not burned recently have lower species richness, are more strongly dominated by the large graminoids, and are believed to be poorer habitat for waterfowl. Marshes often show evidence of transition to or from treed communities, in the form of young invading trees and shrubs or standing dead older trees. Lack of fire appears to be allowing sufficient tree invasion to eventually produce a swamp forest in some upstream examples, but the trend in most places is toward development of marshes in former swamp areas.

MEMBERSHIP

Associations:

- *Carex stricta* - *Peltandra virginica* - *Sagittaria (lancifolia ssp. media, latifolia)* Tidal Herbaceous Vegetation (CEGL004314, G2?)
- *Cladium mariscus ssp. jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Eleocharis fallax* - *Eleocharis rostellata* - *Schoenoplectus americanus* - *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004628, G1G2)
- *Eriocaulon parkeri* - *Polygonum punctatum* Herbaceous Vegetation (CEGL006352, G2)
- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Isoetes riparia* Tidal Herbaceous Vegetation (CEGL006058, GNR)
- *Juncus roemerianus* - *Pontederia cordata* Herbaceous Vegetation (CEGL004660, G2G3)
- *Morella cerifera* - *Rosa palustris* / *Thelypteris palustris var. pubescens* Shrubland (CEGL004656, G4)

- *Nuphar lutea ssp. advena* Tidal Herbaceous Vegetation (CEGL004472, G4G5)
- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Vegetation (CEGL004473, G2G4)
- *Schoenoplectus pungens* - (*Osmunda regalis* var. *spectabilis*) Herbaceous Vegetation (CEGL004189, G2G3)
- *Spartina alterniflora* - *Lilaeopsis chinensis* Herbaceous Vegetation (CEGL004193, G3G4)
- *Spartina cynosuroides* - *Panicum virgatum* - *Phyla lanceolata* Herbaceous Vegetation (CEGL007741, G2G3)
- *Spartina cynosuroides* Herbaceous Vegetation (CEGL004195, G4)
- *Typha angustifolia* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201, G4G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Zizania aquatica* Tidal Herbaceous Vegetation (CEGL004202, G4?)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Cladium mariscus ssp. jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Eriocaulon parkeri* Tidal Herbaceous Alliance (A.1701)
- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Isoetes riparia* Tidal Herbaceous Alliance (A.1879)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Morella cerifera* - *Rosa palustris* Tidal Shrubland Alliance (A.806)
- *Nuphar lutea* Tidal Herbaceous Alliance (A.1708)
- *Peltandra virginica* - *Pontederia cordata* Tidal Herbaceous Alliance (A.1703)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Alliance (A.1710)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina cynosuroides* Tidal Herbaceous Alliance (A.1480)
- *Typha (angustifolia, domingensis)* Tidal Herbaceous Alliance (A.1472)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizania aquatica* Tidal Herbaceous Alliance (A.1484)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

SPATIAL CHARACTERISTICS

Size: Patches range from a few square meters to 1000-2000 acres.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Adjacent Ecological System Comments: Generally grades to Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240) inland and upstream. May grade to Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260) downstream or seaward. Occasionally borders uplands or other wetlands.

DISTRIBUTION

Range: This system is restricted to the embayed region of North Carolina and Virginia, with the best development along the North Carolina-Virginia border. The transition to areas with more lunar tidal influence is fairly gradual to the south over a space of 50 miles.

Divisions: 203:C

Nations: US

Subnations: NC, VA

Map Zones: 58:C, 60:C

USFS Ecomap Regions: 232I:CC

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723227#references

Description Author: R. Evans, M. Schafale, G. Fleming

Version: 23 Sep 2002

Concept Author: R. Evans, M. Schafale, G. Fleming

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN EMBAYED REGION TIDAL SALT AND BRACKISH MARSH (CES203.260)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9261

CONCEPT

Summary: This system encompasses the brackish to salt intertidal marshes of the embayed region of southeastern Virginia and adjacent North Carolina. It is distinguished by the extensive brackish water and wind tidal flooding characteristic of that region. Low diversity, often monospecific, marshes are found on intertidal flats generally cut off from direct oceanic influence by a series of protective barrier islands. Embedded within the matrix of marshes are smaller hypersaline areas or salt pannes.

Classification Comments: This system is distinguished from the salt marsh systems to the north and south because of the characteristic hydrology of the embayed region and its implications to ecosystem dynamics. However, the species-poor vegetation is not notably different. There is some question whether the few salt marshes on near inlets on the barrier islands in this region should be considered part of this system. They have regular lunar tidal flooding and full strength saltwater, both not characteristic of most of the region. However, lunar tidal flooding is muted compared to other regions. Submerged aquatic vegetation (*Ruppia*, etc.) is covered under the Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243).

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243)
- Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)
- Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

DESCRIPTION

Environment: Occurs on intertidal flats that are tidally flooded with salt to brackish water in the Embayed Region of the Mid-Atlantic Coastal Plain in North Carolina and Virginia. The embayed region is characterized by very extensive sounds cut off from the ocean by long barrier islands with few tidal inlets. A low tidal range in the ocean in this region limits tidal exchange at the inlets. Saltwater is present only in limited areas near the inlets. Brackish water prevails in most of the southern part of the region and some of the seaward side of the northern part of the region, grading to oligohaline and freshwater inland and northward, as well as upstream in tidal creeks. Lunar tidal fluctuation is negligible in most of the embayed region, and the irregular flooding of wind tides dominates. Soils are generally organic, but mineral soils are present in the more regularly flooded areas.

Vegetation: Vegetation is primarily herbaceous marsh, most of it dominated by *Juncus roemerianus*. Areas near tidal inlets have salt marsh dominated by *Spartina alterniflora*. The marshes are low in species richness and are strongly dominated by a single species. Also part of the system are more limited communities such as hypersaline flats dominated by *Distichlis spicata* and *Sarcocornia*, salt-tolerant shrublands, and a few hammocks that occur on small elevated areas closely associated with the marshes.

Dynamics: Tidal flooding is the ecological factor that distinguishes this system from others. Because tides are irregular and shifts not as frequent or as strong as in lunar tide-dominated areas, sediment transport and probably productivity are lower in the marshes. Storms may drive increased amounts of salt into the sounds, stressing or killing plants in the brackish marshes. For marshes on the back of barrier islands, overwash in storms may deposit sand in the marsh. Marshes usually recover from this, but if sufficient sand is deposited, a different system may develop on the site. Fire is a natural force in the larger and less isolated patches of marsh, removing dead material, stimulating growth, and increasing species richness slightly but not altering overall composition. Rising sea level will affect this system strongly, drowning some marsh areas, promoting shoreline erosion, and causing salt or brackish marshes to spread into freshwater marsh areas.

MEMBERSHIP

Associations:

- *Baccharis halimifolia* - *Iva frutescens* / *Panicum virgatum* Shrubland (CEGL003921, G5)
- *Borrichia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Eriocaulon parkeri* - *Polygonum punctatum* Herbaceous Vegetation (CEGL006352, G2)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Juniperus virginiana* var. *silicicola* - (*Quercus virginiana*, *Sabal palmetto*) Forest (CEGL007813, G3?)
- *Phragmites australis* Temperate Upland Herbaceous Vegetation (CEGL004019, GNA)
- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Vegetation (CEGL004473, G2G4)
- *Salicornia* (*virginica*, *bigelovii*, *maritima*) - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308, G5)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Spartina alterniflora* / (*Ascophyllum nodosum*) Acadian/Virginian Zone Herbaceous Vegetation (CEGL004192, G5)

- *Spartina alterniflora* Carolinian Zone Herbaceous Vegetation (CEGL004191, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus roemerianus*) Herbaceous Vegetation (CEGL004197, G4G5)

Alliances:

- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Borrchia frutescens* Tidal Shrubland Alliance (A.1026)
- *Eriocaulon parkeri* Tidal Herbaceous Alliance (A.1701)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Phragmites australis* Herbaceous Alliance (A.1196)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Alliance (A.1710)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system.

Size: Occurs in small to large patches, with a few ranging up to thousands of acres.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)

Adjacent Ecological System Comments: Grades to Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259) upstream and inland. May border various communities on the upland side.

DISTRIBUTION

Range: Endemic to southeastern Virginia and adjacent North Carolina.

Divisions: 203:C

Nations: US

Subnations: NC, VA

Map Zones: 58:C, 60:C

USFS Ecomap Regions: 232I:CC

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723226#references

Description Author: R. Evans, M. Schafale, G. Fleming

Version: 23 Sep 2002

Concept Author: R. Evans, M. Schafale, G. Fleming

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN INDIAN RIVER LAGOON SEAGRASS BED (CES203.256)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9254

CONCEPT

Summary: Seagrass beds comprising this ecological system are found on the Atlantic Coast of Florida from approximately the St. Johns River (near the Florida-Georgia border) south to Sebastian Inlet (approximately from 30 degrees 30 minutes N latitude to 28 degrees N latitude). This region is the northernmost range of *Thalassia testudinum* and *Cymodocea filiformis* along the Atlantic Coast (Kenworthy pers. comm.). Seagrasses in this region are found in a narrow longitudinal complex of lagoonal embayments, including Mosquito Lagoon, Indian River, and Banana River, where they occupy approximately 2% of the available bottom area (Moore 1992). All of the typical seagrass species are present, including *Cymodocea filiformis*, *Halodule beaudettei*, *Halophila engelmannii*, *Ruppia maritima*, and *Thalassia testudinum*. Little specific information is available on the extent of each type, but it is believed that several of the individual seagrass species may be found in mixed-species beds. More commonly, they are likely to exhibit the general pattern of individual species zonation typical of other systems where zones are largely related to water depth. Beds along the northern boundary of the system are somewhat less diverse than those associated with the Indian River Lagoon, due largely to the absence of *Halophila engelmannii* (which does not extend northward of the lagoon) (W. Kenworthy pers. comm.).

Similar Ecological Systems:

- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Florida Keys Seagrass Bed (CES411.285)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: This system is largely protected from storm surges by a nearly continuous series of protective barriers which are perched on limestone and consequently wind tides predominate. This region is connected to the Atlantic by 4 small inlets. However, since freshwater inputs are so localized and minimal, water salinity is close to sea strength.

Vegetation: All of the typical seagrass species are present, including *Cymodocea filiformis*, *Halodule beaudettei*, *Halophila engelmannii*, *Ruppia maritima*, and *Thalassia testudinum*. Little specific information is available on the extent of each type, but it is believed that several of the individual seagrass species may be found in mixed-species beds.

MEMBERSHIP

Associations:

- *Cymodocea filiformis* - (*Thalassia testudinum*) Herbaceous Vegetation (CEGL004317, G4?)
- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Carolinian Zone Herbaceous Vegetation (CEGL004335, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Cymodocea filiformis* Permanently Flooded - Tidal Herbaceous Alliance (A.1732)
- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: This system occurs in Florida, from the St. Johns River (near the Florida-Georgia border) south to Sebastian Inlet, in a narrow longitudinal complex of lagoonal embayments along the Florida coast, including Mosquito Lagoon, Indian River, and Banana River.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 55:C, 56:C

SOURCES

References: Comer et al. 2003, Kenworthy pers. comm., Moore 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723230#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN INDIAN RIVER LAGOON TIDAL MARSH (CES203.257)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9253

CONCEPT

Summary: This tidally influenced marsh system of the Indian River Lagoon along Florida's Atlantic Coast supports approximately 10% of the salt marshes in Florida (Montague and Wiegert 1990). This area begins in the vicinity of Daytona Beach and extends south from there. The bulk of these are "high marshes" wholly above mean high water levels. They are protected from direct exposure to the Atlantic Ocean by perched barrier islands, and consequently receive natural inundation only from wind tides and seasonal sea level changes. A berm or levee generally separates these high marshes from lower fringing marshes of *Spartina alterniflora* (to the north) and *Rhizophora mangle* (to the south). Landward of this berm, salt flats or hypersaline zones often develop with *Salicornia*, *Distichlis spicata*, *Borrhchia frutescens*, *Batis maritima*, and *Paspalum vaginatum*. In some areas these species occur in monospecific zones, while in others they co-occur, grading into occasional *Avicennia germinans*. These zones are followed by a typical *Juncus roemerianus* zone, and the most inland fringes may be dominated by *Spartina bakeri*. Marshes of this region have been heavily altered by mosquito control impoundments of the 1950s and 1960s.

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
- Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Tidal amplitudes in this region range from 0.6-1.5 meters. Tides have a minute range in the north contributing to a very narrow intertidal zone, which is sometimes occupied by *Spartina alterniflora*. In the south where tidal range is greater, mangroves occupy the intertidal zone, replacing *Spartina*.

Vegetation: *Spartina alterniflora* zone is dominant, with lesser area of *Juncus roemerianus* and *Spartina patens*.

MEMBERSHIP

Associations:

- *Cladium mariscus ssp. jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Distichlis spicata* - (*Sporobolus virginicus*) Herbaceous Vegetation (CEGL007694, G3G5)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Sarcocornia pacifica* - (*Batis maritima*, *Distichlis spicata*) Dwarf-shrubland (CEGL002278, G4)
- *Spartina alterniflora* Carolinian Zone Herbaceous Vegetation (CEGL004191, G5)
- *Spartina bakeri* - *Kosteletzkya virginica* Herbaceous Vegetation (CEGL004194, G3?)
- *Spartina bakeri* Herbaceous Vegetation (CEGL003992, G3?)

Alliances:

- *Cladium mariscus ssp. jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Distichlis spicata* Tidal Herbaceous Alliance (A.1882)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Spartina alterniflora*) Tidal Dwarf-shrubland Alliance (A.1705)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina bakeri* - (*Spartina patens*) Tidal Herbaceous Alliance (A.1479)

DISTRIBUTION

Range: This system is endemic to the Atlantic Coast of Florida where it ranges from central Volusia County, southward through Brevard, Indian River, St. Lucie, and northern Martin counties. This area begins in the vicinity of Daytona Beach and extends south from there.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

USFS Ecomap Regions: 232G:CC

TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723229#references

Description Author: R. Evans, mod. M. Pyne

Version: 22 Sep 2008

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN NORTHERN SALT POND MARSH (CES203.892)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9274

CONCEPT

Summary: This system occurs from New Hampshire to New York on ponds behind sandy or cobbly barrier beaches that are breached periodically by storm surges, causing seawater incursion into the pond. Salinity levels, and thus effects on vegetation, are highly variable as a result. A mixture of salt marsh, brackish marsh, and shrublands occur on the periphery of the pond. *Spartina patens*, *Typha angustifolia*, *Eleocharis parvula*, *Eleocharis halophila*, *Schoenoplectus maritimus* (= *Scirpus maritimus*), *Schoenoplectus pungens* (= *Scirpus pungens*), and *Hibiscus moscheutos* are typical species. Salt shrub vegetation at the upper reaches of flooding may occur, and *Ruppia maritima* or *Zannichellia palustris* may occur in the pond.

MEMBERSHIP

Associations:

- *Baccharis halimifolia* - *Iva frutescens* / *Panicum virgatum* Shrubland (CEGL003921, G5)
- *Cornus amomum* - *Alnus serrulata* Shrubland (CEGL006414, GNR)
- *Panicum virgatum* - *Spartina patens* Herbaceous Vegetation (CEGL006150, GNR)
- *Ruppia maritima* Acadian/Virginian Zone Temperate Herbaceous Vegetation (CEGL006167, GNR)
- *Schoenoplectus pungens* - *Eleocharis parvula* Herbaceous Vegetation (CEGL006398, GNR)
- *Spartina patens* - *Agrostis stolonifera* Herbaceous Vegetation (CEGL006365, GNR)
- *Spartina patens* - *Distichlis spicata* - (*Juncus gerardii*) Herbaceous Vegetation (CEGL006006, G5)
- *Spartina patens* - *Schoenoplectus pungens* - *Solidago sempervirens* Herbaceous Vegetation (CEGL004097, G2G3)
- *Typha angustifolia* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201, G4G5)

Alliances:

- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Typha* (*angustifolia*, *domingensis*) Tidal Herbaceous Alliance (A.1472)

DISTRIBUTION

Range: This system occurs in New Hampshire, Massachusetts and New York.

Divisions: 203:C

Nations: US

Subnations: MA, NH, NY

Map Zones: 65:C, 66:C

TNC Ecoregions: 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722788#references

Description Author: L.A. Sneddon, mod. S.C. Gawler

Version: 05 Oct 2004

Concept Author: L. Sneddon

Stakeholders: East

ClassifResp: East

1516 ATLANTIC COASTAL PLAIN SANDHILL SEEP (CES203.253)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: EVT 2516; ESLF 3187; ESP 1516

CONCEPT

Summary: This sandhill seep system occurs in small patches on slopes in dissected terrain, where a clay lens or other impermeable layer forces groundwater to the surface as seepage. This type occurs largely in the Fall-line Sandhills region of the Carolinas and Georgia but also rarely in other parts of the Atlantic Coastal Plain. Soils are seasonally to permanently saturated by seepage and range from sandy or clayey to mucky. Vegetation is variable and complex in composition and structure, consisting of a mixture of plants of pine savannas and streamhead pocosins, but contrasting with both in structure and proportions. The tree canopy may be open or absent, and patches of dense shrubs, dense grass, ferns, and various mixtures may be present. Fire is a crucial determinant of structure and composition; it tends to occur in a variable and patchy pattern that is driven by both the fire regime of the surrounding system and the wetness of the seep vegetation at the time.

Classification Comments: This system is distinguished from Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) by having wetland hydrology driven by seepage rather than seasonal high water table, and by vegetational and landscape differences. Occurs rarely in southeastern Georgia in escarpment areas which have greater topography than is locally typical, and perched water tables which flow to the surface in sloping areas.

Similar Ecological Systems:

- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- East Gulf Coastal Plain Interior Shrub Bog (CES203.385)
- Piedmont Seepage Wetland (CES202.298)

DESCRIPTION

Environment: This system occurs on gentle to steep slopes of dissected areas in interbedded sand and clay, largely in the Fall-line Sandhills region but rarely in other parts of the Atlantic Coastal Plain. Sites are seasonally to permanently saturated with seeping groundwater, forced to the surface by an impermeable layer such as a clay bed. Soils may be sandy, clayey, or in the wettest sites, mucky. The hydrological connection to adjacent Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254), whose well-drained sandy soils are the source of seepage water, is crucial. Fire is a crucial natural force, and is also dependent on the adjacent systems. At Fort Benning, Georgia, examples of this system occur in wet mineral soils in zones between drier, sandhills longleaf pine communities and saturated streamside forests dominated by *Nyssa biflora*.

Vegetation: Vegetation is a potentially diverse mixture of plants of wet savannas and pocosins. Vegetation structure may vary widely, with dense shrubs, dense herbs, or mixtures of shrubs and herbs, and with an open tree canopy or absent tree canopy occurring in complexes or in different patches. *Pinus palustris*, *Pinus serotina*, or several hardwood species may dominate the canopy. Characteristic Streamhead Pocosin shrubs, such as *Ilex glabra*, *Lyonia lucida*, *Clethra alnifolia*, *Toxicodendron vernix*, *Ilex coriacea*, and *Zenobia pulverulenta*, may mix with flatwoods shrubs, such as *Gaylussacia frondosa* and *Kalmia carolina*. The herbs are primarily species shared with wet savannas, such as *Aristida stricta*, *Calamovilfa brevipilis*, *Ctenium aromaticum*, *Andropogon glomeratus*, and a variety of showy forbs and insectivorous plants, but often occur in very different proportions. Large wetland ferns, such as *Osmunda cinnamomea*, *Osmunda regalis*, and *Pteridium aquilinum*, also often dominate.

Dynamics: Fire is the predominant natural dynamic force in this system and is critical in determining its structure and even its identity. Fire regime is dominated by the fire regime of the surrounding system, which naturally burned every few years, but is modified by the wetness and flammability of the seep vegetation. Some fires do not penetrate parts of the seeps, creating variable age and vegetation structure. Areas that seldom burn have dense shrubs, while areas that burn frequently are dominated by herbs. With long absence of fire, many seeps become indistinguishable from Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252). Canopy dynamics are probably driven mainly by fire, with hot fires killing the less fire-tolerant trees and creating a fine mosaic or zoned complex of older trees, younger regeneration, and treeless areas. Shrubs and herbs readily sprout after fires, but relative proportions are controlled by the frequency of fire.

MEMBERSHIP

Associations:

- (*Pinus palustris*, *Pinus serotina*) / *Ctenium aromaticum* - *Muhlenbergia expansa* - *Calamovilfa brevipilis* Woodland (CEGL003659, G2)
- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Clethra alnifolia* - *Toxicodendron vernix* / *Aristida stricta* - *Osmunda cinnamomea* - *Sarracenia* spp. Shrub Herbaceous Vegetation

(CEGL004467, G2?)

- *Gaylussacia frondosa* - *Clethra alnifolia* - *Arundinaria gigantea* ssp. *tecta* / *Aristida stricta* - *Pteridium aquilinum* var. *pseudocaudatum* Herbaceous Vegetation (CEGL004468, G3?)
- *Ilex coriacea* - *Lyonia lucida* - *Smilax laurifolia* Shrubland (CEGL004666, G3G4)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* / *Ctenium aromaticum* Woodland (CEGL003860, G3)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Rhynchospora oligantha* - *Sarracenia* spp. - (*Aristida beyrichiana*, *Ctenium aromaticum*) - *Osmunda cinnamomea* / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch, with occurrences ranging from a fraction of an acre to several acres. Patches sometimes occur in complexes in close proximity, but as often are isolated. Some seeps are linear bodies stretching across slopes, some are linear running downslope, and some are small oval bodies.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)

Adjacent Ecological System Comments: Generally, this system is surrounded by Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254). It is sometimes interspersed or found grading to Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252) on one side.

DISTRIBUTION

Range: This system occurs from east-central North Carolina to central Georgia, primarily in the Fall-line Sandhills region but occasionally occurring in the Outer Coastal Plain. For example, this system occurs in limited parts of southeastern Georgia associated with the topography of old escarpments. It occurs primarily in the Atlantic drainage but is rarely represented in the Gulf drainage (such as at Fort Benning, Georgia).

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232J:CC

TNC Ecoregions: 53:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003, M. Elliott pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723232#references

Description Author: M. Schafale and R. Evans

Version: 23 Sep 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL AND UPPER TEXAS COAST FRESH AND OLIGOHALINE TIDAL MARSH (CES203.472)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9243

CONCEPT

Summary: This ecological system includes tidal marshes strongly influenced by freshwater producing a fresh to oligohaline chemistry. These areas typically represent small patches along bay margins near the mouths of inflowing rivers from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

Similar Ecological Systems:

- Gulf Coast Chenier Plain Fresh and Oligohaline Tidal Marsh (CES203.467)

MEMBERSHIP

Associations:

- *Paspalum vaginatum* - *Spartina patens* Oligohaline Herbaceous Vegetation (CEGL007885, G2?)
- *Phragmites australis* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Herbaceous Vegetation (CEGL007891, G4?)
- *Schoenoplectus americanus* - (*Spartina patens*) - *Typha* spp. Herbaceous Vegetation (CEGL008476, G3?)

Alliances:

- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)

DISTRIBUTION

Range: This fresh and oligohaline marsh system of the central and upper coast of Texas ranges from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

Divisions: 203:C

Nations: US

Subnations: TX

Map Zones: 36:C

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723114#references

Description Author: J. Teague, mod. M. Pyne

Version: 04 Feb 2009

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL AND UPPER TEXAS COAST SALT AND BRACKISH TIDAL MARSH (CES203.473)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9244

CONCEPT

Summary: This ecological system encompasses the brackish to salt intertidal marshes of the central and upper coast of Texas. These marshes typically occur on the bay side of barrier islands. It also includes extensive irregularly flooded tidal flats and salt pannes, some vegetated by succulent herbs such as *Sarcocornia*, *Salicornia*, and *Batis*; some are nonvegetated. This system ranges from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

Similar Ecological Systems:

- Gulf Coast Chenier Plain Salt and Brackish Tidal Marsh (CES203.468)

DESCRIPTION

Environment: These marshes typically occur on the bay side of barrier islands. This system also includes extensive irregularly flooded tidal flats and salt pannes.

Vegetation: Some examples are vegetated by succulent herbs such as *Sarcocornia* spp, *Salicornia* spp., and *Batis maritima*; some are nonvegetated. Other plants that may be found in examples of this system include *Andropogon hallii*, *Artemisia filifolia*, *Avicennia germinans*, *Baccharis halimifolia*, *Borrchia frutescens*, *Distichlis spicata*, *Iva frutescens ssp. frutescens*, *Juncus roemerianus*, *Monanthochloe littoralis*, *Sarcocornia pacifica*, *Schoenoplectus americanus*, *Schoenoplectus californicus*, *Schoenoplectus pungens*, *Spartina alterniflora*, *Spartina patens*, *Spartina spartinae*, *Sporobolus virginicus*, and the exotic shrubs *Tamarix* spp.

MEMBERSHIP

Associations:

- *Avicennia germinans* / *Spartina alterniflora* Shrubland (CEGL003801, G2?)
- *Batis maritima* - *Sarcocornia pacifica* Dwarf-shrubland (CEGL003956, G5)
- *Borrchia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Distichlis spicata* - (*Sporobolus virginicus*) Herbaceous Vegetation (CEGL007694, G3G5)
- *Iva frutescens ssp. frutescens* - *Baccharis halimifolia* / *Spartina spartinae* Shrubland (CEGL004616, G4?)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Monanthochloe littoralis* Herbaceous Vegetation (CEGL003991, G2G3)
- *Sarcocornia pacifica* - (*Batis maritima*, *Distichlis spicata*) Dwarf-shrubland (CEGL002278, G4)
- *Spartina alterniflora* - *Distichlis spicata* - *Spartina patens* Mesohaline Tidal Herbaceous Vegetation (CEGL002230, G4?)
- *Spartina alterniflora* - *Juncus roemerianus* - *Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190, G5)
- *Spartina patens* - *Schoenoplectus (americanus, pungens)* - (*Distichlis spicata*) Herbaceous Vegetation (CEGL004755, G4?)
- *Spartina spartinae* - *Sporobolus virginicus* Tidal Herbaceous Vegetation (CEGL004199, G4G5)

Alliances:

- *Avicennia germinans* Tidal Shrubland Alliance (A.733)
- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Batis maritima* Tidal Dwarf-shrubland Alliance (A.1111)
- *Borrchia frutescens* Tidal Shrubland Alliance (A.1026)
- *Distichlis spicata* Tidal Herbaceous Alliance (A.1882)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Monanthochloe littoralis* Tidal Herbaceous Alliance (A.1179)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Spartina alterniflora*) Tidal Dwarf-shrubland Alliance (A.1705)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Spartina spartinae* Tidal Herbaceous Alliance (A.1483)

DISTRIBUTION

Range: This salt and brackish marsh system of the central and upper coast of Texas ranges from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

Divisions: 203:C

Nations: US

Subnations: TX
Map Zones: 36:C
TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723113#references

Description Author: J. Teague, mod. M. Pyne

Version: 04 Feb 2009

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

1514 CENTRAL FLORIDA HERBACEOUS PONDShORE (CES203.890)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Depressional; Graminoid

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

National Mapping Codes: EVT 2514; ESLF 9275; ESP 1514

CONCEPT

Summary: This system includes a variety of seasonal depression ponds in central Florida, especially along the Lake Wales Ridge. Examples are rounded or irregularly shaped, shallow depressions from tens to hundreds of meters in diameter (Abrahamson et al. 1984). Extensive variation is present based on the variety of soils and resultant hydroperiods. Most examples exhibit some zonation in vegetation and nearly all are ringed by *Serenoa repens*. Characteristic or dominant species associated with the interior of the ponds include *Panicum hemitomon*, *Panicum abscissum*, *Hypericum edisonianum*, and *Andropogon brachystachyus*.

Classification Comments: Compare to East Gulf Coastal Plain Southern Depression Pondshore (CES203.504), found to the north.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)

DESCRIPTION

Environment: Most examples are known from the Lake Wales Ridge area of central Florida. These are shallow depressions found on a variety of different soils with different hydroperiods (Abrahamson et al. 1984).

Vegetation: Most depression ponds accommodated in this system display distinct vegetational zonation. At least four vegetational zones can be readily distinguished (Abrahamson et al. 1984); the community types need to be further reconciled into associations.

MEMBERSHIP

Associations:

- *Amphicarpum muehlenbergianum* - (*Panicum hemitomon*) Herbaceous Vegetation (CEGL008588, G2G3)
- *Andropogon (capillipes, glaucopsis)* - *Rhynchospora fascicularis var. fascicularis* - *Rhexia mariana* Herbaceous Vegetation (CEGL004460, G2?)
- *Dichanthelium wrightianum* - *Dichanthelium erectifolium* Herbaceous Vegetation (CEGL004105, G2G3)
- *Hypericum brachyphyllum* Dwarf-shrubland (CEGL003955, G3?)
- *Panicum hemitomon* - *Pluchea (camphorata, rosea)* - *Ludwigia* spp. Herbaceous Vegetation (CEGL007792, G3)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Vegetation (CEGL004132, G3?)
- *Woodwardia virginica / Sphagnum cuspidatum* Herbaceous Vegetation (CEGL004475, G2?)

Alliances:

- *Aristida palustris* - *Andropogon (capillipes, glaucopsis)* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Dichanthelium (erectifolium, wrightianum)* - *Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Hypericum brachyphyllum* Seasonally Flooded Dwarf-shrubland Alliance (A.1090)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Alliance (A.1383)
- *Woodwardia virginica* Seasonally Flooded Herbaceous Alliance (A.1713)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- Florida Dry Prairie (CES203.380)

Adjacent Ecological System Comments: May grade into Central Florida Wet Prairie and Herbaceous Seep (CES203.491).

Surrounding matrix vegetation can include Central Florida Pine Flatwoods (CES203.382) and Florida Dry Prairie (CES203.380).

DISTRIBUTION

Range: Endemic to central Florida.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

USFS Ecomap Regions: 232K:CC

TNC Ecoregions: 55:C

SOURCES

References: Abrahamson et al. 1984, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722789#references

Description Author: R. Evans

Version: 25 Mar 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL FLORIDA WET PRAIRIE AND HERBACEOUS SEEP (CES203.491)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9279

CONCEPT

Summary: This system includes herbaceous seepage wetlands and nearly treeless plains over poorly drained soils in central Florida. Although examples of this system are similar to other wetland ecological systems, these are characterized by the presence of subtropical plant species not occurring in herbaceous-dominated wetlands farther north, especially *Panicum abscissum*. At least some examples have dense cover of grasses and low shrubs, with fairly rich species composition. Examples may be most common along the southern part of the Lake Wales Ridge area.

Classification Comments: East Gulf Coastal Plain Savanna and Wet Prairie (CES203.192) is a closely related system found farther north.

Similar Ecological Systems:

- East Gulf Coastal Plain Savanna and Wet Prairie (CES203.192)

Related Concepts:

- Wet Prairie (FNAI 1990) Intersecting

DESCRIPTION

Environment: Associated with saturated soils caused by seepage or high water tables; some examples may be saturated for 50-100 days/year. Seepage-influenced examples tend to occur in areas of greater topographic relief than wet prairies.

Vegetation: Usually dominated by *Panicum abscissum*.

Dynamics: Frequent fires were an important natural process in this system, with an estimated frequency of 1-4 years (FNAI 1990).

MEMBERSHIP

Associations:

- *Panicum abscissum* Herbaceous Vegetation (CEGL004113, G2G3)

Alliances:

- *Panicum abscissum* Saturated Herbaceous Alliance (A.1460)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Herbaceous Pondshore (CES203.890)
- Central Florida Pine Flatwoods (CES203.382)
- Florida Dry Prairie (CES203.380)
- Florida Longleaf Pine Sandhill (CES203.284)

Adjacent Ecological System Comments: May grade downslope into Central Florida Herbaceous Pondshore (CES203.890). Surrounding matrix vegetation can include Central Florida Pine Flatwoods (CES203.382) and Florida Dry Prairie (CES203.380).

DISTRIBUTION

Range: Endemic to central Florida, mainly found in the southern Lake Wales Ridge.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:P, 56:C

TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723095#references

Description Author: R. Evans and C. Nordman

Version: 14 Dec 2004

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

COLORADO PLATEAU HANGING GARDEN (CES304.764)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saturated Soil; Montane [Montane]; Montane [Lower Montane]; Cliff (Substrate); Sedimentary Rock; Temperate [Temperate Xeric]; Seepage-Fed Sloping; Forb; Fern; Graminoid; Cliff (Landform)

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 9285

CONCEPT

Summary: Hanging gardens in the Colorado Plateau region are surrounded by an arid environment and associated with canyon country. These highly localized environments include canyonlands with perennial water sources (seeps) forming pocketed wetlands and draping vegetation across wet cliff faces. Three main garden types exist: alcove, terrace, or windowblind. Each is determined by the nature of the geological formation and the presence or absence of joint systems. They tend to occur at all exposures of the canyon walls, but they are always shaded for much to most of each day. Temperature and humidity are relatively stable compared to the surrounding environment. Most hanging gardens are dominated by herbaceous plants, and a number of these are endemic to this region. Common species include *Adiantum capillus-veneris*, *Adiantum pedatum*, *Mimulus eastwoodiae*, *Mimulus guttatus*, *Sullivantia hapemanii*, *Cirsium rydbergii*, and several species of *Aquilegia*.

DESCRIPTION

Environment: Hanging gardens in the Colorado Plateau ecoregion are surrounded by an arid environment and associated with canyon country. Annual precipitation is low and varies from 5 to 14 inches. While mean annual temperatures are high, extreme temperatures are probably more important than means to the survival of plants. Summer temperatures greater than 100 degrees F are common. Complexity of the plant community within a hanging garden is a function of the quantity and quality of water, developmental aspects, and accessibility of plant species to it. They tend to occur at all exposures of the canyon walls, but they are always shaded for much to most of each day. Temperature and humidity are relatively stable compared to the surrounding environment. They vary in size, aspect, exposure to the elements, water quantity and quality, number of bedding planes, and amount of light received. Water quality, in some degree, controls the kinds of plants in hanging gardens. Quality of water is dictated by the nature of the formations through which the water passes. Water is often drinkable quality, however, water may be saline or laden with calcium, which results in tufa deposits in the gardens. Generally, however, water from the gardens is potable.

In the Colorado Plateau region, three main garden types exist: alcove, terrace, or windowblind. Each is determined by the nature of the geological formation and the presence or absence of joint systems. In general, the hanging gardens are the result of the ancient swales or valleys in a sand dune-swale system that developed between the Cretaceous and Pennsylvanian periods (65-310 mya). Massive sandstones seem to be best suited for alcove development coincidental with garden formation, some better than others. The formations with greatest development are the Navajo and Entrada, both of them cross-bedded, massive formations composed of wind-blown sand and containing ancient pond bottoms that serve as impervious bedding planes. The Wingate Formation lacks significant hanging gardens. The sands of formations suitable for hanging garden development were deposited mainly on lands, as dunes with interdunal valleys. The interdunal valleys were often the sites of lakes, whose bottoms were made impervious by accumulations of dust and other fine particles. Turned to stone, the ancient lake and pond basins continue to exist within the strata. Water percolating through the porous rock encounters the ancient bedding planes, still impervious and capable of holding water. When filled to overflowing, these bedding planes carry the water downward to the next bedding plane beneath or to another impervious stratum at the base of the formation. Joint systems within the rock act as passageways for water. Where the joint systems are exposed along canyon walls the water flows over the moist surfaces.

In the Utah High Plateaus, the hanging garden ecological system is associated with springs, seeps and waterfalls. The waterfall vegetation grows in the cracks behind and beside the waterfall and is best described as hanging gardens. In the seeps adjacent to waterfalls and in the splash zones at the base of waterfalls, the substrate is saturated during most of the growing season. The vegetation is continually wet, at least near the bases of the plants, and water can very commonly be seen dripping from leaves, exposed roots and old stems. Suitable growing sites are limited on the steep rock walls such that each of the available ledges has an abundance of plants which grow on it. Most of the hanging gardens in the Utah High Plateaus are associated with calcareous shales of the Green River Formation. Although large occurrences of hanging gardens are primarily associated with waterfalls, smaller occurrences occur along cliff seeps above the streams, especially in the Roan Plateau area.

Vegetation: The vegetation of hanging gardens is often comprised of few species, although the diversity of vegetation is much greater in the gardens on the Colorado Plateau versus those of the Utah High Plateaus. The vegetation may overlap with the nearby riparian vegetation, but there are a series of species that are unique to hanging gardens (Welsh 1989). Several species of algae are restricted to these hanging gardens. The classic alcove type of hanging garden in the Canyonlands of southeastern Utah consists of an overhanging back wall, a vaulted face wall, a detrital slope, and a plunge basin. The back and face walls support clinging plants of *Adiantum capillus-veneris*, *Primula specuicola*, *Mimulus eastwoodiae*, *Petrophyton caespitosum*, and several other species. The wet,

sandy detritus supports *Carex aurea*, *Aquilegia micrantha*, *Calamagrostis scopulorum*, *Epipactis gigantea*, *Perityle specuicola*, *Dichanthelium acuminatum* (= *Panicum acuminatum*), *Cirsium rydbergii*, and *Zigadenus vaginatus*. A fringing margin of *Cercis canadensis* var. *texensis* (= *Cercis occidentalis*), *Celtis laevigata* var. *reticulata* (= *Celtis reticulata*), and *Quercus gambelii* often occurs outward from the footslope where the plants tend to conceal the alcove base. The outer and drier edges support grasses typical of the prairies and plains of the western U.S. In the Utah High Plateaus gardens, the dominants are usually *Sullivantia hapemanii* var. *purpusii* and *Aquilegia barnebyi* with *Mimulus guttatus* common.

Variation in hanging garden vegetation varies from canyon to canyon as well as separate alcoves within a canyon. The vegetation of hanging gardens generally has some common species that are found at most of the hanging gardens, e.g., *Maianthemum stellatum*, *Adiantum capillus-veneris*, *Adiantum pedatum*, and *Mimulus* spp. But numerous endemics occur of which some may be represented by just one or two sites. The following species are endemic to hanging gardens of the Colorado Plateau region: *Aquilegia micrantha*, *Carex curatorum*, *Cirsium rydbergii*, *Erigeron kachinensis* (one occurrence outside of hanging gardens in the Abajo Mountains), *Erigeron sionis*, *Erigeron zothecinus*, *Platanthera zothecina* (= *Habenaria zothecina*), *Mimulus eastwoodiae*, *Perityle specuicola*, and *Primula specuicola*.

MEMBERSHIP

Associations:

- *Aquilegia micrantha* - *Calamagrostis scopulorum* Herbaceous Vegetation (CEGL002592, GNR)
- *Aquilegia micrantha* - *Mimulus eastwoodiae* Herbaceous Vegetation (CEGL002729, G2G3)
- *Aquilegia micrantha* Herbaceous Vegetation (CEGL002762, GNR)
- *Calamagrostis scopulorum* Hanging Garden Herbaceous Vegetation (CEGL002751, GNR)

Alliances:

- *Aquilegia micrantha* Saturated Hanging Garden Herbaceous Alliance (A.2506)
- *Calamagrostis scopulorum* Saturated Hanging Garden Herbaceous Alliance (A.2655)

DISTRIBUTION

Range: Colorado Plateau.

Divisions: 304:C

Nations: US

Subnations: AZ, CO, NV?, UT

Map Zones: 15:P, 16:C, 17:C, 23:C, 24:C, 25:?, 27:P, 28:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 322A:CC, 341A:C?, 341B:CC, 341F:C?, M331D:C?, M331E:CP, M331G:CC, M341B:CC

TNC Ecoregions: 19:C

SOURCES

References: Comer et al. 2003, Keammerer and Keammerer 1978, Malanson 1980, Malanson 1982, Malanson and Kay 1980, Romme et al. 1993, Tuhy et al. 2002, Welsh 1989, Welsh and Toft 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722908#references

Description Author: NatureServe Western Ecology Team, R. Rondeau

Version: 14 Dec 2004

Concept Author: NatureServe Western Ecology Team; R. Rondeau

Stakeholders: West

ClassifResp: West

COLUMBIA PLATEAU VERNAL POOL (CES304.057)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Impermeable Layer; 1-29-day hydroperiod; Vernal Pool Mosaic; Depressional [Vernal Pool]

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Temperate [Temperate Oceanic]; Isolated Wetland [Strictly Isolated]; Consolidated

National Mapping Codes: ESLF 9231

CONCEPT

Summary: This system includes shallow ephemeral water bodies found in very small (3 square meters to 1 acre) to large depressions (1500 square meters to a square mile, average size of vernal pools are 1600 square meters, while average size on non-alkaline playa lakes are 5-10 acres) throughout the exposed volcanic scablands of the Columbia Plateau in Washington, Oregon, and northern Nevada. Most of these pools and lakes are located on massive basalt flows exposed by Pleistocene floods; southward they also occur on andesite or rhyodacite caprock. Inundation is highly irregular, sometimes not occurring for several years. Depressions usually (but not always) fill with water during winter and spring. They are generally dry again within 9 months, though in exceptional times they can remain inundated for two years in a row. Water is from rainfall and snowmelt in relatively small closed basins, on average probably no more than 5-15 times the area of the ponds themselves. Because these pools and playas are perched above the general surrounding landscape, they are not generally subject to runoff from major stream systems. They typically have silty clay soils, sometimes with sandy margins. Pools are often found within a mounded or biscuit-swale topography with *Artemisia* shrub-steppe or rarely *Pinus ponderosa* savanna. In the northern Columbia Plateau, characteristic species are predominantly annual and diverse. Floristically akin to California vernal pool flora (one-third), however, many of the most abundant species are not reported in Californian pools. Characteristic species include *Callitriche marginata*, *Camissonia tanacetifolia*, *Elatine* spp., *Epilobium densiflorum* (= *Boisduvalia densiflora*), *Eryngium vaseyi*, *Juncus uncialis*, *Myosurus X clavicaulis*, *Plagiobothrys* spp., *Polygonum polygaloides* ssp. *confertiflorum*, *Polygonum polygaloides* ssp. *polygaloides*, *Psilocarphus brevissimus*, *Psilocarphus elatior*, *Psilocarphus oregonus*, and *Trifolium cyathiferum*. *Artemisia ludoviciana* ssp. *ludoviciana* can occur on better developed soils. In northern Nevada, most of the species by biomass are perennials and include *Polygonum*, *Rumex*, *Juncus balticus*, *Eleocharis*, *Carex douglasii*, *Muhlenbergia richardsonis*, and *Polycytenium* species, in addition to *Camissonia tanacetifolia* and *Psilocarphus brevissimus*. Endemic plant species *Navarretia leucocephala* ssp. *diffusa* and *Polycytenium williamsiae* may occur.

Classification Comments: This includes Bjork (1997) vernal pool annual-dominated, vernal pool perennial-dominated and rain pools.

DESCRIPTION

Environment: Winters are colder (coldest average median temperature month in the high 20 degrees F) than California vernal pools and are climatically defined by wet winters (November through January, sporadically so southward) and severe summer drought (July-September), although May or June can be wet. The northernmost vernal pools are adapted to cold spring and long summer days (18 hours).

SPATIAL CHARACTERISTICS

Size: Depressions (3-4608 square meters to a square mile; average 1600 sq.m to 10 acres), mean depth 0.47 to 1.5 m.

Adjacent Ecological Systems:

- Columbia Plateau Scabland Shrubland (CES304.770)
- Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)

Adjacent Ecological System Comments: Primarily Columbia Plateau Scabland Shrubland (CES304.770) or Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) (three-tip sagebrush) rarely into ponderosa pine savanna or pinyon-juniper.

DISTRIBUTION

Range: This system is restricted to the northern Columbia Plateau ecoregion commonly called the Columbia Basin and perhaps the Okanagan Valley in British Columbia, and to the western Great Basin.

Divisions: 304:C

Nations: CA?, US

Subnations: BC?, NV, OR, WA

Map Zones: 7:C, 8:C, 9:P, 18:C

USFS Ecomap Regions: 331A:PP, 342B:CC, 342C:CC, 342D:C?, 342H:C?, 342I:CC, M242C:CC, M333A:??

TNC Ecoregions: 6:C, 68:P

SOURCES

References: Bjork 1997, Bjork and Dunwiddie n.d., Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722654#references

Description Author: R. Crawford, mod. J. Morefield and G. Kittel

Version: 27 Jun 2005

Concept Author: R. Crawford

Stakeholders: Canada, West

ClassifResp: West

EAST GULF COASTAL PLAIN DEPRESSION PONDSHORE (CES203.558)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9403

CONCEPT

Summary: This small-patch wetland system occupies upland depressions (ponds and pondshores) in the East Gulf Coastal Plain. Included here are shallow ponds of various geomorphic origin in a variety of substrates (e.g., limesinks, "Grady Ponds") which are not separately distinguished as systems. This system only includes ponds and pondshores in more-or-less isolated upland settings, not those in riparian or floodplain environments. They may serve as the origin of a stream system in a general way, releasing water gradually into the stream drainage system during periods of wet weather. These tend to occupy basins that were formed by subsidence of surface sediments caused by solution in underlying limestone or as swales in eolian sand deposits. No explicit distinction is intended for wooded versus herbaceous ponds. In some examples, a distinct zonation of vegetation is present, in others the zones are not distinct or the differing associations are present in a complex mosaic. Most seasonal depression ponds are usually composed of mosaics of several plant associations. The vegetation includes various zones which become exposed as water levels decline, as well as emergent (rising out of the water) or submergent/floating plants. Some typical associations include ones dominated by species such as *Dichanthelium wrightianum*, *Dichanthelium erectifolium*, *Eleocharis equisetoides*, *Eleocharis microcarpa*, *Juncus effusus*, *Juncus repens*, *Rhynchospora corniculata*, *Rhynchospora inundata*, *Panicum hemitomon*, *Proserpinaca* spp., *Pluchea* spp., *Ludwigia* spp., *Saccharum* spp., *Panicum verrucosum*, *Rhexia* spp., and *Sabatia angularis*. In addition, associations dominated by *Polygonum* spp., *Leersia* spp., and *Typha* spp. may be present but are not characteristic. Coastal dune lakes and related wetlands of barrier islands are covered by another system, Southeastern Coastal Plain Interdunal Wetland (CES203.258).

Classification Comments: In Mississippi, this system is apparently confined to the "Pamlico Plain" (this is meant to refer to the Outer Coastal Plain) where it is very rare and small scale in occurrence (R. Wieland pers. comm.). It is unknown how distinct these depressions are from so-called "Grady Ponds" (e.g., Cottonmouth Savanna site). This system is closely related to Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) of the Atlantic Coastal Plain. This system also has karstic origins in common with Southern Coastal Plain Sinkhole (CES203.495) but occupies comparatively much shallower depressions and lacks exposed limestone. Compare to Central Florida Herbaceous Pondshore (CES203.890) to the south.

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Central Florida Herbaceous Pondshore (CES203.890)
- East Gulf Coastal Plain Sandhill Lakeshore Depression (CES203.292)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)
- Southern Coastal Plain Sinkhole (CES203.495)

Related Concepts:

- Depression Marsh (FNAI 1990) Broader
- Flatwoods/Prairie/Marsh Lake (FNAI 1990) Intersecting
- Limesink (in part) (Wharton 1978) Intersecting

DESCRIPTION

Environment: Examples of this system are relatively shallow depressions or basins with some surface soils present. These tend to occupy basins that were formed by subsidence of surface sediments caused by solution in underlying limestone or as swales in eolian sand deposits. However, sinkholes with steep, vertical, exposed limestone walls are accommodated by another ecological system, as are sandhill ponds that develop on extreme sandy sites in the East Gulf Coastal Plain of Florida and adjacent Alabama. Hydroperiod can vary substantially from year to year, and vegetation can similarly vary significantly in aspect and dominants. Fire is an important natural force in the outer, drier portions of many examples, and periodic fires may sweep through the interior of many examples during dry periods.

Vegetation: Most seasonal depression ponds are usually composed of mosaics of several plant associations. The vegetation includes various zones which become exposed as water levels decline. These are occupied sequentially by various graminoids and/or forbs, as well as emergent (rising out of the water) and submergent/floating plants. Some typical dominant species in component associations include *Aristida palustris*, *Dichanthelium wrightianum*, *Dichanthelium erectifolium*, *Eleocharis elongata*, *Eleocharis equisetoides*, *Eleocharis microcarpa*, *Fuirena scirpoidea*, *Juncus repens*, *Rhynchospora chapmanii*, *Rhynchospora corniculata*, *Rhynchospora harperi*, *Rhynchospora inundata*, *Rhynchospora filifolia*, *Rhynchospora tracyi*, *Proserpinaca* spp., *Juncus abortivus*, *Juncus effusus*, *Panicum hemitomon*, *Pluchea* spp., *Ludwigia* spp., *Saccharum* spp., *Panicum verrucosum*, *Rhexia* spp., and *Sabatia angularis*. In addition, associations dominated by *Polygonum* spp., *Leersia* spp., and *Typha* spp. may be present but are not characteristic. Other characteristic species include *Rhexia cubensis*, *Panicum rigidulum*, *Panicum verrucosum*, *Carex striata*, *Lachnanthes caroliana*,

Bartonia verna, *Lachnocaulon minus*, and *Centella erecta*. Woody plants which may be present (particularly on margins) include *Cephalanthus occidentalis*, *Hibiscus* spp., *Hypericum chapmanii*, *Hypericum fasciculatum*, *Hypericum reductum*, *Ilex myrtifolia*, and *Nyssa ursina*. Some stands with trees contain *Fraxinus pennsylvanica*, *Populus heterophylla*, *Ulmus americana*, and *Quercus texana*. Vegetation may exhibit distinct zonation in response to variation in duration of flooding. Communities can range from floating aquatic types (in the centers of the deepest basins) to emergent herbaceous zones (in semipermanent water drawdown zones) to sparse, yet diverse, small graminoid and forb herbaceous vegetation to bald-cypress woodland edges. Some examples may have emergent trees throughout their extent.

Dynamics: The seasonal fluctuation in the water levels in these ponds controls both the overall vegetation composition as well as the composition of the zones of the vegetation, which may be quite distinct from one another. Hydroperiod can vary substantially from year to year, and vegetation can similarly vary significantly in aspect and dominants. Fire is an important natural force in the outer, drier portions of many examples, and periodic fires may sweep through the interior of many examples during dry periods.

MEMBERSHIP

Associations:

- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Alnus serrulata* Southeastern Seasonally Flooded Shrubland (CEGL008474, G4)
- *Cephalanthus occidentalis* / *Hibiscus moscheutos* ssp. *moscheutos* Depression Pond Shrubland (CEGL004742, G3?)
- *Crataegus aestivalis* Forest (CEGL004639, G2G3)
- *Crataegus rufula* Forest (CEGL007783, G2G3)
- *Cyrilla racemiflora* - *Lyonia lucida* Shrubland (CEGL003844, G3?)
- *Dichantherium wrightianum* - *Dichantherium erectifolium* Herbaceous Vegetation (CEGL004105, G2G3)
- *Eleocharis (elongata, equisetoides)* - *Rhynchospora tracyi* Semipermanently Flooded Herbaceous Vegetation (CEGL004960, G3?)
- *Eleocharis microcarpa* - *Juncus repens* - *Rhynchospora corniculata* - (*Mecardonia acuminata*, *Proserpinaca* spp.) Herbaceous Vegetation (CEGL004748, G2G3)
- *Fuirena scirpoidea* - *Rhynchospora tracyi* Herbaceous Vegetation (CEGL004123, G3G4)
- *Hypericum chapmanii* - *Ilex myrtifolia* - (*Nyssa ursina*) Shrubland (CEGL003867, G1)
- *Hypericum fasciculatum* / *Rhynchospora (chapmanii, harperi)* Shrubland (CEGL003869, G2G3)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Nyssa biflora* / *Itea virginica* - *Cephalanthus occidentalis* Depression Forest (CEGL007434, G3G4)
- *Panicum hemitomon* - *Eleocharis equisetoides* - *Rhynchospora inundata* Herbaceous Vegetation (CEGL004127, G3)
- *Panicum hemitomon* - *Pluchea (camphorata, rosea)* - *Ludwigia* spp. Herbaceous Vegetation (CEGL007792, G3)
- *Panicum virgatum* - *Andropogon (capillipes, glaucopsis)* - *Aristida palustris* Herbaceous Vegetation (CEGL004100, G2?)
- *Polygonum (hydropiperoides, punctatum)* - *Leersia* spp. Herbaceous Vegetation (CEGL004290, G4?)
- *Polygonum amphibium* - (*Polygonum hydropiperoides*) Seasonally Flooded Herbaceous Vegetation (CEGL004699, G4G5)
- *Polygonum densiflorum* - (*Saccharum giganteum*) Herbaceous Vegetation (CEGL004966, G4G5)
- *Rhynchospora filifolia* - *Juncus abortivus* Herbaceous Vegetation (CEGL004131, G2?)
- *Saccharum* spp. - *Panicum verrucosum* - (*Rhexia* spp., *Sabatia* spp.) Herbaceous Vegetation (CEGL004752, G2G3)
- *Salix nigra* / (*Cephalanthus occidentalis*) Forest (CEGL004773, G4G5)
- *Sparganium americanum* - *Saccharum giganteum* Herbaceous Vegetation (CEGL004769, G3)
- *Taxodium ascendens* / *Ilex myrtifolia* Depression Forest (CEGL007418, G3?)
- *Taxodium distichum* East Gulf Coastal Plain Pondshore Woodland (CEGL004046, G3)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)

Alliances:

- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Aristida palustris* - *Andropogon (capillipes, glaucopsis)* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Crataegus (aestivalis, opaca, rufula)* Seasonally Flooded Forest Alliance (A.320)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Dichantherium (erectifolium, wrightianum)* - *Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Eleocharis (elongata, equisetoides)* - *Rhynchospora tracyi* Semipermanently Flooded Herbaceous Alliance (A.1428)
- *Fuirena scirpoidea* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Hypericum (chapmanii, fasciculatum)* Seasonally Flooded Shrubland Alliance (A.844)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Juncus repens* - *Eleocharis microcarpa* Seasonally Flooded Herbaceous Alliance (A.1376)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Sparganium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium distichum* - (*Taxodium ascendens*) Seasonally Flooded Lakeshore Woodland Alliance (A.652)

- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain, including the Gulf Coast Flatwoods (i.e., EPA Level III Ecoregion 75 (EPA 2004)), as well as more inland portions (EPA Ecoregion 65). In particular, there are clusters of large ponds in parts of EPA 65g, 65h, and 65o, these areas being more or less proximal to EPA 75. They are also found in scattered parts of the inner Coastal Plain (e.g., Tifton Uplands (65h of EPA) and the Okefenokee Plain (75e of EPA). This system also includes the "limesink" ponds of the Valdosta Limesink Region (65o in part).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA?, MS

Map Zones: 45:P, 46:C, 55:C, 99:C

TNC Ecoregions: 42:P, 43:C, 53:C

SOURCES

References: Comer et al. 2003, EPA 2004, FNAI 1990, Peet and Allard 1993, Southeastern Ecology Working Group n.d., Wieland pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723046#references

Description Author: M. Pyne

Version: 02 Feb 2007

Concept Author: M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN FLORIDA BIG BEND SEAGRASS BED (CES203.244)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9412

CONCEPT

Summary: This seagrass bed system overlies the drowned karst of the Florida Big Bend region extending along the west coast from approximately St. Marks National Wildlife Refuge to Tarpon Springs, Florida (Anclote Key). This area is one of the few known places in the world with a zero energy coast line (Murali 1982). This phenomenon allows for the development of seagrass beds without protective ocean barriers. Six different species of seagrasses comprise these beds which range from near-shore shoals (exposed at low tide) to relatively deep waters as far as 112 km offshore. The deepest extent of this system is constrained, at least in part, by water clarity as seagrasses require light penetration for photosynthesis. For this reason, these beds are found in deeper waters along the southern boundary of the system, deeper waters where the water is increasingly clear due apparently to reduced input of highly organic river runoff which is concentrated in the north (Zieman and Zieman 1989). Species composition and density are variable. The densest beds are found in shallow waters well removed from river mouths. Although several of the individual seagrass species may be found in mixed species beds, there is a general pattern of species zonation evident, largely related to water depth. Periodically exposed shoals tend to support monospecific stands of *Halodule*. *Thalassia* grows only in shallower subtidal areas, and *Cymodocea* is concentrated in deeper subtidal areas. Pure stands of *Halophila* are abundant in deepest areas often removed from beds of the other species, while *Ruppia* is confined to river mouths.

Similar Ecological Systems:

- Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)
- Florida Keys Seagrass Bed (CES411.285)
- Northern Gulf of Mexico Seagrass Bed (CES203.263)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: This system is found along a zero energy coast line of Florida where the average wave breaker heights are 3-4 cm or less, and there is almost no significant littoral transport of sand. Factors contributing to this phenomenon are the wide gently sloping shelf, the divergence of approaching wave trains into the large expanding coastal concavity, the location of the coast in an upwind direction, small sediment supply, and wave dampening effects of submerged beaches. These are important factors which allow the development of this system without normal ocean barriers (Murali 1982).

Vegetation: Seagrasses are monocots which carry out their entire life cycle completely submerged in the marine environment. Species composition and density are variable. The densest beds are found in shallow waters well removed from river mouths. Although several of the individual seagrass species may be found in mixed-species beds, there is a general pattern of species zonation evident, largely related to water depth. Periodically exposed shoals tend to support monospecific stands of *Halodule*. *Thalassia* grows only in shallower subtidal areas, and *Cymodocea* is concentrated in deeper subtidal areas. Pure stands of *Halophila* are abundant in deepest areas often removed from beds of the other species, while *Ruppia* is confined to river mouths. Succession dynamics also helps determine composition. *Halodule beaudettei* (= *Halodule wrightii*) is the local pioneering species which colonizes areas from seed or vegetative reproduction. *Cymodocea* often appears next and may mix with *Halodule*. *Thalassia* occupies beds as succession advances.

Dynamics: Unlike most other seagrass systems, these beds are not protected from large storm surges. Hurricanes may cause localized disruptions and bottom scouring which may dislodge plants. The rate of recolonization depends upon the severity of the disturbance and the species involved. Colonization of seagrasses often follows a generalized successional sequence. Non-vegetated areas may first be colonized by rhizophytic macroalgae which have some sediment-binding capacity. Possibly more importantly they contribute sedimentary particles as they die and decompose (Zieman and Zieman 1989). *Halodule beaudettei* is the local pioneering species which colonizes areas from seed or vegetative reproduction. *Cymodocea* often appears next and may mix with *Halodule*. *Thalassia* occupies beds as succession advances. This pattern marks a progressive increase of biomass in the system with increased leaf areas, increased sediment-trapping capacity, and increased microbial cycling. Seagrasses in this region experience large temperature fluctuations and exhibit more cold tolerance than those in more southerly areas. Cold temperatures during the winter cause leaf die-off to within several centimeters of the sediment surface.

MEMBERSHIP

Associations:

- *Cymodocea filiformis* - (*Thalassia testudinum*) Herbaceous Vegetation (CEGL004317, G4?)

- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Louisianian Zone Herbaceous Vegetation (CEGL004450, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)
- *Vallisneria americana* Estuarine Bayou Herbaceous Vegetation (CEGL004634, G3G5)

Alliances:

- *Cymodocea filiformis* Permanently Flooded - Tidal Herbaceous Alliance (A.1732)
- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)
- *Vallisneria americana* Permanently Flooded - Tidal Herbaceous Alliance (A.1770)

DISTRIBUTION

Range: This system is restricted to the Florida Big Bend region extending along the west coast from approximately St. Marks to Tarpon Springs.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Murali 1982, Zieman and Zieman 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723241#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN SANDHILL LAKESHORE DEPRESSION (CES203.292)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional [Vernal Pool]; Graminoid

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9223

CONCEPT

Summary: This small-patch wetland system occupies upland depressions on deep sandy soils in the southern portions of the East Gulf Coastal Plain of Florida. These depressions are apparently of karstic origin but exhibit no evidence of calcareous conditions or evidence of limestone. Limestone is buried 50 or more feet below the surface under coarse sandy soils that cover the margins and, in some cases, the entire surface extent of these depressions (A. Johnson pers. comm.). The resulting appearance of these pondshores is that of large, inland white sand beach (at least in dry years). In the drier margins they even support some plant species found on coastal beaches of the region, such as *Lupinus westianus*, *Hypericum reductum*, and *Chrysoma pauciflosculosa*. The aspect of the vegetation ranges from shrublands to herbaceous-dominated with local variability. Several narrowly endemic plant species may be present such as *Hypericum lissophloeus*, *Rhexia salicifolia*, and *Xyris longisepala*. Examples may be periodically flooded to depths of as much as 1.5 m deep, but they dry down regularly. Some are fairly large, steep-sided depressions with as much as a 30-m elevation change from rim (sandhill) to center, while others form much more gradual depressions. Fire may be an important natural force in some examples.

Classification Comments: This system has karstic origins in common with Southern Coastal Plain Sinkhole (CES203.495) but lacks exposed limestone and steep vertical, limestone walls. Other upland depressions of the East Gulf Coastal Plain (that may or may not have karstic origins) on less extreme sandy soils are accommodated by East Gulf Coastal Plain Southern Depression Pondshore (CES203.504).

This system was formerly covered by East Gulf Coastal Plain Southern Depression Pondshore (CES203.504), but this type was split out and recognized as distinct in February 2004.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- Southern Coastal Plain Sinkhole (CES203.495)

Related Concepts:

- Sandhill Upland Lake (FNAI 1990) Undetermined

DESCRIPTION

Environment: Examples occur in the southern Dougherty Plain of the Florida panhandle (65g of EPA 2004), only in Bay and Washington counties. This is high rolling sandhill territory (not flatwoods) with very steep-sided ponds in many cases (A. Johnson pers. comm. 2009). Some are fairly large, steep-sided depressions with as much as a 30-m elevation change from rim (sandhill) to center, while others form much more gradual depressions. The limestone beneath them is more deeply dissected than elsewhere in Florida, but it is solidly blanketed with deep sand, so it does not reach the surface at all, and the soils are all acidic. Fire may be an important natural force in some examples.

Vegetation: *Hypericum lissophloeus*, *Rhexia salicifolia*, and *Xyris longisepala* are some of the more unusual species associated with this system (A. Johnson pers comm.).

MEMBERSHIP

Associations:

- *Hypericum lissophloeus* Shrubland (CEGL003870, G1)
- *Hypericum reductum* / *Syngonanthus flavidulus* - *Rhexia salicifolia* - (*Xyris longisepala*) Dwarf-shrubland (CEGL004998, G1G2)

Alliances:

- *Hypericum lissophloeus* Seasonally Flooded Shrubland Alliance (A.846)
- *Hypericum reductum* Temporarily Flooded Dwarf-shrubland Alliance (A.1088)

DISTRIBUTION

Range: This system is restricted to the Florida panhandle (apparently confined to a single site) (A. Johnson pers. comm. 2009).

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 99:C

TNC Ecoregions: 53:C

SOURCES

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

References: EPA 2004, Johnson pers. comm., Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.731768#references

Description Author: R.E. Evans and A. Johnson

Version: 04 Feb 2009

Concept Author: R.E. Evans and A. Johnson

Stakeholders: Southeast

ClassifResp: Southeast

1485 EAST GULF COASTAL PLAIN SAVANNA AND WET PRAIRIE (CES203.192)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Extensive Wet Flat; Very Short Disturbance Interval; Graminoid

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2485; ESLF 9206; ESP 1485

CONCEPT

Summary: This ecological system of western Florida and adjacent Alabama and Mississippi, may be considered a "lush grassland" (Kindell et al. 1997), "grass-sedge savannah" (Clewell 1981), wet prairie (FNAI 1990), or wet savanna (Collins et al. 2001). As implied by these names, this system consists of primarily herbaceous vegetation with relatively thick cover of grasses and sedge species. Examples occupy low, flat plains on poorly drained soils, often saturated for 50-100 days per year. Frequent fires, including growing-season burns, are essential for maintenance of this system. Some examples have a sparse tree component of *Pinus elliottii* or *Pinus palustris* and scattered shrubs, such as *Morella cerifera*.

Classification Comments: Related vegetation of central Florida is covered by another ecological system.

Similar Ecological Systems:

- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)

Related Concepts:

- Wet Prairie (FNAI 1990) Broader

DESCRIPTION

Environment: This system occupies low, flat plains on poorly drained Ultisols. Sites are saturated for 50-100 days per year (FNAI 1990). Other soil orders may include Ultisols, Spodosols, Inceptisols, and Entisols (Collins et al. 2001); some of these soils have an argillic horizon which impedes drainage and contributes to high water tables. On Eglin Air Force Base, this system is found on the Rutledge series (Kindell et al. 1997).

Vegetation: Collins et al. (2001) documented less than 10 trees per acre (*Pinus elliottii* and *Pinus palustris*) in examples of this system on the Apalachicola National Forest. *Magnolia virginiana*, *Acer rubrum*, and *Morella cerifera* are often present in sometimes locally dense patches, especially when managed with infrequent fires (FNAI 1990, Collins et al. 2001). *Aristida beyrichiana*, *Ctenium aromaticum*, *Rhexia alifanus*, *Rhynchospora* spp., and *Eriocaulon* spp. are typical species.

MEMBERSHIP

Associations:

- *Aristida beyrichiana* - *Rhynchospora oligantha* - *Carphephorus pseudoliatris* - *Sarracenia (alata, flava, leucophylla)* Herbaceous Vegetation (CEGL004154, G2)
- *Aristida beyrichiana* - *Rhynchospora* spp. - *Pilea tenuifolia* - *Sarracenia (psittacina, flava)* Herbaceous Vegetation (CEGL004153, G2)
- *Aristida beyrichiana* - *Rhynchospora* spp. - *Verbesina chapmanii* Herbaceous Vegetation (CEGL004152, G2)
- *Hypericum fasciculatum* / *Rhynchospora (chapmanii, harperi)* Shrubland (CEGL003869, G2G3)
- *Nyssa ursina* / *Aristida beyrichiana* - *Rhynchospora (chapmanii, corniculata)* Herbaceous Vegetation (CEGL008595, G1G2)
- *Scleria baldwinii* - *Rhynchospora cephalantha* - *Polygala cymosa* - *Fuirena scirpoidea* Herbaceous Vegetation (CEGL007717, G2?)
- *Taxodium ascendens* / *Hypericum chapmanii* / *Rhynchospora harperi* Dwarf Woodland (CEGL007725, G1)

Alliances:

- *Fuirena scirpoidea* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Hypericum (chapmanii, fasciculatum)* Seasonally Flooded Shrubland Alliance (A.844)
- *Rhynchospora oligantha* - *Sarracenia* spp. - (*Aristida beyrichiana*, *Ctenium aromaticum*) - *Osmunda cinnamomea* / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)
- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)

DISTRIBUTION

Range: Western Florida and adjacent Alabama and Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232B:CC, 232D:CC, 232K:CC, 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Clewell 1981, Collins et al. 2001, Comer et al. 2003, FNAI 1990, Kindell et al. 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723248#references

Description Author: R. Evans and C. Nordman

Version: 14 Dec 2004

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1488 EASTERN GREAT PLAINS WET MEADOW, PRAIRIE, AND MARSH (CES205.687)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Shoreline; Herbaceous; Depressional; Isolated Wetland [Partially Isolated]; Depression

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2488; ESLF 9213; ESP 1488

CONCEPT

Summary: This system is found along creeks and streams from Nebraska and Iowa to Illinois, and from Minnesota to Texas. It is also found in depressions and along lake borders, especially in the northern extension of its range into Minnesota. It is often adjacent to a floodplain system but is devoid of trees and riparian vegetation. It is also distinguished from upland prairie systems by having more hydrology, especially associated with silty, dense clay soils that are often hydric, classified as Vertic Haplaquolls. The landform is usually floodplain or poorly drained, relatively level land. The vegetation is dominated by *Spartina pectinata*, *Tripsacum dactyloides*, numerous large sedges, such as *Carex frankii* and *Carex hyalinolepis*, and in wetter areas, *Eleocharis* spp. Other emergent marsh species such as *Typha* spp. can be associated with this system. Forbs can include *Helianthus grosseserratus*, *Vernonia fasciculata*, and *Physostegia virginiana*. Some parts of this system may be saline and have species such as *Distichlis spicata* and *Schoenoplectus maritimus*. Fire has been the primary influence in keeping these wet areas free of trees. Other dynamic processes include grazing and flooding (often in late spring). Many areas have been converted to agricultural, but this usually requires some sort of drainage.

DESCRIPTION

Environment: This system is found primarily on silty and/or dense clay, hydric soils, usually classified as Vertic Haplaquolls. It is often found within poorly drained, relatively level areas.

Vegetation: *Spartina pectinata*, *Tripsacum dactyloides*, and numerous large sedges, such as *Carex frankii* and *Carex hyalinolepis*, dominate this system. In wetter areas, *Eleocharis* spp. and *Typha* spp. may be significant. Forbs such as *Helianthus grosseserratus*, *Vernonia fasciculata*, and *Physostegia virginiana* also may be common. Shrub species can be present, especially in the northern range of this system; however, they are usually insignificant compared to the prairie and meadow species.

Dynamics: Fire is the major dynamic process that helps maintain the herbaceous nature of this system and prevents trees from establishing. Grazing and periodic flooding can also influence this system.

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex aquatilis* - *Carex* spp. Herbaceous Vegetation (CEGL002262, G4?)
- *Carex atherodes* Herbaceous Vegetation (CEGL002220, G3G5)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex pellita* - *Calamagrostis stricta* Herbaceous Vegetation (CEGL002254, G3G5)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Ceratophyllum demersum* - *Stuckenia pectinata* Herbaceous Vegetation (CEGL004528, G4G5)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Distichlis spicata* - *Schoenoplectus maritimus* - *Salicornia rubra* Herbaceous Vegetation (CEGL002043, G1G2)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* - (*Chrysosplenium iowense*, *Aconitum noveboracense*) Herbaceous Vegetation (CEGL002387, G2)
- *Nuphar lutea ssp. advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Polygonum amphibium* - (*Polygonum hydropiperoides*) Seasonally Flooded Herbaceous Vegetation (CEGL004699, G4G5)
- *Polygonum* spp. - Mixed Forbs Herbaceous Vegetation (CEGL002430, G4G5)
- *Potamogeton nodosus* Herbaceous Vegetation (CEGL004529, GNR)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Sagittaria cuneata* - *Sagittaria longiloba* Herbaceous Vegetation (CEGL004525, GNR)
- *Sagittaria latifolia* - *Leersia oryzoides* Herbaceous Vegetation (CEGL005240, GNR)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Schoenoplectus maritimus* - *Atriplex patula* - *Eleocharis parvula* Herbaceous Vegetation (CEGL005111, G1)

- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002027, G3?)
- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* - *Lythrum alatum* - (*Oxypolis rigidior*) Herbaceous Vegetation (CEGL002224, G3?)
- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* Sand Herbaceous Vegetation (CEGL005178, G3?)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)
- *Spiraea tomentosa* - *Salix humilis* / *Andropogon gerardii* - *Panicum virgatum* Shrubland (CEGL005069, G1Q)
- *Typha* (*angustifolia*, *domingensis*, *latifolia*) - *Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032, G3G4)
- *Typha latifolia* - *Thalia dealbata* Herbaceous Vegetation (CEGL004526, GNR)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229, G4?)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233, G5)

Alliances:

- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex* (*rostrata*, *utriculata*) Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex atherodes* Seasonally Flooded Herbaceous Alliance (A.1396)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Corylus americana* - (*Spiraea tomentosa*, *Malus ioensis*) Shrubland Alliance (A.897)
- *Distichlis spicata* - (*Hordeum jubatum*) Temporarily Flooded Herbaceous Alliance (A.1341)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* Herbaceous Alliance (A.1598)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Sagittaria latifolia* Semipermanently Flooded Herbaceous Alliance (A.1675)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found throughout the northeastern Great Plains ranging from eastern Kansas to western Illinois and north into Minnesota.

Divisions: 205:C

Nations: US

Subnations: IA, IL, KS, MN, MO, ND, NE, OK, SD, TX?

Map Zones: 31:P, 38:C, 39:C, 40:C, 41:P, 42:C, 43:C, 49:C, 50:C, 51:P, 52:P

USFS Ecomap Regions: 251A:CC, 251B:CC, 251E:CC, 251F:CC, 251G:CC, 251H:CC, 255A:PP, 332B:CP, 332C:CC, 332D:CC, 332E:CC, 332F:C?

TNC Ecoregions: 35:C, 36:C, 45:P, 46:P

SOURCES

References: Comer et al. 2003, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722972#references

Description Author: S. Menard and K. Kindscher

Version: 18 Jul 2006

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, Southeast

ClassifResp: Midwest

EDWARDS PLATEAU UPLAND DEPRESSION (CES303.654)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Depressional; Depression

National Mapping Codes: ESLF 9239

CONCEPT

Summary: This system includes shallow wetlands formed over limestone on the Edwards Plateau of Texas. Variable in size and duration of inundation, these wetlands are typically found on level uplands. Dominant vegetation includes both graminoids and forbs tolerant of wet periods but not necessarily wetland-dependent. Dominant species may include *Pleuraphis mutica*, *Buchloe dactyloides*, *Sedum pulchellum*, *Sedum nuttallianum*, *Sporobolus vaginiflorus*, *Chaetopappa bellidifolia*, *Paronychia* spp., and the alga *Nostoc commune*. Some larger occurrences of this wetland system are found in Crocket, Reagan, Schleicher, Irion and Sterling counties in the northwest Edwards Plateau (the Eldorado Plateau). Formation of these occurrences is apparently from solution of the underlying limestone.

Classification Comments: The solution ponds of the Eldorado Plateau are superficially similar to the playa lakes of the Llano Estacado, but the underlying geology of the Edwards Plateau (Cretaceous limestone) occurrences is different from the Llano Estacado (Pliocene and late Tertiary) conglomerates and caliche of the Ogallala Formation and is mantled by a thick layer of wind-deposited Pleistocene sands and silty sands. Further field investigation is needed to better develop the association-level information for this system.

DESCRIPTION

Environment: This system occurs in shallow depressions over limestone in the Edwards Plateau of Texas.

Vegetation: Dominant species may include *Pleuraphis mutica*, *Buchloe dactyloides*, *Sedum pulchellum*, *Sedum nuttallianum*, *Sporobolus vaginiflorus*, *Chaetopappa bellidifolia*, *Paronychia* spp., and the alga *Nostoc commune*.

MEMBERSHIP

Associations:

- *Pleuraphis mutica* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL002272, G4?)

Alliances:

- *Pleuraphis mutica* Herbaceous Alliance (A.1249)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)

DISTRIBUTION

Range: This system is found throughout the Edwards Plateau of Texas.

Divisions: 303:C

Nations: US

Subnations: TX

Map Zones: 35:C

TNC Ecoregions: 29:C

SOURCES

References: Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791378#references

Description Author: J. Teague

Version: 09 Feb 2007

Concept Author: J. Teague

Stakeholders: Midwest, Southeast, West

ClassifResp: Southeast

FLORIDA BIG BEND FRESH AND OLIGOHALINE TIDAL MARSH (CES203.507)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9290

CONCEPT

Summary: This system includes tidal freshwater and oligohaline marshes of the northern Gulf of Mexico along the Florida Big Bend area (roughly from Wakulla County to the Pasco/Hernando county line on Florida's west coast). The tidal range in this region is higher than in the western Panhandle, and wave energy is low; lunar, wind and seasonal tides make flooding irregular (Montague and Wiegert 1990). In comparison to the matrix-forming salt and brackish marshes of the same region, this system is confined to small patches that are generally restricted to areas near the mouths of rivers where freshwater is abundant.

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Tidal (irregular) but influenced by freshwater flows from the mouths of rivers.

Vegetation: This system is dominated by herbaceous graminoids tolerant of tidal flooding, but not tolerant of saltwater and with only a limited tolerance of true brackish conditions. It does not include the abundant salt marshes of *Spartina alterniflora* and *Juncus roemerianus* (brackish).

MEMBERSHIP

Associations:

- *Eleocharis rostellata* - *Rhynchospora colorata* - *Rhynchospora microcarpa* Herbaceous Vegetation (CEGL004951, G2?Q)
- *Sagittaria lancifolia* - *Glottidium vesicarium* - *Solidago sempervirens* - *Lythrum lineare* Herbaceous Vegetation (CEGL008447, G3G4)
- *Schoenoplectus californicus* Tidal Herbaceous Vegetation (CEGL003985, G4G5)
- *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456, GNR)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Sagittaria lancifolia* Tidal Herbaceous Alliance (A.1987)
- *Schoenoplectus californicus* Tidal Herbaceous Alliance (A.2004)
- *Typha (angustifolia, domingensis)* Tidal Herbaceous Alliance (A.1472)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

DISTRIBUTION

Range: Endemic to Florida from Wakulla County (Apalachicola Bay) to Pasco/Hernando county line, north of Tampa Bay.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232D:CC, 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723081#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA BIG BEND SALT AND BRACKISH TIDAL MARSH (CES203.508)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9289

CONCEPT

Summary: This system represents salt and brackish marshes of the northern Gulf of Mexico along the Florida Big Bend (roughly from Wakulla County (Apalachicola Bay) to the Pasco/Hernando countyline (more or less to Tampa Bay) on Florida's west coast). The tidal range here is higher than in the western Panhandle, and wave energy is low; lunar, wind and seasonal tides make flooding irregular (Montague and Wiegert 1990). The bulk of these marshes are comprised of monospecific stands of *Juncus roemerianus* that often exhibit tall- and short-growth zones. Less common are patches of *Spartina alterniflora*, which may be confined to the edges of creeks or in other pockets of low elevation; small patches of *Distichlis spicata* may also be present near berms or levees (Montague and Wiegert 1990).

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Irregularly tidal; wind, lunar, and seasonal influences are important.

Vegetation: This system consists of salt marshes characterized by *Spartina alterniflora*, *Juncus roemerianus*, and *Distichlis spicata* and brackish marshes dominated by *Juncus roemerianus*. The brackish marshes are in areas slightly higher than the salt marshes, where flooding is greater.

MEMBERSHIP

Associations:

- *Batis maritima* - *Sarcocornia pacifica* Dwarf-shrubland (CEGL003956, G5)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Spartina alterniflora* - *Juncus roemerianus* - *Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190, G5)

Alliances:

- *Batis maritima* Tidal Dwarf-shrubland Alliance (A.1111)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)

DISTRIBUTION

Range: This system is endemic to Florida from Wakulla County (Apalachicola Bay) to the Pasco/Hernando countyline, north of Tampa Bay. (To the west of Apalachicola Bay, where the tides are diurnal instead of semi-diurnal, Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303) replaces this system.)

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232D:CC, 232L:CC

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723080#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA KEYS SEAGRASS BED (CES411.285)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb
Non-Diagnostic Classifiers: Herbaceous
National Mapping Codes: ESLF 9270

CONCEPT

Summary: This system encompasses seagrass beds of Florida Bay and the Florida Keys. *Thalassia testudinum*, *Cymodocea filiformis* (= *Syringodium filiforme*), and *Halodule beaudettei* are the primary potential species. All three species may co-occur in mixed beds, or stands may be heavily dominated by *Thalassia testudinum* only. Some stands may be further characterized by high density and abundance of calcareous green algae.

Similar Ecological Systems:

- Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)
- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: The Florida Bay region is characterized by a peculiar depositional environment (Tanner 1960) with low wave energy, shallow waters, and prevalence of calcareous material. The extensive seagrass beds may form marine peats.

Vegetation: *Thalassia testudinum*, *Cymodocea filiformis*, and *Halodule* are the primary potential species. All three species may co-occur in mixed beds, while other areas may be heavily dominated by *Thalassia testudinum* only, such as Bob Allen Key and Duck Key (<http://serc.fiu.edu/seagrass/!CDreport/DataHome.htm>). Some stands may be further characterized by high density and abundance of calcareous green algae.

MEMBERSHIP

Associations:

- *Thalassia testudinum* - *Cymodocea filiformis* Herbaceous Vegetation (CEGL008384, GNR)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723203#references

Description Author: R. Evans

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA RIVER FLOODPLAIN MARSH (CES203.055)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9246

CONCEPT

Summary: This system occupies generally narrow, but widely fluctuating, zones of herbaceous vegetation along rivers of northeastern, central and southern Florida. *Cladium mariscus ssp. jamaicense* or *Panicum hemitomon* and *Polygonum punctatum* were apparently the historical dominant plant species, but a variety of other species may also be present. Plant species composition (including dominants) may vary seasonally or annually depending on inundation and fire history.

Classification Comments: Placing all component associations is difficult due to a number of factors; the current list (8-03) is incomplete.

Similar Ecological Systems:

- Floridian Highlands Freshwater Marsh (CES203.077)--is found on lakes and former lakes (i.e., Paynes Prairie) not on rivers.
- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Floodplain Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: This system occupies non-tidal, generally narrow, but widely fluctuating, zones of freshwater herbaceous marsh vegetation along rivers of northeastern, central and southern Florida. These include the Myakka, St. Johns, Kissimmee, and perhaps Caloosahatchee rivers.

Vegetation: A relatively diverse assemblage of vegetation is present, ranging from open-water communities to emergent and graminoid marshes and scattered shrublands. See floristic list provided by Huffman and Judd (1998). In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

Dynamics: This system is subject to river flooding. In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* / *Limnobium spongia* - *Salvinia minima* Shrubland (CEGL004457, G3?)
- *Cladium mariscus ssp. jamaicense* Herbaceous Vegetation (CEGL003940, GNR)
- *Nelumbo lutea* - *Pontederia cordata* - *Schoenoplectus tabernaemontani* Herbaceous Vegetation (CEGL004470, G2G3)
- *Osmunda regalis var. spectabilis* - *Peltandra virginica* - *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004471, G2?)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Salix caroliniana* / *Decodon verticillatus* / *Typha latifolia* Forest (CEGL004423, G2G3)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Typha latifolia* - *Pontederia cordata* Herbaceous Vegetation (CEGL004462, G3?)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Osmunda (cinnamomea, regalis)* Saturated Herbaceous Alliance (A.1692)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Typha latifolia* Seasonally Flooded Herbaceous Alliance (A.1393)

DISTRIBUTION

Range: This system is endemic to rivers of northeastern, central and southern Florida.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

USFS Ecomap Regions: 232D:CC, 232G:CC, 232K:CC

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Comer et al. 2003, Huffman and Judd 1998, Kushlan 1990, Patton and Judd 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722655#references

Description Author: R. Evans, mod. C.W. Nordman and M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1489 FLORIDIAN HIGHLANDS FRESHWATER MARSH (CES203.077)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional [Sinkhole]; Graminoid

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2489; ESLF 9214; ESP 1489

CONCEPT

Summary: This system represents non-tidal marsh vegetation in the peninsula of Florida and in the Tallahassee area. These highland marshes occupy different types of depressions such as former lake basins, shallow peat-filled valleys, and zones around existing natural lakes (Kushlan 1990). The marshes and the basins they occur within are unstable over time due to subsurface subsidence and drainage pattern changes. In some examples, surface waterflow is generally lacking due to the presence of limestone near the surface, but water levels have fluctuated greatly over time (Patton and Judd 1986). Soils range from mucky surfaces to sandy loams or sands, but slowly permeable subsoils contribute to the presence of standing water for much of the year. The vegetation mosaic includes a range of mostly herbaceous plant communities that may be referred to as marshes, meadows, and prairies, collectively comprising a relatively diverse number of associations. Permanent water bodies support a range of submerged and floating aquatic species. Areas with approximately a meter of standing water tend to support dense stands of emergent herbaceous perennials, often in monospecific stands; species include *Typha latifolia*, *Pontederia cordata*, *Nelumbo lutea*, and others. Where there is less water (usually present only during wet season), more graminoid vegetation is present, with species such as *Panicum hemitomon*, *Leersia hexandra*, and other species. With historic water level fluctuations, the vegetation mosaic has also changed, sometimes quite rapidly.

Classification Comments: This system was originally intended to cover Paynes Prairie only, but the concept was greatly expanded to include other non-tidal marsh vegetation of Florida, including that around natural lakes, as well as the large Kissimmee and St. Johns River marshes. The Kissimmee and St. Johns River marshes also occur within floodplains but are influenced by somewhat different processes than typical highland marshes. These were formerly considered part of Florida River Floodplain Marsh (CES203.055).

Similar Ecological Systems:

- Florida River Floodplain Marsh (CES203.055)
- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Basin Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: These highland marshes occupy different types of depressions such as former lake basins, shallow peat-filled valleys, and zones around existing natural lakes (Kushlan 1990). The marshes and the basins they occur within are unstable over time due to subsurface subsidence and drainage pattern changes. Soils range from mucky surfaces to sandy loams or sands, but slowly permeable subsoils contribute to the presence of standing water for much of the year.

Vegetation: A relatively diverse assemblage of vegetation is present, ranging from open water communities to emergent and graminoid marshes, and scattered shrublands. Placing all component associations is difficult due to a number of factors; the current list (12-02) is incomplete. In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

Dynamics: In some examples, surface waterflow is generally lacking due to the presence of limestone near the surface, but water levels have fluctuated greatly over time (Patton and Judd 1986). In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* / *Limnobium spongia* - *Salvinia minima* Shrubland (CEGL004457, G3?)
- *Cladium mariscus* ssp. *jamaicense* Herbaceous Vegetation (CEGL003940, GNR)
- *Nelumbo lutea* - *Pontederia cordata* - *Schoenoplectus tabernaemontani* Herbaceous Vegetation (CEGL004470, G2G3)
- *Osmunda regalis* var. *spectabilis* - *Peltandra virginica* - *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004471, G2?)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Pontederia cordata* Seasonally Flooded Herbaceous Vegetation (CEGL004474, G3?)
- *Salix caroliniana* / *Decodon verticillatus* / *Typha latifolia* Forest (CEGL004423, G2G3)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Spartina bakeri* - *Muhlenbergia filipes* - *Andropogon glomeratus* - *Rhynchospora colorata* Herbaceous Vegetation (CEGL004511, G3?)

- *Typha latifolia* - *Pontederia cordata* Herbaceous Vegetation (CEGL004462, G3?)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cladium mariscus* ssp. *jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Osmunda* (*cinnamomea*, *regalis*) Saturated Herbaceous Alliance (A.1692)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Pontederia cordata* Seasonally Flooded Herbaceous Alliance (A.1712)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
- *Typha latifolia* Seasonally Flooded Herbaceous Alliance (A.1393)

DISTRIBUTION

Range: This system is found in the Florida Peninsula and in the Tallahassee Hills/Valdosta Limesink area, possibly ranging into adjacent Georgia.

Divisions: 203:C

Nations: US

Subnations: FL, GA?

Map Zones: 55:C, 56:C

USFS Ecomap Regions: 232B:CC, 232D:CC, 232G:CC, 232J:CC, 232K:CC

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, Kushlan 1990, Patton and Judd 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723252#references

Description Author: R. Evans, mod. C.W. Nordman and M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Central Interior and Appalachian (202)**Land Cover Class:** Herbaceous Wetland**Spatial Scale & Pattern:** Large patch**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Herbaceous; Riverine / Alluvial; Tidal / Estuarine**Non-Diagnostic Classifiers:** >180-day hydroperiod; Lowland [Lowland]; Temperate [Temperate Continental]**National Mapping Codes:** ESLF 9268**CONCEPT**

Summary: This system is found throughout the southern Great Lakes Basin in the United States and Canada. It can include many associated wetlands occurring along portions of tributary rivers and streams that are directly affected by Great Lakes water regimes. It also forms much of the St. Clair River delta. Species distributions and community patterns are determined by multiple abiotic factors, including the type of aquatic system (major river channels, smaller tributary rivers, major deltas, or estuarine), Great Lakes water-level fluctuations, surficial bedrock, glacial landform, climate, and land use. Although wetland species are generally widely distributed, those of more temperate prairie regions are found in the southern parts of the basin. Vegetation types found across this diverse set of abiotic factors can be placed into a number of zones, though not all are present at a given site. The first four zones are typically inundated directly by lake waters: (a) submergent marsh; (b) emergent marsh; (c) shore fen; and (d) shoreline or strand. The next set of zones are inland from the water's edge and include: (e) herbaceous and shrubby wet meadows and (f) shrub or wooded swamps.

This system can be divided into a number of geographical variants, based on the various community types found across the range of the system: (1) Lake Michigan Lacustrine Estuary; (2) Lake Erie-St. Clair Lakeplain Marsh; (3) Lake Ontario Lagoon Marsh; and (4) St Lawrence River Estuary.

Similar Ecological Systems:

- Northern Great Lakes Coastal Marsh (CES201.722)

DESCRIPTION

Environment: Species distributions and community patterns are determined by multiple abiotic factors. Great Lakes water-level fluctuations, surficial bedrock, glacial landform, climate, and land use. Great Lakes water level fluctuate over at least three temporal time scales: first, short-term fluctuations caused by winds or barometric pressures; second, seasonal fluctuations reflecting the annual hydrologic cycle in the basin; and third, interannual fluctuations in lake level as a result of variable precipitation and evaporation within the drainage basin. Interannual fluctuations can be as much as 1.3-2.5 m, with apparently little or no periodicity. These fluctuations, which also alter turbidity, nutrient availability, ice scour zones, etc., cause locational shifts in vegetation zones, but also in the composition of these zones, as species have individual tolerance limits.

The major bedrock distinction in the Great Lakes Basin is between igneous and metamorphic bedrock of the Precambrian period and younger (Paleozoic) sedimentary bedrock. The igneous and metamorphic bedrock form the rugged north shore of Lake Superior and Georgian Bay, and line much of the St. Lawrence River; they are locally present on the south shore of western Lake Superior. They lack the shallow protected waters and fine-textured substrates that support broad coastal wetlands. Where such bedrock is at or near the surface, it forms soils that are nutrient-poor and acidic. The rest of the basin is dominated by softer, sedimentary bedrock, which, with its broad, horizontal depositions, favors broad zones of shallow waters. The sedimentary rocks are typically more alkaline (calcareous), forming soils that are nutrient- and moisture-rich loams and clays. Bedrock patterns are overlaid by glacial landforms that, in combination with recent long-shore transport processes, create the prevalent physiographic features of the shorelines. In the lakes themselves, sand lakeplains, clay lakeplains, and moraines are shaped by currents, and the long-shore transportation of sediments has created sand-spit embayments and swales, dune-swale complexes, and tombolos. Channels and rivers contain channel-side wetlands, embayments, and deltas, and estuaries form as either open or barred river mouths. It is this diversity of landforms that has given rise to a diverse set of vegetation types.

Finally, regional patterns of climate affect the basin. The strong latitudinal gradient from southern Lake Erie to northern Lake Superior creates marked differences in length of growing season and solar radiation. Although wetland species are generally widely distributed, those of more temperate and prairie regions are found in the southern parts.

Vegetation: Vegetation types found across this diverse set of abiotic factors vary in any number of ways, but they can be placed into a number of zones, though not all are present at a given site. The first four zones are typically inundated directly by lake waters: (a) submergent marsh - containing submergent and/or floating vegetation; (b) emergent marsh - characterized by shallow water or semipermanently flooded soils, and typically dominated by bulrushes, cattails, and other emergent species, but also containing submergent and/or floating vegetation; (c) shore fen - saturated vegetation mats characterized by groundwater influence from shoreline habitats but affected by lake level fluctuations, and dominated by herbaceous or shrubby species; and (d) shoreline or strand - a narrow zone at or just above the water level where seasonal water-level fluctuations and waves cause erosion, and which is dominated by annual or pioneer herbaceous species. The next set of zones are inland from the water's edge and include: (e) herbaceous and shrubby wet meadows - characterized by saturated or seasonally flooded soils, and typically dominated by sedges, grasses, and

other herbs, but occasionally dominated by shrubs; and (f) shrub or wooded swamps - characterized by seasonal flooding and dominated by woody species. Species assemblages in these zones change depending on the interaction of factors across the Great Lakes Basin.

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Carex viridula* - *Cladium mariscoides* - *Lobelia kalmii* Herbaceous Vegetation (CEGL005115, G1G2)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Potamogeton zosteriformis* - *Ceratophyllum demersum* - *Elodea canadensis* Southern Great Lakes Shore Herbaceous Vegetation (CEGL005152, G3G4)
- *Typha* spp. - *Schoenoplectus tabernaemontani* - Mixed Herbs Southern Great Lakes Shore Herbaceous Vegetation (CEGL005112, G3G4)

Alliances:

- *Calamagrostis canadensis* - *Carex viridula* - *Cladium mariscoides* - *Lobelia kalmii* Saturated Herbaceous Alliance (A.3525)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

DISTRIBUTION

Range: Throughout the southern Great Lakes Basin in the United States and Canada.

Divisions: 201:?: 202:C

Nations: CA, US

Subnations: MI, NY, OH, ON, PA

Map Zones: 41:P, 49:C, 50:C, 51:C, 52:C, 62:C, 63:C, 64:C

USFS Ecomap Regions: 212Ha:CCC, 212Hf:CCC, 212Hj:CCC, 212Hl:CCC, 212Lb:CCP, 212Ra:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212Sc:CCC, 212Sn:CCC, 212Sq:CCC, 212Te:CCC, 212Y:CC, 222Ja:CCC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 48:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722674#references

Description Author: D. Albert, L. Minc

Version: 26 Mar 2003

Concept Author: D. Albert, L. Minc

Stakeholders: Canada, East, Midwest
ClassifResp: Midwest

GULF COAST CHENIER PLAIN FRESH AND OLIGOHALINE TIDAL MARSH (CES203.467)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Aquatic Herb; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9237

CONCEPT

Summary: This system includes large expanses of tidal marshes, strongly influenced by freshwater, along the Chenier Plain of Louisiana and Texas. Fresh marsh is the most common marsh type of the Chenier Plain because of the unique geomorphology of the area. The Chenier Plain is characterized by a prograding coastline replenished by sediments carried to the Gulf of Mexico by the Atchafalaya and other rivers. It is void of barrier islands, and shoreline sediments are reworked by waves into beach ridges. This process has been continuing since the last glacial retreat, and as the coastline progrades, older beach ridges are left as interior ridges surrounded by marsh. Historically, there were very few natural connections between the marshes and the ocean, resulting in fresh to oligohaline salinity. In more recent times, with the increase of dredged canals connecting the marsh system to the gulf, an increase in salinity has occurred, to the detriment of plants adapted to freshwater environments. Significant fresh marsh loss has occurred. Increases in salinity levels may be caused by saltwater intrusion and freshwater diversion. As salinity increases fresh marsh composition shifts to species more tolerant of salinity, ultimately losing species diversity and resulting in open saline waters. Oligohaline marshes range in salinity from 3-4 ppt. Species richness is typically higher in oligohaline marshes than in brackish marshes. A declining component of freshwater communities is sawgrass. This is a highly threatened system in coastal Louisiana.

Classification Comments: This system also includes some flotant marshes formerly recognized as a distinct ecological group.

Similar Ecological Systems:

- Central and Upper Texas Coast Fresh and Oligohaline Tidal Marsh (CES203.472)
- Mississippi Delta Fresh and Oligohaline Tidal Marsh (CES203.470)

MEMBERSHIP

Associations:

- *Panicum hemitomon* Semipermanently Flooded Herbaceous Vegetation (CEGL004665, G3G4)
- *Paspalum vaginatum* - *Spartina patens* Oligohaline Herbaceous Vegetation (CEGL007885, G2?)
- *Phragmites australis* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Herbaceous Vegetation (CEGL007891, G4?)
- *Sagittaria lancifolia* - *Typha* spp. - *Ludwigia* spp. Herbaceous Vegetation (CEGL007894, G3G4)
- *Schoenoplectus americanus* - (*Spartina patens*) - *Typha* spp. Herbaceous Vegetation (CEGL008476, G3?)
- *Schoenoplectus californicus* Tidal Herbaceous Vegetation (CEGL003985, G4G5)
- *Spartina patens* - *Typha* spp. Chenier Plain Oligohaline Herbaceous Vegetation (CEGL007887, G3?)
- *Zizaniopsis miliacea* - *Panicum hemitomon* Herbaceous Vegetation (CEGL007895, G3G4)

Alliances:

- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Sagittaria lancifolia* Semipermanently Flooded Herbaceous Alliance (A.1588)
- *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007)
- *Schoenoplectus californicus* Tidal Herbaceous Alliance (A.2004)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

SPATIAL CHARACTERISTICS

Spatial Summary: Typically in large patches but may also occur in small patches.

DISTRIBUTION

Range: This system extends from Vermillion Bay, Louisiana, through Jefferson County, Texas. It does not extend into Galveston Bay.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 37:C, 98:C

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003, Visser et al. 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723119#references

Description Author: J. Teague and R. Evans, mod. M. Pyne

Version: 30 Jan 2006

Concept Author: J. Teague and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

GULF COAST CHENIER PLAIN SALT AND BRACKISH TIDAL MARSH (CES203.468)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); Brackish (Mesohaline); Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9240

CONCEPT

Summary: This system includes brackish to salt intertidal marshes in the Chenier Plain of Louisiana and Texas. Because of the unique geomorphology of the area, salt and brackish marshes were historically less common than fresh marsh in the Chenier Plain. This area is characterized by a prograding coastline replenished by sediments carried to the Gulf of Mexico by the Atchafalaya and other rivers. It is void of barrier islands, and shoreline sediments are reworked by waves into beach ridges. This process has been continuing since the last glacial retreat, and as the coastline progrades, older beach ridges are left as interior ridges surrounded by marsh. Historically, there were very few natural connections between the marshes and the ocean, resulting in fresh to oligohaline salinity. In more recent times, with the increase of dredged canals connecting the marsh system to the gulf, an increase in salinity has occurred, to the detriment of plants adapted to freshwater environments. Significant fresh marsh loss has occurred in this area. Increases in salinity levels may be caused by saltwater intrusion and/or freshwater diversion. Both water level and salinity influence species composition. Salt marshes (about 16 ppt) receive regular daily tides and are typically dominated by *Spartina alterniflora*. Brackish marshes (about 8 ppt), under slightly less tidal influence and moderately influenced by freshwater, are typically dominated by *Spartina patens*, and degraded by saltwater intrusion. More brackish occurrences may be found along tidal creeks and the upper reaches of daily tides or in areas more influenced by wind tides. Inclusions of *Juncus roemerianus* and other brackish species are found in small to large patches.

Similar Ecological Systems:

- Central and Upper Texas Coast Salt and Brackish Tidal Marsh (CES203.473)
- Mississippi Delta Salt and Brackish Tidal Marsh (CES203.471)

MEMBERSHIP

Associations:

- *Borrhichia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Iva frutescens* ssp. *frutescens* - *Baccharis halimifolia* / *Spartina spartinae* Shrubland (CEGL004616, G4?)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Sarcocornia pacifica* - (*Batis maritima*, *Distichlis spicata*) Dwarf-shrubland (CEGL002278, G4)
- *Spartina alterniflora* - *Distichlis spicata* - *Spartina patens* Mesohaline Tidal Herbaceous Vegetation (CEGL002230, G4?)
- *Spartina alterniflora* - *Juncus roemerianus* - *Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190, G5)
- *Spartina patens* - *Schoenoplectus (americanus, pungens)* - (*Distichlis spicata*) Herbaceous Vegetation (CEGL004755, G4?)
- *Spartina spartinae* - *Sporobolus virginicus* Tidal Herbaceous Vegetation (CEGL004199, G4G5)
- *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456, GNR)

Alliances:

- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Borrhichia frutescens* Tidal Shrubland Alliance (A.1026)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Spartina alterniflora*) Tidal Dwarf-shrubland Alliance (A.1705)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Spartina spartinae* Tidal Herbaceous Alliance (A.1483)
- *Typha (angustifolia, domingensis)* Tidal Herbaceous Alliance (A.1472)

DISTRIBUTION

Range: This system extends from Vermillion Bay, Louisiana, through Jefferson County, Texas. It does not extend into Galveston Bay.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 37:C

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003, Visser et al. 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723118#references

Description Author: J. Teague and R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: J. Teague and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

INTER-MOUNTAIN BASINS ALKALINE CLOSED DEPRESSION (CES304.998)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saline Water Chemistry; Herbaceous; Depressional [Mineral]; Isolated Wetland [Partially Isolated]; Depression

National Mapping Codes: ESLF 9297

CONCEPT

Summary: This ecological system occurs on sites that are seasonally to semipermanently flooded, usually retaining water into the growing season and drying completely only in drought years. Many are associated with hot and cold springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation. Salt encrustations can occur on the surface in some examples of this system, and the soils are severely affected and have poor structure. Species that typify this system are salt-tolerant and halophytic species such as *Distichlis spicata*, *Puccinellia lemmonii*, *Poa secunda*, *Muhlenbergia* spp., *Leymus triticoides* (= *Elymus triticoides*), *Schoenoplectus maritimus*, *Schoenoplectus americanus*, *Triglochin maritima*, and *Salicornia* spp. During exceptionally wet years, an increase in precipitation can dilute the salt concentration in the soils of some examples of this system which may allow for less salt-tolerant species to occur. Communities found within this system may also occur in floodplains (i.e., more open depressions), but probably should not be considered a separate system unless they transition to areas outside the immediate floodplain. Types often occur along the margins of perennial lakes, in alkaline closed basins, with extremely low-gradient shorelines. This system is very similar to Western Great Plains Closed Depression Wetland (CES303.666).

Similar Ecological Systems:

- Western Great Plains Closed Depression Wetland (CES303.666)

Related Concepts:

- Other Sagebrush Types (408) (Shiflet 1994) Intersecting. *Artemisia cana* ssp. *bolanderi* shrublands are included in this ecological system.

DESCRIPTION

Environment: This system is distinct from the freshwater depression systems by its brackish nature caused by strongly saline soils. Salt encrustations could occur near the surface in some examples of this system.

Vegetation: Salt-tolerant and halophytic species such as *Distichlis spicata* typify the system.

Dynamics: Hydrology processes primarily drive this system. Increases in precipitation and/or runoff can dilute the salt concentration and allow for less salt-tolerant species to occur. Conversion to agriculture and pastureland can also impact this system, especially when it alters the hydrology of the system.

MEMBERSHIP

Associations:

- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003050, G5)
- *Eleocharis palustris - Distichlis spicata* Herbaceous Vegetation (CEGL001834, G2G4)
- *Eleocharis palustris - Juncus balticus* Herbaceous Vegetation (CEGL001835, G2G4)
- *Leymus triticoides - Poa secunda* Herbaceous Vegetation (CEGL001572, G2)
- *Leymus triticoides* Herbaceous Vegetation (CEGL001571, G4?)
- *Poa secunda - Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002755, GNR)
- *Puccinellia lemmonii - Poa secunda* Seasonally Flooded Herbaceous Vegetation (CEGL001658, G1)
- *Schoenoplectus americanus - Eleocharis palustris* Herbaceous Vegetation (CEGL001585, G4)

Alliances:

- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Alliance (A.1371)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Leymus triticoides* Temporarily Flooded Herbaceous Alliance (A.1353)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)

DISTRIBUTION

Range: This system can occur throughout the Columbia Plateau and the northern Great Basin but is most common in eastern Oregon and northern Nevada. It occurs in the Wyoming basins (central Wyoming) where it is surrounded by sage steppe systems.

Divisions: 304:C

Nations: US

Subnations: CA, ID, NV, OR, UT, WA?, WY

Map Zones: 7:P, 8:P, 9:C, 12:C, 13:?, 16:?, 17:P, 18:C, 22:C, 23:P, 24:?

USFS Ecomap Regions: 341A:??, 341D:??, 341E:??, 341G:??, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, 342J:CC, M261G:PP, M341A:??, M341D:??

TNC Ecoregions: 6:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.731763#references

Description Author: J. Kagan and P. Comer

Version: 29 Jan 2007

Concept Author: J. Kagan

Stakeholders: West

ClassifResp: West

INTER-MOUNTAIN BASINS INTERDUNAL SWALE WETLAND (CES304.059)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Dune (Landform); Dune field; Dune (Substrate); Temperate [Temperate Xeric]; Depressional; Isolated Wetland [Partially Isolated]; Sand Soil Texture; W-Landscape/High Intensity; Graminoid

Non-Diagnostic Classifiers: Dune (undifferentiated); Lowland [Lowland]; Shrubland (Shrub-dominated); Herbaceous; Temperate [Temperate Continental]; Aridic

National Mapping Codes: ESLF 9235

CONCEPT

Summary: This ecological system occurs within dune fields in the Intermountain western U.S. as small (usually less than 0.1 ha) interdunal wetlands that occur in wind deflation areas, where sands are scoured down to the water table. Small ponds may be associated. The water table may be perched over an impermeable layer of caliche or clay or, in the case of the Great Sand Dunes of Colorado, a geologic dike that creates a closed basin that traps water. These wetland areas are typically dominated by common emergent herbaceous vegetation such as species of *Eleocharis*, *Juncus*, and *Schoenoplectus*. Dune field ecological processes distinguish these emergent wetlands from similar non-dune wetlands.

Classification Comments: This system was originally included within Inter-Mountain Basins Active and Stabilized Dune (CES304.775). These small-scale wetlands were pulled out into their own system because they are isolated wetlands and support completely different biota than the surrounding dry dunes. Many dune fields in the Great Basin are associated with playas and playa lakes such as Washoe Lake, Great Salt Lake, and Mono Lake. At Great Sand Dunes National Monument, Colorado, isolated interdunal swale wetlands occur where winds scour sand to expose wet sand at the water table, largely on the west side (windward) of the main dune field. The same groundwater source also feeds springs that form intermittent creeks that are not part of this interdunal swale system.

DESCRIPTION

Environment: Occurs in wet interdunal swales.

Vegetation: A variety of emergent herbaceous vegetation may occur including, *Juncus balticus*, *Schoenoplectus pungens*, *Typha* spp., *Cyperus* spp., *Eleocharis* spp., and *Salix exigua*.

Dynamics: The dunes are shaped by the wind and continue to change. The size and exact location of the wet swales may change as the sand dunes shift, due to active dune migration. Dune "blowouts" and subsequent stabilization through succession are characteristic processes of the active dunes which surround the interdunal swales.

MEMBERSHIP

Associations:

- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Juncus balticus* - *Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)
- *Schoenoplectus americanus* - *Carex* spp. Herbaceous Vegetation (CEGL004144, GNR)
- *Schoenoplectus americanus* - *Eleocharis palustris* Herbaceous Vegetation (CEGL001585, G4)
- *Schoenoplectus americanus* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Schoenoplectus americanus* Western Herbaceous Vegetation (CEGL001841, G3Q)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001587, G3G4)
- *Typha* (*latifolia*, *angustifolia*) Western Herbaceous Vegetation (CEGL002010, G5)
- *Typha domingensis* Western Herbaceous Vegetation (CEGL001845, G5?)

Alliances:

- *Carex* (*rostrata*, *utriculata*) Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)

- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha domingensis* Seasonally Flooded Temperate Herbaceous Alliance (A.1392)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch.

Adjacent Ecological Systems:

- Inter-Mountain Basins Active and Stabilized Dune (CES304.775)

Adjacent Ecological System Comments: This wetland system occurs in wet swales within Inter-Mountain Basins Active and Stabilized Dune (CES304.775).

DISTRIBUTION

Range: The system occurs in some dune fields across the Intermountain western U.S., including the Great Sand Dunes in southern Colorado and the Pink Coral Dunes in Utah. Interdunal wetlands may also occur in dune fields in northeastern Arizona and the Great Basin, as well as in southwestern Wyoming in the Killpecker Dunes and Ferris Dunes, and southern Idaho.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ?, CO, ID, NV, UT, WY

Map Zones: 7:P, 8:P, 9:P, 12:P, 16:?, 17:P, 18:?, 22:C, 23:?, 24:?, 28:C

USFS Ecomap Regions: 313A:PP, 321A:CC, 331J:CC, 342B:PP, 342C:PP, 342D:PP, 342H:P?, M332E:PP

TNC Ecoregions: 6:?, 10:?, 11:?, 19:?, 20:C

SOURCES

References: Bowers 1982, Bowers 1984, Bowers 1986, Brand and Sanderson 2002, Cooper and Severn 1992, Hammond 1998, Pineada et al. 1999, Pineda 2000, Rondeau 2001, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.777819#references

Description Author: K.A. Schulz

Version: 12 May 2005

Concept Author: Hammond (1998)

Stakeholders: West

ClassifResp: West

INTERIOR LOW PLATEAU SEEPAGE FEN (CES202.346)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated)

National Mapping Codes: ESLF 9409

CONCEPT

Summary: This system accommodates small-scale, herbaceous-dominated seepage areas found in limited areas of the Interior Low Plateau of Tennessee, Kentucky and possibly Ohio. It is most frequent in the Western Highland Rim of Tennessee (Lewis, Cheatham, and Williamson counties). There are also rare occurrences of this system in the Eastern Highland Rim of Tennessee and related limited areas of Kentucky and possibly Ohio (D. Minney pers. comm. 2006). These features have been generally known as "seepage fens" and are fed by mineral-rich groundwater. Examples are associated with stream drainages but are generally not affected by stream-related hydrology. Soils contain a thin organic layer over limestone gravel, over a less permeable layer of more solid rock. The vegetation is dominated by herbaceous plants. Characteristic species include *Carex atlantica*, *Carex lurida*, *Carex leptalea* ssp. *harperi*, *Parnassia grandifolia*, *Juncus brachycephalus*, *Rudbeckia fulgida* var. *umbrosa*, *Cardamine bulbosa*, *Impatiens capensis*, *Juncus coriaceus*, *Juncus effusus*, *Lobelia puberula*, *Lobelia cardinalis*, *Oxypolis rigidior*, *Phlox glaberrima*, *Rhynchospora capitellata*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Solidago patula* var. *patula*, and *Thelypteris palustris* var. *pubescens*. Woody species include *Alnus serrulata*, *Salix humilis*, *Salix caroliniana*, *Cornus amomum*, and *Acer rubrum*, which may invade the herbaceous seep. *Xyris tennesseensis* is endemic to this system and occurs in 50% or more of its occurrences.

Classification Comments: This system is a small-patch system, originally described from a small region. Its range has been expanded to include a greater geographic scope.

Similar Ecological Systems:

- North-Central Appalachian Seepage Fen (CES202.607)
- Ozark-Ouachita Fen (CES202.052)

Related Concepts:

- *Carex lurida* (*hystericina*?) - *Carex leptalea* - *Rhynchospora capillacea* Alkaline Seep (Minney 2000) Undetermined
- Calcareous Seep (Evans 1991) Finer

DESCRIPTION

Environment: These features are fed by mineral-rich groundwater. Stands occur on the sideslopes of hills in narrow valleys, bases of bluffs, rock ledges, and terraces of streams and rivers, where the soil or substrate is saturated by calcareous groundwater seepage. Examples are associated with stream drainages but are generally not affected by stream-related hydrology. The parent material is a mixture of gravel and dolomite with fragments of deeply weathered bedrock present or colluvium over bedrock. Soils contain a thin organic layer over limestone gravel, over a less permeable layer of more solid rock.

Vegetation: The vegetation is dominated by herbaceous plants. Characteristic species include *Carex atlantica*, *Carex lurida*, *Carex leptalea* ssp. *harperi*, *Parnassia grandifolia*, *Juncus brachycephalus*, *Rudbeckia fulgida* var. *umbrosa*, *Cardamine bulbosa*, *Impatiens capensis*, *Juncus coriaceus*, *Juncus effusus*, *Lobelia puberula*, *Lobelia cardinalis*, *Oxypolis rigidior*, *Phlox glaberrima*, *Rhynchospora capitellata*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Solidago patula* var. *patula*, and *Thelypteris palustris* var. *pubescens*. Woody species include *Alnus serrulata*, *Salix humilis*, *Salix caroliniana*, *Cornus amomum*, and *Acer rubrum*. Some stands in southern Ohio may lack *Parnassia* (D. Minney pers. comm. 2006).

MEMBERSHIP

Associations:

- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Carex lurida* - *Carex leptalea* - *Parnassia grandifolia* - *Juncus brachycephalus* - (*Xyris tennesseensis*) Herbaceous Vegetation (CEGL004161, G1)

Alliances:

- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)

DISTRIBUTION

Range: This system is found in limited areas of the Interior Low Plateau of Tennessee, Kentucky and possibly Ohio, including primarily the Western Highland Rim region of Tennessee (Ecoregion 71f of Griffith et al. (1998), EPA (2004); Subsection 222Eg of Keys et al. (1995)).

Divisions: 202:C

Nations: US

Subnations: KY, OH?, TN
Map Zones: 47:C, 48:C, 53:C
TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, EPA 2004, Griffith et al. 1998, Keys et al. 1995, Minney pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723164#references

Description Author: M. Pyne

Version: 17 Apr 2006

Concept Author: M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

LAURENTIAN-ACADIAN FRESHWATER MARSH (CES201.594)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; >180-day hydroperiod; Depressional [Lakeshore]; Riverine / Alluvial; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Moderate (100-500 yrs) Persistence; Herbaceous; Extensive Wet Flat; Depressional [Pond]; Muck; Aquatic Herb

National Mapping Codes: ESLF 9405

CONCEPT

Summary: These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They are common throughout the northeastern United States and adjacent Canadian provinces. Freshwater marshes occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Examples of vegetation in the Delaware Estuary freshwater marsh communities include *Typha latifolia*, *Typha angustifolia*, *Phragmites australis*, *Schoenoplectus americanus*, *Thelypteris palustris*, *Impatiens capensis*, *Carex* spp., *Vallisneria americana*, *Potamogeton perfoliatus*, *Nuphar lutea* ssp. *advena*, and *Nymphaea odorata*.

Similar Ecological Systems:

- Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)
- North-Central Interior Freshwater Marsh (CES202.899)

MEMBERSHIP

Associations:

- *Bidens cernua* - *Verbena hastata* - *Polygonum* spp. Herbaceous Vegetation (CEGL006446, GNR)
- *Elodea canadensis* - *Potamogeton* spp. Eastern Herbaceous Vegetation [Placeholder] (CEGL006431, GNR)
- *Equisetum fluviatile* - (*Eleocharis palustris*) Herbaceous Vegetation (CEGL005258, G4)
- *Eriocaulon aquaticum* - *Lobelia dortmanna* Herbaceous Vegetation (CEGL006346, GNR)
- *Juncus militaris* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL006345, GNR)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nymphaea odorata* - *Nuphar lutea* (ssp. *pumila*, ssp. *variegata*) Herbaceous Vegetation (CEGL002562, G5)
- *Nymphaea tetragona* - *Nuphar lutea* (ssp. *pumila*, ssp. *variegata*) Herbaceous Vegetation (CEGL002563, G4G5)
- *Pontederia cordata* - *Peltandra virginica* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL006191, G5)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Schoenoplectus (tabernaemontani, acutus)* Eastern Herbaceous Vegetation (CEGL006275, GNR)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus acutus* - *Carex lasiocarpa* Herbaceous Vegetation (CEGL006358, G1G2)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Schoenoplectus fluviatilis* Herbaceous Vegetation (CEGL006366, GNR)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation (CEGL006349, GNR)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Eastern Herbaceous Vegetation (CEGL006153, G5)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229, G4?)
- *Vallisneria americana* - *Potamogeton perfoliatus* Herbaceous Vegetation (CEGL006196, G5)
- *Zizania (aquatica, palustris)* Herbaceous Vegetation (CEGL002382, G3G4)

Alliances:

- *Eleocharis* spp. - *Eriocaulon aquaticum* Semipermanently Flooded Herbaceous Alliance (A.1429)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Juncus militaris* Semipermanently Flooded Herbaceous Alliance (A.1430)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

- *Vallisneria americana* Permanently Flooded Temperate Herbaceous Alliance (A.1757)
- *Zizania (aquatica, palustris)* Semipermanently Flooded Herbaceous Alliance (A.1441)

DISTRIBUTION

Range: This system occurs in New England and northern New York west across the upper Great Lakes to Minnesota, and adjacent Canada, southward to Pennsylvania, New Jersey, and Ohio; mostly north of the glacial boundary.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: CT, IL?, IN?, MA, ME, MI, MN, NB, NH, NJ, NY, OH?, ON, PA, QC, RI, VT, WI

Map Zones: 41:C, 49:?, 50:C, 51:C, 52:?, 60:C, 61:C, 62:P, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC

TNC Ecoregions: 47:C, 48:C, 49:C, 59:C, 60:C, 61:C, 63:C, 64:C

SOURCES

References: Comer and Albert 1997, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.731557#references

Description Author: E. Largay

Version: 22 Dec 2005

Concept Author: S.C. Gawler, D. Faber-Langendoen

Stakeholders: Canada, East, Midwest
ClassifResp: East

LAURENTIAN-ACADIAN WET MEADOW-SHRUB SWAMP (CES201.582)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; Depressional [Lakeshore]; Riverine / Alluvial; Broad-Leaved Shrub; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Moderate (100-500 yrs) Persistence; Herbaceous; Extensive Wet Flat; Depressional [Pond]; Muck

National Mapping Codes: ESLF 9406

CONCEPT

Summary: This system encompasses shrub swamps and wet meadows on mineral soils of the Northeast and upper Midwest. They are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and graminoid dominance; typical species include *Salix* spp., *Cornus amomum*, *Alnus incana*, *Spiraea alba*, *Calamagrostis canadensis*, tall *Carex* spp., and *Juncus effusus*. Trees are generally absent and, if present, are scattered.

Similar Ecological Systems:

- Laurentian-Acadian Freshwater Marsh (CES201.594)
- North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)

MEMBERSHIP

Associations:

- *Alnus incana* Swamp Shrubland (CEGL002381, G5)
- *Alnus serrulata* Swamp Shrubland (CEGL005082, G4G5)
- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519, GNR)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation (CEGL006412, G4G5)
- *Carex tetanica* - *Carex prairea* - *Eleocharis erythropoda* - *Lysimachia quadriflora* Herbaceous Vegetation (CEGL006170, G1Q)
- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Equisetum fluviatile* - (*Eleocharis palustris*) Herbaceous Vegetation (CEGL005258, G4)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Myrica gale* - *Spiraea alba* - *Chamaedaphne calyculata* Shrubland (CEGL006512, GNR)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation (CEGL006349, GNR)
- *Typha latifolia* - *Caltha palustris* Herbaceous Vegetation (CEGL006245, G1)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Myrica gale* Saturated Shrubland Alliance (A.1022)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

DISTRIBUTION

Range: New England and northern New York west across the upper Great Lakes to Minnesota, and adjacent Canada, southward to Pennsylvania and Ohio; mostly north of the glacial boundary.

Divisions: 201:C

Nations: CA, US

Subnations: CT, IL?, IN?, MA, ME, MI, MN, NB, NH, NY, OH?, ON, PA, QC, RI, VT, WI

Map Zones: 41:C, 49:?, 50:C, 51:C, 52:?, 60:C, 61:C, 62:P, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCC, 212Hi:CCC, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCC, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Q:CC, 212Ra:CCC, 212Rb:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212S:CC, 212T:CC, 212X:CC, 212Y:CC, 212Z:CC, 222K:CC, 222M:CC, 222R:CC, 222Ue:CCC

TNC Ecoregions: 47:C, 48:C, 49:C, 59:C, 60:C, 61:C, 63:C, 64:C

SOURCES

References: Comer and Albert 1997, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.731538#references

Description Author: S.C. Gawler, D. Faber-Langendoen, mod. E. Largay

Version: 11 Apr 2007

Concept Author: S.C. Gawler, D. Faber-Langendoen

Stakeholders: Canada, East, Midwest
ClassifResp: East

MEDITERRANEAN CALIFORNIA COASTAL INTERDUNAL WETLAND (CES206.951)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; Sand Subsoil Texture; Coastal Dune Mosaic; Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Depressional [Pond]; Mineral: W/ A-Horizon <10 cm; Graminoid

Non-Diagnostic Classifiers: Dune field; Saturated Soil; Very Short Flooding Interval; 1-29-day hydroperiod; Short (50-100 yrs) Persistence; Lowland [Lowland]; Slough; Swale; Isolated Wetland [Partially Isolated]; Barrier flat; Forb; Aquatic Herb

National Mapping Codes: ESLF 9262

CONCEPT

Summary: Coastal interdunal wetlands are common components of larger active and stabilized coastal dune fields, ranging from Coos Bay, Oregon, south to San Luis Obispo County, California. They can be referred to as "slack dune ponds" when associated with larger and deeper water or "coastal dune swales" when water is shallow, and typically occur behind active foredunes, especially where the base of the dunes are at or near groundwater levels. They may result from active dune movement, sometimes when dunes interrupt surface waterflow, or where extensive dune "blowouts" remove sand down to the water table. Common plant species include *Argentina anserina* (= *Potentilla anserina*), *Hydrocotyle umbellata*, *Euthamia occidentalis*, *Juncus* spp., *Carex obnupta*, and *Sparganium* spp.

Related Concepts:

- Wetlands (217) (Shiflet 1994) Broader

DISTRIBUTION

Range: Coos Bay, Oregon, south to San Luis Obispo County, California.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:P, 3:C, 4:C

USFS Ecomap Regions: 261B:CC, 263A:CC

TNC Ecoregions: 1:P, 14:C, 15:C, 16:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722730#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

MEDITERRANEAN CALIFORNIA EELGRASS BED (CES206.999)

CLASSIFIERS

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saline Water Chemistry; Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Mediterranean [Mediterranean Xeric-Oceanic]; Mediterranean [Mediterranean Desertic-Oceanic]; Aquatic Herb; Marine Algae

Non-Diagnostic Classifiers: >180-day hydroperiod; Short (50-100 yrs) Persistence; Lowland [Lowland]; Herbaceous

National Mapping Codes: ESLF 9266

CONCEPT

Summary: Intertidal zones are found with clear water in bays, inlets and lagoons, typically dominated by macrophytic algae and marine aquatic angiosperms along the temperate Pacific Coast. Subtidal portions are never exposed, while intertidal areas support species that can tolerate exposure to the air. Common substrates include marine silts, but may also include exposed bedrock and cobble, where many algal species become attached with holdfasts. Intertidal systems are dominated by *Zostera marina* (= *Zostera pacifica*), *Phyllospadix scouleri*, *Fucus distichus*, *Postelsia plumiformis*, and a host of green and brown algae. Adjacent subtidal zones, where rocky substrates are common, support undersea kelp "forest."

DISTRIBUTION

Range: This system is found along the temperate Pacific Coast.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 2:P, 3:C, 4:C

USFS Ecomap Regions: 261B:CC, 263A:CC

TNC Ecoregions: 14:C, 15:C, 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722706#references

Description Author: P. Comer, mod. T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer

Stakeholders: Latin America, West
ClassifResp: West

MEDITERRANEAN CALIFORNIA SERPENTINE FEN (CES206.953)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Ultramafic; Bog and Fen Mosaic; Moss/Lichen (Nonvascular); Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Seepage-Fed Sloping; Organic Peat (>40 cm); Bryophyte; *Darlingtonia californica*

Non-Diagnostic Classifiers: Acidic Water; Montane; Lowland; Shrubland (Shrub-dominated); Herbaceous; Forb; Graminoid

National Mapping Codes: ESLF 9255

CONCEPT

Summary: This ecological system is found uncommonly throughout coastal lowlands and high mountains of the Klamath Mountains and surrounding landscapes where serpentine soils are common in cool and moist environments. This system includes unique assemblages of wetlands species restricted to serpentine and ultramafic substrates. These sites remain moist or wet throughout the year and may have substantial *Sphagnum* accumulation. Some may be bogs in the sense of nutrients and moisture primarily coming from rainfall, or more commonly they are seeps or fens maintained by groundwater discharge. Soils are acidic and often derived from ultramafic parent materials. The acidic (6.5-6.7 pH) and nutrient-poor substrates produce severe nitrogen deficiency which favors insectivorous plants. Characteristic plant species include *Darlingtonia californica*, *Drosera rotundifolia*, *Eleocharis quinqueflora*, *Eriophorum crinigerum*, *Carex californica*, and *Deschampsia caespitosa*. Around the edges of these fens *Chamaecyparis lawsoniana* can occur and form part of the fen. Burning is essential to maintain healthy stands. *Darlingtonia* fens are important habitat for rare species that respond positively to burning. Burning at least eliminates some of the tree invaders (*Pinus jeffreyi*, *Pseudotsuga menziesii*, *Chamaecyparis lawsoniana*) and maintains a high water table, essential for the fen-dependent plants.

DISTRIBUTION

Range: This system is found uncommonly throughout coastal lowlands and high mountains of the Klamath Mountains of California and Oregon and surrounding landscapes where serpentine soils are common in cool and moist environments.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 7:P

USFS Ecomap Regions: M261A:CC, M261B:CP, M261D:CP

TNC Ecoregions: 5:C, 14:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722728#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

MEDITERRANEAN CALIFORNIA SUBALPINE-MONTANE FEN (CES206.952)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Circumneutral Water; Extreme (Mineral) Rich and Iron-Rich; Bog and Fen Mosaic; Temperate [Temperate Oceanic]; Seepage-Fed Sloping; Muck

Non-Diagnostic Classifiers: Saturated Soil; Long (>500 yrs) Persistence; Montane [Upper Montane]; Montane [Montane]; Herbaceous; Moss/Lichen (Nonvascular); Organic Peat (>40 cm); Forb; Graminoid; Bryophyte

National Mapping Codes: ESLF 9248

CONCEPT

Summary: This system is found in montane to subalpine elevations confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation. This system includes extreme rich fens which are quite rare. Fens form at low points in the landscape or near slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, the extreme rich fens have distinct soil and water chemistry, with high levels of one or more minerals such as calcium and/or magnesium. They usually occur as a mosaic of several plant associations dominated by species of *Carex*, *Betula*, *Kobresia*, or *Schoenoplectus*. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests.

Related Concepts:

- Wetlands (217) (Shiflet 1994) Broader

DISTRIBUTION

Range: These fens are found in montane to subalpine elevations of California mountains, in the Sierra Nevada, northwestern California coastal mountains, and possibly the Klamath - Siskiyou mountains.

Divisions: 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 2:P, 3:C, 4:?, 6:C, 7:C, 12:P

USFS Ecomap Regions: 341D:PP, M261A:C?, M261B:C?, M261D:C?, M261E:CC

TNC Ecoregions: 5:P, 12:P, 14:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722729#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 14 Dec 2004

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

MISSISSIPPI DELTA FRESH AND OLIGOHALINE TIDAL MARSH (CES203.470)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9241

CONCEPT

Summary: This system includes tidal marshes strongly influenced by freshwater producing a fresh to oligohaline chemistry. These areas can occupy small to large patches of the Mississippi Delta. A unique type of floating fresh marsh (flotant) is also included in this system. This system has a heterogeneous physiognomy including shrublands, grasslands, and aquatic herbs. Significant fresh marsh loss has occurred in the deltaic plain of the Mississippi River. These losses are related to natural and anthropogenic causes. Subsidence and loss of wetlands are a natural part of the deltaic process, but they have been exacerbated by the reduction in sediment load and freshwater input into coastal areas caused by the impoundment and channelization of streams and rivers. In addition dredged channels in the marsh facilitate saltwater intrusion, and spoil banks prevent marshes from draining. Increases in salinity cause shifts in composition to species more tolerant of salinity, ultimately resulting in loss of species diversity and open saline waters.

Similar Ecological Systems:

- Gulf Coast Chenier Plain Fresh and Oligohaline Tidal Marsh (CES203.467)

DESCRIPTION

Vegetation: Species found in examples of this system include *Colocasia esculenta*, *Eleocharis baldwinii*, *Eleocharis rostellata*, *Hydrocotyle ranunculoides*, *Hydrocotyle umbellata*, *Ludwigia* spp., *Morella cerifera*, *Panicum hemitomon*, *Paspalum vaginatum*, *Phragmites australis*, *Sagittaria lancifolia*, *Sagittaria latifolia*, *Sagittaria platyphylla*, *Schoenoplectus californicus*, *Spartina patens*, *Vigna luteola*, *Typha domingensis*, and *Zizaniopsis miliacea*.

MEMBERSHIP

Associations:

- *Eleocharis baldwinii* - *Hydrocotyle* (*ranunculoides*, *umbellata*) Herbaceous Vegetation (CEGL007893, G3G4Q)
- *Eleocharis rostellata* - *Sagittaria lancifolia* Oligohaline Herbaceous Vegetation (CEGL007886, G3G4)
- *Morella cerifera* - *Panicum hemitomon* Flotant Marsh Herbaceous Vegetation (CEGL007834, G2G3)
- *Panicum hemitomon* Semipermanently Flooded Herbaceous Vegetation (CEGL004665, G3G4)
- *Paspalum vaginatum* - *Spartina patens* Oligohaline Herbaceous Vegetation (CEGL007885, G2?)
- *Phragmites australis* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Herbaceous Vegetation (CEGL007891, G4?)
- *Sagittaria lancifolia* - *Typha* spp. - *Ludwigia* spp. Herbaceous Vegetation (CEGL007894, G3G4)
- *Sagittaria lancifolia* Mississippi River Deltaic Plain Herbaceous Vegetation (CEGL007889, G3G4)
- *Sagittaria latifolia* - *Sagittaria platyphylla* - (*Colocasia esculenta*) Deltaic Herbaceous Vegetation (CEGL007890, G3G4)
- *Schoenoplectus californicus* Tidal Herbaceous Vegetation (CEGL003985, G4G5)
- *Spartina patens* - *Vigna luteola* Mississippi River Deltaic Plain Herbaceous Vegetation (CEGL007888, G3G4)
- *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456, GNR)
- *Zizaniopsis miliacea* - *Panicum hemitomon* Herbaceous Vegetation (CEGL007895, G3G4)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Eleocharis baldwinii* Semipermanently Flooded Herbaceous Alliance (A.1988)
- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Sagittaria lancifolia* Semipermanently Flooded Herbaceous Alliance (A.1588)
- *Sagittaria lancifolia* Tidal Herbaceous Alliance (A.1987)
- *Schoenoplectus californicus* Tidal Herbaceous Alliance (A.2004)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Typha* (*angustifolia*, *domingensis*) Tidal Herbaceous Alliance (A.1472)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

DISTRIBUTION

Range: Mississippi Delta.

Divisions: 203:C

Nations: US

Subnations: LA
Map Zones: 98:C
USFS Ecomap Regions: 232E:CC
TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003, Visser et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723116#references

Description Author: J. Teague and R. Evans, mod. M. Pyne

Version: 30 Jan 2006

Concept Author: J. Teague and R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

MISSISSIPPI DELTA SALT AND BRACKISH TIDAL MARSH (CES203.471)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); Brackish (Mesohaline); Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9242

CONCEPT

Summary: This systems includes brackish to saline intertidal marshes in the Mississippi Delta area of Louisiana. Both water level and salinity influence species composition. The salt marsh component of this system receives regular daily tides that result in salt concentrations of about 16 ppt; these areas are typically dominated by large to extensive expanses of *Spartina alterniflora*. Brackish marshes, under slightly less tidal influence and moderate freshwater influence (about 8 ppt), are typically dominated or codominated by *Spartina patens* and may cover larger expanses than salt marshes in this system. Inclusions of *Juncus roemerianus* and other brackish species are found in small to large patches. Significant brackish marsh loss has occurred in the deltaic plain of the Mississippi River. These losses are related to natural and anthropogenic causes. Subsidence and loss of wetlands are a natural part of the deltaic process, but they have been exacerbated by the reduction in sediment load and freshwater input into coastal areas caused by the impoundment and channelization of streams and rivers. In addition dredged channels in the marsh facilitate saltwater intrusion, and spoil banks prevent marshes from draining. Increases in salinity cause shifts in composition to species more tolerant of salinity, ultimately resulting in loss of species diversity and open saline waters.

Similar Ecological Systems:

- Gulf Coast Chenier Plain Salt and Brackish Tidal Marsh (CES203.468)

MEMBERSHIP

Associations:

- *Avicennia germinans* / *Spartina alterniflora* Shrubland (CEGL003801, G2?)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Sarcocornia pacifica* - (*Batis maritima*, *Distichlis spicata*) Dwarf-shrubland (CEGL002278, G4)
- *Spartina alterniflora* - *Distichlis spicata* - *Spartina patens* Mesohaline Tidal Herbaceous Vegetation (CEGL002230, G4?)
- *Spartina alterniflora* - *Juncus roemerianus* - *Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190, G5)
- *Spartina patens* - *Schoenoplectus (americanus, pungens)* - (*Distichlis spicata*) Herbaceous Vegetation (CEGL004755, G4?)

Alliances:

- *Avicennia germinans* Tidal Shrubland Alliance (A.733)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Spartina alterniflora*) Tidal Dwarf-shrubland Alliance (A.1705)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)

DISTRIBUTION

Range: This system is confined to the deltaic plain of Louisiana.

Divisions: 203:C

Nations: US

Subnations: LA

Map Zones: 36:C, 98:C

USFS Ecomap Regions: 232E:CC

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003, Visser et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723115#references

Description Author: J. Teague and R. Evans

Version: 13 Jan 2003

Concept Author: J. Teague and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

MISSISSIPPI SOUND FRESH AND OLIGOHALINE TIDAL MARSH (CES203.067)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9271

CONCEPT

Summary: This system includes fresh and oligohaline tidal marshes of the northern Gulf of Mexico region of northwestern Florida, southern Alabama, and southeastern Mississippi. These marshes are typically associated with mud-bottomed bays behind barrier islands. Wind-dominated tides and low tidal amplitudes (<1 meter) characterize this region. Diverse freshwater marshes dominate this system. Some typical and dominant graminoids include *Eleocharis rostellata*, *Rhynchospora colorata*, *Rhynchospora microcarpa*, *Schoenoplectus californicus*, and *Zizaniopsis miliacea*. Stands of *Typha domingensis* may also be present in some stands. More information is needed.

Similar Ecological Systems:

- Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303)

Related Concepts:

- Tidal Freshwater Marsh (Wieland 2000b) Equivalent

DESCRIPTION

Environment: This marsh system occurs in a region characterized by diurnal tides, with waves usually less than 0.5 m in amplitude. Inundation is irregular and depends upon wind speed and direction and the flow of water from nearby rivers; generally more flooding occurs in the summer than winter (Hackney and de la Cruz 1982). The climate is mixed, with subtropical conditions prevailing during years with mild winters and temperate conditions when strong arctic cold fronts extend to the gulf.

Vegetation: Diverse freshwater marshes dominate this system. Some typical and dominant graminoids include *Eleocharis rostellata*, *Rhynchospora colorata*, *Rhynchospora microcarpa*, *Schoenoplectus californicus*, and *Zizaniopsis miliacea*. Some other herbs include *Sagittaria lancifolia*, *Glottidium vesicarium*, *Solidago sempervirens*, and *Lythrum lineare*. *Typha domingensis* may also be present in some stands.

MEMBERSHIP

Associations:

- *Eleocharis rostellata* - *Rhynchospora colorata* - *Rhynchospora microcarpa* Herbaceous Vegetation (CEGL004951, G2?Q)
- *Panicum virgatum* - (*Cladium mariscus* ssp. *jamaicense*, *Juncus roemerianus*) Herbaceous Vegetation (CEGL004962, G3?)
- *Sagittaria lancifolia* - *Glottidium vesicarium* - *Solidago sempervirens* - *Lythrum lineare* Herbaceous Vegetation (CEGL008447, G3G4)
- *Schoenoplectus californicus* Tidal Herbaceous Vegetation (CEGL003985, G4G5)
- *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456, GNR)
- *Zizania aquatica* Gulf Coast Herbaceous Vegetation (CEGL003887, G4?)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Sagittaria lancifolia* Tidal Herbaceous Alliance (A.1987)
- *Schoenoplectus californicus* Tidal Herbaceous Alliance (A.2004)
- *Typha* (*angustifolia*, *domingensis*) Tidal Herbaceous Alliance (A.1472)
- *Zizania aquatica* Tidal Herbaceous Alliance (A.1484)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303)

DISTRIBUTION

Range: This system is found along the northern Gulf of Mexico in northwestern Florida, southern Alabama, and southeastern Mississippi, from Bourne Lake on the west to Cape San Blas on the east. The eastern extent of this system coincides with the range of diurnal tides in the northern Gulf of Mexico. East of Apalachicola Bay, the tides are semi-diurnal (Stout 1984), and Florida Big Bend Fresh and Oligohaline Tidal Marsh (CES203.507) replaces this system. To the west, Mississippi Delta Fresh and Oligohaline Tidal Marsh (CES203.470) replaces this system in the Mississippi Delta.

Divisions: 203:C
Nations: US
Subnations: AL, FL, MS
Map Zones: 99:C
USFS Ecomap Regions: 232L:CC
TNC Ecoregions: 53:C

SOURCES

References: Hackney and de la Cruz 1982, Kushlan 1990, Southeastern Ecology Working Group n.d., Stout 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.790953#references

Description Author: M. Pyne

Version: 17 Jan 2006

Concept Author: M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

MISSISSIPPI SOUND SALT AND BRACKISH TIDAL MARSH (CES203.303)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); Brackish (Mesohaline); Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9263

CONCEPT

Summary: This system includes salt and brackish tidal marshes of the northern Gulf of Mexico region of northwestern Florida, southern Alabama, and southeastern Mississippi. These marshes are typically associated with mud-bottomed bays behind barrier islands. Wind-dominated tides and low tidal amplitudes (<1 meter) characterize this region. This system includes predominately brackish marshes and supports what is probably the largest zone of *Juncus roemerianus* in the Atlantic and Gulf Coastal Plain outside of the North Carolina/Virginia Embayed Region estuarine marshes.

Similar Ecological Systems:

- Mississippi Sound Fresh and Oligohaline Tidal Marsh (CES203.067)

DESCRIPTION

Environment: This marsh system occurs in a region characterized by diurnal tides, with waves usually less than 0.5 m in amplitude. Inundation is irregular and depends upon wind speed and direction, and the flow of water from nearby rivers; generally more flooding occurs in the summer than winter (Hackney and de la Cruz 1982). The climate is mixed, with subtropical conditions prevailing during years with mild winters and temperate conditions when strong arctic cold fronts extend to the gulf.

Vegetation: Brackish needlerush marshes dominate this system. Communities distinguished by tall and short *Juncus roemerianus* may both be present. A *Spartina* zone occurs in narrow bands only; small-scale hypersaline tidal flats are frequently present.

MEMBERSHIP

Associations:

- *Cladium mariscus ssp. jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Ilex vomitoria* - *Quercus (geminata, virginiana)* - *Morella cerifera* - *Serenoa repens* Shrubland (CEGL003813, G2G3)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Panicum virgatum* - (*Cladium mariscus ssp. jamaicense, Juncus roemerianus*) Herbaceous Vegetation (CEGL004962, G3?)
- *Spartina alterniflora* - *Juncus roemerianus* - *Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190, G5)
- *Spartina patens* - *Schoenoplectus (americanus, pungens)* - (*Distichlis spicata*) Herbaceous Vegetation (CEGL004755, G4?)
- *Spartina spartinae* - *Sporobolus virginicus* Tidal Herbaceous Vegetation (CEGL004199, G4G5)

Alliances:

- *Cladium mariscus ssp. jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Quercus virginiana* - *Ilex vomitoria* - (*Morella cerifera*) Shrubland Alliance (A.785)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Spartina spartinae* Tidal Herbaceous Alliance (A.1483)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mississippi Sound Fresh and Oligohaline Tidal Marsh (CES203.067)

DISTRIBUTION

Range: This system is found along the northern Gulf of Mexico in northwestern Florida, southern Alabama, and southeastern Mississippi. The eastern extent of this system coincides with the range of diurnal tides in the northern Gulf of Mexico. (East of Apalachicola Bay, where the tides are semi-diurnal (Stout 1984), Florida Big Bend Salt and Brackish Tidal Marsh (CES203.508) replaces this system.) To the west, Mississippi Delta Salt and Brackish Tidal Marsh (CES203.471) replaces this system in the Mississippi Delta.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 46:C, 99:C

USFS Ecomap Regions: 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Hackney and de la Cruz 1982, Stout 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723188#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

MODOC BASALT FLOW VERNAL POOL (CES204.996)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Impermeable Layer; 1-29-day hydroperiod; Vernal Pool Mosaic; Depressional

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Montane [Montane]; Montane [Lower Montane]; Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Temperate [Temperate Oceanic]; Isolated Wetland [Strictly Isolated]; Consolidated

National Mapping Codes: ESLF 9264

CONCEPT

Summary: This system includes shallow ephemeral water bodies found in very small depressions (typically no larger than 50 square meters) throughout the Lassen, Klamath, and upper Pit river drainages, as well as the Devils Garden area of northern California, and along the eastern flanks of the Columbia River Gorge along the Oregon-Washington border. These vernal pools are located on top of massive basalt flows where soils are very thin over solid bedrock. Where soils are better developed, they trend towards Vertisols (freeze-thaw characteristics). Characteristic species include *Blennosperma nanum*, *Epilobium densiflorum* (= *Boisduvalia densiflora*), *Callitriche marginata*, *Cicendia quadrangularis*, *Eryngium vaseyi*, *Psilocarphus brevissimus*, and *Sedella pumila* (= *Parvisedum pumilum*). *Artemisia cana* ssp. *bolanderi* can occur on better developed soils. Endemic plant species *Eryngium mathiasiae*, as well as several species of *Mimulus* and *Pogogyne*, may occur.

Related Concepts:

- Wetlands (217) (Shiflet 1994) Broader

DISTRIBUTION

Range: Throughout the Lassen, Klamath, and upper Pit river drainages, as well as the Devils Garden area of northern California, and along the eastern flanks of the Columbia River Gorge along the Oregon-Washington border.

Divisions: 204:C; 206:C

Nations: US

Subnations: CA, OR, WA

Map Zones: 1:?, 2:?, 6:?, 7:C, 8:?, 9:?, 12:?

USFS Ecomap Regions: 342B:PP, M242C:??, M261D:CP, M261G:CC

TNC Ecoregions: 4:C, 5:P

SOURCES

References: Barbour and Major 1988, Bjork 1997, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722709#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 21 Nov 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

NORTH AMERICAN ARID WEST EMERGENT MARSH (CES300.729)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Deep (>15 cm) Water; Saturated Soil; Herbaceous; Depressional [Lakeshore]; Depressional [Pond]; Mineral: W/ A-Horizon >10 cm; Aquatic Herb; Graminoid

Non-Diagnostic Classifiers: Clay Subsoil Texture; Floodplain; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Marsh; Oxbow; Pond; Backwater; Temperate [Temperate Continental]; Forb; Alga; Drainage bottom (undifferentiated)

National Mapping Codes: ESLF 9222

CONCEPT

Summary: This widespread ecological system occurs throughout much of the arid and semi-arid regions of western North America, typically surrounded by savanna, shrub steppe, steppe, or desert vegetation. Natural marshes may occur in depressions in the landscape (ponds, kettle ponds), as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Marshes are frequently or continually inundated, with water depths up to 2 m. Water levels may be stable, or may fluctuate 1 m or more over the course of the growing season. Water chemistry may include some alkaline or semi-alkaline situations, but the alkalinity is highly variable even within the same complex of wetlands. Marshes have distinctive soils that are typically mineral, but can also accumulate organic material. Soils have characteristics that result from long periods of anaerobic conditions in the soils (e.g., gleyed soils, high organic content, redoximorphic features). The vegetation is characterized by herbaceous plants that are adapted to saturated soil conditions. Common emergent and floating vegetation includes species of *Scirpus* and/or *Schoenoplectus*, *Typha*, *Juncus*, *Potamogeton*, *Polygonum*, *Nuphar*, and *Phalaris*. This system may also include areas of relatively deep water with floating-leaved plants (*Lemna*, *Potamogeton*, and *Brasenia*) and submergent and floating plants (*Myriophyllum*, *Ceratophyllum*, and *Elodea*).

Classification Comments: This ecological system occurs in the arid and semi-arid regions of western North America, where semipermanently flooded habitats are found as small patches in the matrix of a relatively dry landscape. Except for stands in the semi-arid portions of the western Great Plains, emergent marsh found in the Great Plains should be classified into one of the Western Great Plains depressional wetland systems.

Similar Ecological Systems:

- Western Great Plains Closed Depression Wetland (CES303.666)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)
- Western Great Plains Saline Depression Wetland (CES303.669)

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex praegracilis* Herbaceous Vegetation (CEGL002660, G3G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Distichlis spicata* - (*Scirpus nevadensis*) Herbaceous Vegetation (CEGL001773, G4)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003050, G5)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Juncus balticus* - *Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Lemna* spp. Permanently Flooded Herbaceous Vegetation (CEGL003059, G5)
- *Myriophyllum sibiricum* Herbaceous Vegetation (CEGL002000, GUQ)
- *Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation (CEGL002001, G5)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Phragmites australis* Western North America Temperate Semi-natural Herbaceous Vegetation (CEGL001475, G5)
- *Potamogeton diversifolius* Herbaceous Vegetation (CEGL002007, G1?)
- *Potamogeton foliosus* Herbaceous Vegetation (CEGL002742, G3?)
- *Potamogeton natans* Herbaceous Vegetation (CEGL002925, G5?)
- *Ranunculus aquatilis* - *Callitriche palustris* Herbaceous Vegetation (CEGL001984, GU)
- *Ruppia (cirrhosa, maritima)* Permanently Flooded Herbaceous Vegetation (CEGL003119, G1G3)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)

- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)
- *Schoenoplectus americanus* - *Carex* spp. Herbaceous Vegetation (CEGL004144, GNR)
- *Schoenoplectus americanus* - *Eleocharis palustris* Herbaceous Vegetation (CEGL001585, G4)
- *Schoenoplectus americanus* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Schoenoplectus americanus* - *Flaveria chlorifolia* - (*Helianthus paradoxus*) Herbaceous Vegetation (CEGL004592, G1)
- *Schoenoplectus americanus* Western Herbaceous Vegetation (CEGL001841, G3Q)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001587, G3G4)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Sparganium angustifolium* Herbaceous Vegetation (CEGL001990, G4)
- *Sparganium eurycarpum* Herbaceous Vegetation (CEGL003323, G4)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)
- *Stuckenia filiformis* Herbaceous Vegetation (CEGL002008, GU)
- *Triglochin maritima* Herbaceous Vegetation (CEGL001995, GU)
- *Typha* (*latifolia*, *angustifolia*) Western Herbaceous Vegetation (CEGL002010, G5)
- *Typha domingensis* Western Herbaceous Vegetation (CEGL001845, G5?)

Alliances:

- (*Potamogeton diversifolius*, *Stuckenia filiformis*) Permanently Flooded Herbaceous Alliance (A.1763)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex praegracilis* Seasonally Flooded Herbaceous Alliance (A.1419)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Alliance (A.1371)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Lemna* spp. Permanently Flooded Herbaceous Alliance (A.1747)
- *Myriophyllum sibiricum* Permanently Flooded Herbaceous Alliance (A.1761)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Potamogeton foliosus* Permanently Flooded Herbaceous Alliance (A.2518)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Ranunculus aquatilis* Semipermanently Flooded Herbaceous Alliance (A.1679)
- *Ruppia (cirrhosa, maritima)* Permanently Flooded Herbaceous Alliance (A.1755)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Sparganium angustifolium* Permanently Flooded Herbaceous Alliance (A.1760)
- *Sparganium eurycarpum* Permanently Flooded Herbaceous Alliance (A.2598)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Triglochin maritima* Semipermanently Flooded Herbaceous Alliance (A.1681)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha domingensis* Seasonally Flooded Temperate Herbaceous Alliance (A.1392)

DISTRIBUTION

Range: This system occurs throughout much of the arid and semi-arid regions of western North America, extending east peripherally into the semi-arid portions of the western Great Plains.

Divisions: 301:C; 302:C; 303:C; 304:C; 305:C; 306:C

Nations: CA, MX, US

Subnations: AB, AZ, BC, CA, CO, ID, MT, MXBC(MX), MXCH(MX), MXSO(MX), NM, NV, OR, TX, UT, WA, WY

Map Zones: 1:C, 2:C, 6:P, 7:C, 8:C, 9:C, 10:C, 12:C, 13:C, 14:C, 15:C, 16:C, 17:C, 18:C, 19:C, 20:P, 21:C, 22:C, 23:P, 24:P, 25:C, 26:C, 27:C, 28:C, 29:P, 31:?, 33:C, 34:C, 35:P, 36:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:C?, 313D:CC, 315A:CC, 315B:CC, 315H:CP, 321A:CC, 322A:CC, 322B:CC, 322C:CP, 331A:CP, 331B:CC, 331C:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC,

342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CP, 342I:CC, 342J:CC, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:C?, M331D:CC, M331E:CC, M331F:CP, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CP, M332B:C?, M332D:CC, M332E:CC, M332F:CC, M332G:C?, M333A:CP, M333C:CC, M341A:CC, M341B:CP, M341D:CC
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 11:C, 17:C, 18:C, 19:C, 20:C, 21:C, 23:C, 24:C, 26:?, 27:C, 28:C, 29:?, 30:C, 68:C

SOURCES

References: Brown 1982, Comer et al. 2003, Cooper 1986b, Dick-Peddie 1993, Faber-Langendoen et al. 1997, Hansen et al. 1995, Kittel et al. 1994, Neely et al. 2001, Padgett et al. 1989, Rondeau 2001, Szaro 1989, Ungar 1965, Ungar 1972

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722943#references

Description Author: NatureServe Western Ecology Team

Version: 23 Jan 2008

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Latin America, Midwest, Southeast, West

ClassifResp: West

NORTH AMERICAN WARM DESERT CIENEGA (CES302.747)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Alkaline Water; Lowland [Lowland]; Seep; Seepage-Fed Sloping [Mineral]

Non-Diagnostic Classifiers: Herbaceous; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aquatic Herb; Graminoid

National Mapping Codes: ESLF 9284

CONCEPT

Summary: This ecological system occurs at low elevations (<1000 m) across the warm deserts of western North America. "Cienegas" are freshwater spring-fed wetlands. The system also includes mid-elevation (1000-2000 m) wetlands found in semi-desert grasslands and Madrean evergreen woodlands. Evaporation often creates saline conditions especially on the margins as evidenced by salt-tolerant species such as *Distichlis spicata* and *Sporobolus airoides*. Typically, low-elevation examples are too warm to accumulate a deep organic layer. The type of vegetation depends on depth of water. In shallow margins, emergent plants typical of riparian vegetation are present including species of *Carex*, *Juncus*, and *Schoenoplectus*. In adjacent deeper waters, emergent marsh can be characteristic.

MEMBERSHIP

Associations:

- *Eleocharis palustris* - *Carex praegracilis* - *Berula erecta* Herbaceous Vegetation (CEGL002634, G2)
- *Schoenoplectus americanus* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Schoenoplectus americanus* - *Flaveria chlorifolia* - (*Helianthus paradoxus*) Herbaceous Vegetation (CEGL004592, G1)

Alliances:

- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)

DISTRIBUTION

Range: Occurs at low elevations (<1000 m) across the warm deserts of western North America, including the Mojave, Sonoran, and Chihuahuan.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 4:?, 13:C, 14:C, 15:C, 17:?, 25:C, 26:C, 27:?

USFS Ecomap Regions: 313C:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, M313A:CC, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Brown 1982, Comer et al. 2003, Hendrickson and Minckley 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722925#references

Description Author: NatureServe Western Ecology Team

Version: 14 Dec 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

NORTH AMERICAN WARM DESERT INTERDUNAL SWALE WETLAND (CES302.039)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Dune (Landform); Dune field; Dune (Substrate); Temperate [Temperate Xeric]; Isolated Wetland [Partially Isolated]; Sand Soil Texture; W-Landscape/High Intensity; Graminoid

Non-Diagnostic Classifiers: Dune (undifferentiated); Lowland [Lowland]; Shrubland (Shrub-dominated); Herbaceous; Tropical/Subtropical [Tropical Xeric]; Depressional; Aridic

National Mapping Codes: ESLF 9238

CONCEPT

Summary: This interdunal wetland ecological system occurs in dune fields in the Chihuahuan Desert and likely in the Sonoran and Mojave deserts. This isolated or partially isolated wetland system is an occasional component of the more extensive active and stabilized desert dune system. Stands are typically small (usually less than 0.1 ha) interdunal swales that occur in wind deflation areas, where sands are scoured down to the water table. Water table may be perched over an impermeable layer of caliche or clay layer. These wetland areas are typically dominated by common emergent herbaceous vegetation, such as species of *Eleocharis*, *Juncus*, and *Schoenoplectus*, but may include endemic plants or animals. Occasionally wetlands are dominated by trees and shrubs, such as *Populus fremontii* and *Baccharis salicifolia*, which survive both being buried as dunes advance and having their root system exposed when deflation of the dune occurs. The specific dune field ecological processes distinguish these wetlands from non-dune emergent wetlands with similar species composition.

Classification Comments: Additional interdunal wetland surveys and classification work are needed at dune systems in the Chihuahuan Desert at Cuatro Cienegas, Guadalupe Mountains, and Samalayuca dunes as well as dune systems in the Sonoran or Mojave deserts, such as Algodones, Death Valley, Eureka, Gran Desierto, Kelso, Mohawk, and Salton Sea dunes, to clarify the extent of this small-patch ecological system. It may be necessary to restrict the system to the Chihuahuan Desert if that is the extent. Gypsum dunes have species unique to that substrate and may need to be treated differently.

DESCRIPTION

Environment: This interdunal wetland ecological system occurs in some dune fields in the Chihuahuan and likely the Sonoran and Mojave deserts. This isolated or partially isolated wetland system is an occasional component of the more extensive active and stabilized desert dune system. Stands are typically small (usually less than 0.1 ha) interdunal swales that occur in wind deflation areas, where sands are scoured down to the water table. Water table may be perched over an impermeable layer of caliche or clay. Dune sands may be quartz or gypsum. Gypsum dunes have species unique to that substrate and may need to be treated differently. The specific dune field ecological processes distinguish these wetlands from similar emergent wetlands.

In west Texas, these wetlands occur in interdunal swales in Monahan and Kermit quartz sand dunes. These dunes occur northeast of the Pecos River where the prevailing southwest winds have blown the sands to the east where they are trapped by the escarpment of the High Plains (Southern Shortgrass Prairie Ecoregion). The ponds are on a perched water table underlain by impermeable caliche layers. The White Sands dunes of the Tularosa Basin in southern New Mexico are a gypsum interdunal/dune system that is moving/semi-stable; during the rainy season, many of the interdunes become ephemeral lakes with wetland indicators.

Vegetation: These wetland areas are typically dominated by common emergent herbaceous vegetation, such as species of *Eleocharis*, *Juncus*, and *Schoenoplectus*, but may include endemic plants or animals, especially on gypsum dunes. Occasionally wetlands are dominated by trees and shrubs, such as *Populus fremontii*, *Baccharis salicifolia*, or *Salix* spp., which must survive both being buried as dunes advance and having their root system exposed when deflation of the dune occurs. On occasion, dunes move over a site, leaving only the tops of cottonwood trees as remnants of the buried community (Muldavin et al. 1994b). The specific dune field ecological processes distinguish these wetlands from non-dune emergent wetlands with similar species composition.

In west Texas, stands in the Monahan and Kermit sandsheets wet interdunal swales, ponds and fringing wetlands are vegetated by herbaceous graminoids (generally >10% plant cover) between active dunes in sandsheets derived from quartz sands. Common vegetation is characterized by herbaceous graminoids and *Salix* spp. These interdunal valleys over impermeable substrata (as with the Monahan Sandsheet) may contain seasonal swales or ephemeral ponds supporting *Achnatherum hymenoides* and other grasses, *Schoenoplectus tabernaemontani*, *Juncus* spp., *Cyperus* spp., *Baccharis* spp., *Prosopis glandulosa*, *Salix interior*, *Pluchea odorata* (= *Pluchea purpurascens*), *Xanthium strumarium*, and other weeds (TPWD 1989d). The fringing wetland plants of the more permanent ponds include *Salix* spp., *Scirpus* and/or *Schoenoplectus* spp., *Typha* spp., *Cyperus* spp., *Juncus* spp., *Eleocharis* spp., and others. *Cyperus onerosus* is a rare plant, endemic to this region, also associated with these unusual wetlands (El-Hage and Moulton 1998).

Dynamics: The dunes are shaped by the wind and continue to change. The size and exact location of the wet swales may change as the sand dunes shift, due to active dune migration. Dune "blowouts" and subsequent stabilization through succession are characteristic processes of the active dunes which surround this system.

MEMBERSHIP

Associations:

- *Baccharis salicifolia* - *Baccharis neglecta* / *Eustoma exaltatum* Shrubland (CEGL004590, G2?)
- *Eleocharis palustris* - *Carex praeegracilis* - *Berula erecta* Herbaceous Vegetation (CEGL002634, G2)
- *Salix exigua* / *Baccharis salicifolia* - *Baccharis neglecta* / *Schoenoplectus* spp. Woodland (CEGL004587, G2?)
- *Schoenoplectus americanus* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Schoenoplectus americanus* - *Flaveria chlorifolia* - (*Helianthus paradoxus*) Herbaceous Vegetation (CEGL004592, G1)

Alliances:

- *Baccharis salicifolia* - *Baccharis neglecta* Seasonally Flooded Shrubland Alliance (A.987)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Salix exigua* Seasonally Flooded Woodland Alliance (A.649)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch.

Adjacent Ecological Systems:

- North American Warm Desert Active and Stabilized Dune (CES302.744)

Adjacent Ecological System Comments: This wetland system occurs in wet swales in North American Warm Desert Active and Stabilized Dune (CES302.744).

DISTRIBUTION

Range: This interdunal wetland ecological system occurs in some dune fields in the Chihuahuan Desert and likely occurs in dune fields of the Sonoran and Mojave deserts, but more research is needed to learn the exact extent.

Divisions: 302:C

Nations: US

Subnations: NM, TX

Map Zones: 13:C, 14:C, 15:?, 25:C, 26:C, 27:?

USFS Ecomap Regions: 321A:CC, 322A:??, 322B:??, 322C:??

TNC Ecoregions: 24:C

SOURCES

References: Bezanson 2000, Bowers 1982, Bowers 1984, Bowers 1986, Brown 1982, Carr 1991, Carr 2004, El-Hage and Moulton 1998, Muldavin et al. 1994b, Muldavin et al. 2000a, Muldavin et al. 2000b, Southeastern Ecology Working Group n.d., TPWD 1989d

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.771414#references

Description Author: C.W. Nordman and K.A. Schulz

Version: 12 May 2005

Concept Author: El-Hage and Moulton (1998)

Stakeholders: Southeast, West

ClassifResp: Southeast

NORTH PACIFIC COASTAL INTERDUNAL WETLAND (CES204.062)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; Sand Subsoil Texture; Coastal Dune Mosaic; Herbaceous; Depressional [Pond]; Isolated Wetland [Partially Isolated]; Mineral: W/ A-Horizon <10 cm; Graminoid

National Mapping Codes: ESLF 9229

CONCEPT

Summary: Coastal interdunal wetlands are common components of larger active and stabilized coastal barrier islands, spits, and coastal dunes, ranging from southern Oregon through the Aleutian Islands. Distinct landform and vegetation patterns are common to these dune systems. Landforms on the ocean side include low-gradient beaches, sparse to unvegetated dunes, slacks dominated by low herbaceous vegetation, and back dunes dominated by tall herbaceous, shrub, or forested communities. Foredunes in Oregon and Washington are usually densely covered by *Ammophila arenaria* that was introduced for dune stabilization projects and has spread throughout the region. This has largely replaced native *Leymus mollis* that is a less effective sand-binder. *Ammophila* is much less abundant behind the foredunes, and dunes in these areas range from unvegetated and actively moving to completely stabilized with mostly native vegetation.

In Alaska, slacks between dunes are colonized by *Equisetum variegatum* and other herbaceous species. The sites are elevated by the deposition of wind-blown sand, tectonic uplift and isostatic rebound. This further removes the sites from tidal water and allows shrubs, such as *Salix commutata*, *Salix sitchensis*, and *Myrica gale* to invade. Organic mats also develop. Some slacks may develop into forested sites or peatlands, whereas other slacks may not persist to late succession because of dune encroachment. Depending on moisture and salinity gradients, dune slacks in Oregon and Washington are colonized by *Carex obnupta*, *Argentina egedii*, *Juncus lesueurii*, *Juncus nevadensis*, *Salix hookeriana*, and various other emergent species. The higher portions of dunes are dry and nutritionally poor because of leaching, moving the moisture and nutrients into the dune bases and slacks.

Classification Comments: Oregon and Washington interdunal wetlands had previously been included in other freshwater wetland ecosystems. The truly interdunal wetlands are included here. While interdunal wetlands undoubtedly occur in Alaska, recent systems classification work did not split them out into a separate system. In the future, it may be appropriate to include interdunal wetlands in Alaska in this system. Currently included in Alaskan Pacific Maritime Coastal Dune, Beach, and Beach Meadow (CES204.166) in that state.

DESCRIPTION

Environment: In Oregon and Washington, habitat ranges from small interdunal depressions to extensive deflation plains behind stabilized foredunes. Winter precipitation elevates the water table and inundates some communities to a depth of 1 m (3 feet). The seasonal rise in water table also causes vernal pools to form in forested sites on old deflation plains. These pools are teeming with invertebrates and are temporary sources of food and breeding grounds for amphibians and waterfowl. Some wetlands are perched on an iron-cemented duripan, and groundwater may be charged with iron. pH ranges from 5.0-6.3 (6.9), with low conductivity.

MEMBERSHIP

Associations:

- *Carex exsiccata* Herbaceous Vegetation [Provisional] (CEGL003312, G2G3)
- *Carex lyngbyei* - *Argentina egedii* Herbaceous Vegetation (CEGL003289, G4)
- *Carex obnupta* - *Argentina egedii* ssp. *egedii* Herbaceous Vegetation (CEGL001820, G4)
- *Carex obnupta* Herbaceous Vegetation (CEGL003313, G4)
- *Juncus falcatus* - *Trifolium wormskioldii* Herbaceous Vegetation (CEGL001570, G4)
- *Pinus contorta* var. *contorta* / *Carex obnupta* Forest (CEGL000142, G2)
- *Salix hookeriana* - (*Malus fusca*) / *Carex obnupta* - *Lysichiton americanus* Shrubland (CEGL003432, G3)
- *Salix hookeriana* - *Morella californica* Shrubland (CEGL001138, G4)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)

Alliances:

- *Carex lyngbyei* Tidal Herbaceous Alliance (A.2622)
- *Carex obnupta* Seasonally Flooded Herbaceous Alliance (A.2582)
- *Juncus falcatus* Temporarily Flooded Herbaceous Alliance (A.1352)
- *Pinus contorta* Seasonally Flooded Forest Alliance (A.188)
- *Salix hookeriana* Seasonally Flooded Shrubland Alliance (A.999)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)

SPATIAL CHARACTERISTICS

Size: In Oregon and Washington, size ranges from 0.25 to 50 acres or more.

Adjacent Ecological Systems:

- North Pacific Maritime Coastal Sand Dune and Strand (CES200.881)

DISTRIBUTION

Range: This system ranges from southern Oregon into British Columbia. In Alaska, they are treated as part of the dune and beach system.

Divisions: 204:C

Nations: US

Subnations: AK?, OR, WA

USFS Ecomap Regions: 242A:??, M242A:CC

TNC Ecoregions: 1:C, 69:?, 70:?

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.784004#references

Description Author: K. Boggs, G. Kittel, and J. Christy

Version: 08 Dec 2008

Concept Author: K. Boggs, G. Kittel, and J. Christy

Stakeholders: West

ClassifResp: West

NORTH PACIFIC HARDPAN VERNAL POOL (CES204.859)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Depressional [Vernal Pool]

Non-Diagnostic Classifiers: Lowland [Lowland]; Temperate [Temperate Oceanic]; Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 9225

CONCEPT

Summary: This system includes shallow ephemeral water bodies found in depressions (up to several hectares in size) among grasslands and open woodlands throughout intermountain valleys of California, Oregon and the Gulf and San Juan islands of Washington and British Columbia. Northern hardpan vernal pools include an indurated clay or cemented (Si or Fe) hardpan that retains water inputs throughout some portion of the spring, but typically the depression dries down entirely into early summer months. In the Sand Juan and Gulf islands, they are created in small depressions in bedrock. This system typically occurs with a hummocky micro-relief. They tend to be acidic wetlands with characteristic plant species including *Downingia elegans*, *Isoetes orcuttii*, *Pilularia americana*, *Triteleia hyacinthina*, *Eleocharis* spp., *Eryngium petiolatum*, *Plagiobothrys figuratus*, *Plagiobothrys scouleri*, *Grindelia nana*, *Veronica peregrina*, *Deschampsia danthonioides*, and *Callitriche* spp. Due to draw-down characteristics, vernal pools typically form concentric rings of similar vegetation. Given their relative isolation in upland-dominated landscapes, many endemic plant species are common in California vernal pools.

Classification Comments: This system includes both duripan/hardpan and bedrock types, which are segregated in the California systems. Decided to lump them for this system because both occur intermixed in the geographic area defined.

MEMBERSHIP

Associations:

- *Eryngium petiolatum* - *Grindelia nana* Herbaceous Vegetation (CEGL003345, G1G2)
- *Eryngium petiolatum* - *Lasthenia glaberrima* Herbaceous Vegetation (CEGL003458, G1G2)
- *Plagiobothrys figuratus* Vernal Pool Herbaceous Vegetation (CEGL003346, G1G2)
- *Plagiobothrys scouleri* - *Plantago bigelovii* Herbaceous Vegetation (CEGL003459, G2)

Alliances:

- *Eryngium petiolatum* Herbaceous Alliance (A.2625)
- *Plagiobothrys* spp. Herbaceous Alliance (A.2627)

DISTRIBUTION

Range: Found in depressions among grasslands and open woodlands throughout intermountain valleys of California, Oregon and the Gulf and San Juan islands of Washington.

Divisions: 204:C

Nations: CA, US

Subnations: BC, CA, OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CP, M242A:PP, M242B:PP, M242C:PP

TNC Ecoregions: 2:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722816#references

Description Author: C. Chappell

Version: 21 Nov 2003

Concept Author: C. Chappell

Stakeholders: Canada, West

ClassifResp: West

NORTH PACIFIC INTERTIDAL FRESHWATER WETLAND (CES204.875)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9220

CONCEPT

Summary: This ecological system occurs throughout the coastal margin and intertidal zone of the Pacific Northwest Coast of Oregon, Washington and north into British Columbia. It may occur in Alaska, but has not been described from there. Intertidal freshwater wetlands occur as narrow strips to more extensive patches along tidally influenced portions of rivers. There has been little vegetation data collection of this type in this region; a few studies indicate dominant species include *Picea sitchensis*, *Alnus rubra*, *Cornus sericea*, *Myriophyllum hippuroides*, *Typha angustifolia*, *Athyrium filix-femina*, and *Carex lyngbyei*. This system is driven by daily tidal flooding of freshwater and associated soil saturation. Vegetation structure and composition are varied and depend on substrate characteristics and the tidal flooding regime of particular sites. Where small areas of mudflat occur in tidally influenced freshwater areas, they are included in this intertidal freshwater wetland and not in Temperate Pacific Freshwater Mudflat (CES200.878).

Classification Comments: It's unclear if this system occurs in Alaska; it was not identified in recent systems classification work.

MEMBERSHIP

Associations:

- *Alnus rubra* / *Rubus spectabilis* / *Carex obnupta* - *Lysichiton americanus* Forest (CEGL003389, G3G4)
- *Bidens cernua* Herbaceous Vegetation [Provisional] (CEGL003324, G3)
- *Carex lyngbyei* Herbaceous Vegetation (CEGL003369, G4)
- *Cornus sericea* - *Salix (hookeriana, sitchensis)* Shrubland (CEGL003292, G3)
- *Lilaeopsis occidentalis* Herbaceous Vegetation [Provisional] (CEGL003329, G4)
- *Myriophyllum hippuroides* Herbaceous Vegetation [Provisional] (CEGL003331, G3)
- *Picea sitchensis* / *Carex obnupta* - *Lysichiton americanus* Forest (CEGL000400, G2G3)
- *Picea sitchensis* / *Cornus sericea* / *Lysichiton americanus* Forest (CEGL000055, G2)
- *Populus balsamifera ssp. trichocarpa* - *Acer macrophyllum* / *Equisetum hyemale* Forest (CEGL003406, G3)
- *Populus balsamifera ssp. trichocarpa* / *Cornus sericea* / *Impatiens capensis* Forest (CEGL003408, G1)

Alliances:

- *Alnus rubra* Seasonally Flooded Forest Alliance (A.342)
- *Carex lyngbyei* Tidal Herbaceous Alliance (A.2622)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Picea sitchensis* Saturated Forest Alliance (A.205)
- *Picea sitchensis* Temporarily Flooded Forest Alliance (A.169)
- *Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance (A.311)

DISTRIBUTION

Range: This system occurs throughout the coastal margin and intertidal zone of the Pacific Northwest coast of Oregon, Washington and north into British Columbia. It may occur in Alaska but has not been described from there.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C

USFS Ecomap Regions: 242A:CC, M242A:CC

TNC Ecoregions: 1:C, 69:C

SOURCES

References: Boggs 2000, Boggs 2002, Comer et al. 2003, Kunze 1994, Viereck et al. 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722800#references

Description Author: C. Chappell, G. Kittel, mod. M.S. Reid

Version: 08 Dec 2008

Concept Author: C. Chappell, G. Kittel

Stakeholders: Canada, West

ClassifResp: West

1670 NORTH PACIFIC MARITIME EELGRASS BED (CES200.882)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Temperate [Temperate Oceanic]; Aquatic Herb

Non-Diagnostic Classifiers: Lowland [Lowland]

National Mapping Codes: EVT 2670; ESLF 9230; ESP 1670

CONCEPT

Summary: Eelgrass beds are found throughout the coastal areas of the North Pacific Coast, from southern Oregon (Coos Bay) north into the Gulf of Alaska, Cook Inlet, and Bristol Bay coasts. Intertidal zones are found with clear water in bays, inlets and lagoons, typically dominated by macrophytic algae and marine aquatic angiosperms along the temperate Pacific coast. Subtidal portions are never exposed while intertidal areas support species that can tolerate exposure to the air. Common substrates include marine silts, but may also include exposed bedrock and cobble, where many algal species become attached with holdfasts. Subtidal/lower intertidal in clear water. Substrate is usually marine silts, but may be cobble. Beds are dominated by *Zostera marina*.

Related Concepts:

- III.D.3.a - Eelgrass (Vioreck et al. 1992) Equivalent

DISTRIBUTION

Range: This system is found throughout the coastal areas of the North Pacific Coast, from southern Oregon (Coos Bay) north into the Gulf of Alaska, Cook Inlet, and Bristol Bay coasts.

Divisions: 204:C

Nations: CA, US

Subnations: AK, BC, OR, WA

Map Zones: 1:C, 2:C, 75:C, 76:C, 77:C, 78:C

USFS Ecomap Regions: 242A:CC, M242A:CC

TNC Ecoregions: 1:C, 2:C, 69:C, 70:C, 71:C, 74:C

SOURCES

References: Boggs 2002, Comer et al. 2003, Holland and Keil 1995, Vioreck et al. 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722793#references

Description Author: P. Comer, G. Kittel, K. Boggs

Version: 06 Mar 2003

Concept Author: P. Comer, G. Kittel, K. Boggs

Stakeholders: Canada, West

ClassifResp: West

NORTH-CENTRAL APPALACHIAN SEEPAGE FEN (CES202.607)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Seepage-Fed Sloping

Non-Diagnostic Classifiers: Circumneutral Water; 1-29-day hydroperiod; Short (50-100 yrs) Persistence; Lowland; Shrubland (Shrub-dominated); Temperate; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9232

CONCEPT

Summary: This system is found in scattered locations in the central Appalachians and eastern Great Lakes regions. Mostly non-forested, these open fens develop on shallow to deep peat over a sloping substrate, where seepage waters provide nutrients. Conditions are often circumneutral to alkaline. Sedges are the major dominants. *Packera aurea*, *Symplocarpus foetidus*, and *Lobelia kalmii* are among the characteristic forbs. Some of these areas are kept open by grazing, and succession to shrublands may occur in the absence of disturbance.

Similar Ecological Systems:

- Interior Low Plateau Seepage Fen (CES202.346)--of unglaciated Kentucky, Ohio, and Tennessee.
- Southern Appalachian Seepage Wetland (CES202.317)

MEMBERSHIP

Associations:

- *Alnus serrulata* - *Lindera benzoin* / *Osmunda regalis* var. *spectabilis* - *Carex tetanica* Shrubland (CEGL008408, G1?)
- *Betula pumila* - *Toxicodendron vernix* - *Dasiphora fruticosa* ssp. *floribunda* Shrubland (CEGL006360, G2G3)
- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549, GNR)
- *Carex prairea* - *Carex stricta* - *Pycnanthemum virginianum* Herbaceous Vegetation (CEGL006551, GNR)
- *Cornus amomum* - *Salix candida* / *Dasiphora fruticosa* ssp. *floribunda* / *Carex stricta* Shrubland (CEGL006359, G3?)
- *Cornus racemosa* / *Carex (sterilis, aquatilis, lacustris)* Shrub Herbaceous Vegetation (CEGL006123, G2G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex (sterilis, hystericina, flava)* Shrub Herbaceous Vegetation (CEGL006326, G2)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex interior* - *Carex flava* - *Sarracenia purpurea* Shrub Herbaceous Vegetation (CEGL005140, G3)
- *Deschampsia caespitosa* - *Claytonia virginica* var. *hammondiae* Herbaceous Vegetation (CEGL006101, G1)
- *Juniperus virginiana* / *Betula pumila* / *Carex sterilis* - *Oligoneuron rigidum* Shrub Herbaceous Vegetation (CEGL006367, G1)
- *Juniperus virginiana* / *Dasiphora fruticosa* ssp. *floribunda* / *Carex flava* - *Carex tetanica* Shrub Herbaceous Vegetation (CEGL006357, G1G2)
- *Morella pensylvanica* - *Dasiphora fruticosa* ssp. *floribunda* / *Carex sterilis* - *Carex flava* Shrub Herbaceous Vegetation (CEGL006103, G2)
- *Symplocarpus foetidus* Herbaceous Vegetation (CEGL002385, G4?)

Alliances:

- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Betula pumila* - (*Salix* spp.) Saturated Shrubland Alliance (A.1021)
- *Carex (flava, hystericina, interior, sterilis)* Saturated Shrub Herbaceous Alliance (A.1561)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Cornus sericea* - *Photinia melanocarpa* - *Toxicodendron vernix* Saturated Shrubland Alliance (A.1016)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex (flava, interior, lasiocarpa, sterilis)* Saturated Shrub Herbaceous Alliance (A.1562)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)

DISTRIBUTION

Range: This system is found in scattered locations from central New England and New York west to Lake Erie and south to West Virginia and western Virginia (Central Appalachians ecoregion).

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, NJ, NY, PA, VA, VT, WV

Map Zones: 53:C, 61:C, 62:C, 63:P, 64:C, 65:C

USFS Ecomap Regions: 221A:CC, 221Ba:CCC, 221E:CC, M221A:CC

TNC Ecoregions: 45:P, 48:P, 49:C, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723002#references

Description Author: S.C. Gawler

Version: 09 Jan 2003

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTH-CENTRAL INTERIOR FRESHWATER MARSH (CES202.899)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; >180-day hydroperiod; Depressional [Lakeshore]; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Moderate (100-500 yrs) Persistence; Herbaceous; Depressional [Pond]; Isolated Wetland [Partially Isolated]; Muck; Aquatic Herb

National Mapping Codes: ESLF 9294

CONCEPT

Summary: This system is found throughout the northern Midwest ranging into southern Canada. It is typically found on glacial potholes, along small streams, ponds, channels in glacial outwash and on lakeplains. This system contains a deep to shallow area of freshwater marsh dominated by emergent and submergent species. Stands may be open ponds with floating or rooted aquatics, or deep marsh with bulrush or cattails, and range from fairly small to several acres. It contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate this system with an occasional scattering of tall *Carex* spp. and forbs that can vary from dense to open cover. Trees are generally absent and, if present, are scattered. Submergent wetlands include a variety of macrophytes.

Classification Comments: Some of the specific communities will also be found in the floodplain system and should not be considered a separate system in that case [see North-Central Interior Floodplain (CES202.694)]. Many of these marshes also may have a border of shrubby wet-meadow species similar to North-Central Interior Wet Meadow-Shrub Swamp (CES202.701), but only those areas with a relatively narrow border (<5-10 m) should included with this system.

Similar Ecological Systems:

- Laurentian-Acadian Freshwater Marsh (CES201.594)
- Laurentian-Acadian Shrub-Herbaceous Wetland Systems (CES201.642)

DESCRIPTION

Environment: This system is typically found on glacial potholes, along small streams, ponds, channels in glacial outwash, and on lakeplains. This system contains a deep to shallow area of freshwater marsh dominated by emergent and submergent species. It contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season.

Vegetation: This system contains a deep to shallow area of freshwater marsh dominated by emergent and submergent species. Stands may be open ponds with floating or rooted aquatics, or deep marsh with bulrush or cattails, and range from fairly small to several acres. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate this system with an occasional scattering of tall *Carex* spp. and forbs that can vary from dense to open cover. Trees are generally absent and, if present, are scattered. Submergent wetlands include a variety of macrophytes.

MEMBERSHIP

Associations:

- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Phragmites australis* Eastern North America Temperate Semi-natural Herbaceous Vegetation (CEGL004141, GNA)
- *Polygonum* spp. - Mixed Forbs Herbaceous Vegetation (CEGL002430, G4G5)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229, G4?)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233, G5)
- *Zizania (aquatica, palustris)* Herbaceous Vegetation (CEGL002382, G3G4)

Alliances:

- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizania (aquatica, palustris)* Semipermanently Flooded Herbaceous Alliance (A.1441)

DISTRIBUTION

Range: This system is found in the northern Midwest and southern Canada.

Divisions: 201:C; 202:C

Nations: CA?, US

Subnations: IA, IL, IN, MI, MN, MO, ND, OH, ON?, SD, WI

Map Zones: 39:C, 40:C, 41:P, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C, 62:P

USFS Ecomap Regions: 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:?

SOURCES

References: Comer and Albert 1997, Midwestern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.732597#references

Description Author: Midwest Ecology Group

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, Midwest, Southeast

ClassifResp: Midwest

NORTHERN ATLANTIC COASTAL PLAIN BRACKISH TIDAL MARSH (CES203.894)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Brackish (Mesohaline); Herbaceous; Tidal / Estuarine [Haline]; Graminoid

National Mapping Codes: ESLF 9272

CONCEPT

Summary: This system ranges from Massachusetts south to the Chesapeake drainage and is comprised of brackish marshes occurring on the portion of large tidal rivers and their tributaries where saltwater is mixed with freshwater. Vegetation typically exhibits zonation, with associations distributed by flooding frequency. Typical species include *Spartina alterniflora*, *Typha angustifolia*, *Spartina cynosuroides*, and *Schoenoplectus americanus*.

Classification Comments: In contrast to Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519), which this type grades into, brackish marshes are distinguished by being confined within a tidal river and by reduced cover of *Spartina patens* and increased cover of associated brackish marsh species such as *Schoenoplectus americanus*, *Typha angustifolia*, *Amaranthus cannabinus*, and *Polygonum* spp. Flats with low forbs will be dominated by plants such as *Sagittaria subulata* and *Limosella australis* rather than by the halophytes (*Salicornia* and *Sarcocornia* spp., for example) seen in salt marsh flats.

Similar Ecological Systems:

- Acadian Estuary Marsh (CES201.579)

MEMBERSHIP

Associations:

- *Amaranthus cannabinus* Tidal Herbaceous Vegetation (CEGL006080, G3G5)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Vegetation (CEGL004473, G2G4)
- *Schoenoplectus americanus* - *Spartina patens* Herbaceous Vegetation (CEGL006612, GNR)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Schoenoplectus robustus* - *Spartina alterniflora* Herbaceous Vegetation (CEGL006416, GNR)
- *Spartina alterniflora* - *Lilaeopsis chinensis* Herbaceous Vegetation (CEGL004193, G3G4)
- *Spartina alterniflora* - *Polygonum punctatum* - *Amaranthus cannabinus* Herbaceous Vegetation (CEGL006418, GNR)
- *Spartina cynosuroides* Herbaceous Vegetation (CEGL004195, G4)
- *Spartina patens* - *Agrostis stolonifera* Herbaceous Vegetation (CEGL006365, GNR)
- *Typha angustifolia* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201, G4G5)

Alliances:

- *Amaranthus cannabinus* Tidal Herbaceous Alliance (A.1706)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Alliance (A.1710)
- *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina cynosuroides* Tidal Herbaceous Alliance (A.1480)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Typha* (*angustifolia*, *domingensis*) Tidal Herbaceous Alliance (A.1472)

DISTRIBUTION

Range: This system ranges from Massachusetts south to the Chesapeake drainage and the James River, Virginia.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, NJ, NY, RI, VA

Map Zones: 60:C, 65:C

TNC Ecoregions: 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722786#references

Description Author: L. Sneddon, mod. S.C. Gawler

Version: 12 Oct 2004

Concept Author: L. Sneddon

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN FRESH AND OLIGOHALINE TIDAL MARSH (CES203.516)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9293

CONCEPT

Summary: This system includes freshwater tidal vegetation occurring on the upper reaches of large rivers influenced by tidal flooding, but beyond the reach of the salt wedge. The system is well-developed on the Chesapeake and Delaware Bay drainages, including the rivers of southern New Jersey, then extends northeast and includes inland portions of the Hudson, Connecticut, Merrimack, Kennebec, and Penobscot rivers and their tributaries. The vegetation includes tall marshes dominated by tall grasses such as *Zizania aquatica*, marshes of lower stature dominated by forbs such as *Amaranthus cannabinus*, *Hibiscus moscheutos* and others, and vegetation characterized by short-statured and rosette-forming forbs such as *Eriocaulon parkeri* and *Isoetes riparia*. Associations are distributed by proximity to tidal waters and thus duration and force of flooding. Sediments of more protected and isolated vegetation is comprised of finer-grained materials that are poorly drained, or of well-consolidated peat deposits. Vegetation exposed to greater flooding force and scouring action is supported by mineral substrates such as sand and gravel.

Similar Ecological Systems:

- Acadian Estuary Marsh (CES201.579)

MEMBERSHIP

Associations:

- *Acorus calamus* Tidal Herbaceous Vegetation (CEGL006833, GNR)
- *Alnus (incana ssp. rugosa, serrulata) - Cornus amomum* Shrubland (CEGL006337, GNR)
- *Alnus maritima / Acorus calamus* Shrubland (CEGL006841, GNR)
- *Alnus serrulata - Salix nigra / Pilea (fontana, pumila)* Tidal Shrubland (CEGL006843, GNR)
- *Amaranthus cannabinus* Tidal Herbaceous Vegetation (CEGL006080, G3G5)
- *Amorpha fruticosa* Tidal Shrubland (CEGL006844, GNR)
- *Carex hyalinolepis* Tidal Herbaceous Vegetation (CEGL006177, GNR)
- *Decodon verticillatus* Semipermanently Flooded Shrubland (CEGL005089, GNR)
- *Eriocaulon parkeri - Polygonum punctatum* Herbaceous Vegetation (CEGL006352, G2)
- *Hibiscus moscheutos - Polygonum punctatum - Peltandra virginica* Tidal Herbaceous Vegetation (CEGL006181, GNR)
- *Impatiens capensis - Peltandra virginica - Polygonum arifolium - Schoenoplectus fluviatilis - Typha angustifolia* Tidal Herbaceous Vegetation (CEGL006325, GNR)
- *Isoetes riparia* Tidal Herbaceous Vegetation (CEGL006058, GNR)
- *Iva frutescens / Spartina cynosuroides* Tidal Shrubland (CEGL006847, GNR)
- *Justicia americana - Peltandra virginica* Herbaceous Vegetation [Provisional] (CEGL006579, GNR)
- *Morella cerifera - Baccharis halimifolia / Eleocharis fallax* Shrubland (CEGL006846, GNR)
- *Nelumbo lutea* Tidal Herbaceous Vegetation (CEGL006913, GNR)
- *Nuphar lutea ssp. advena* Tidal Herbaceous Vegetation (CEGL004472, G4G5)
- *Nuphar lutea ssp. sagittifolia* Tidal Herbaceous Vegetation (CEGL006094, G1G2)
- *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation (CEGL004706, G3G4)
- *Peltandra virginica - Schoenoplectus (pungens, tabernaemontani)* Tidal Herbaceous Vegetation [Provisional] (CEGL006578, GNR)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Zizania aquatica* Tidal Herbaceous Vegetation (CEGL004202, G4?)

Alliances:

- *Acorus calamus* Tidal Herbaceous Alliance (A.3018)
- *Alnus (incana, serrulata, maritima)* Tidal Shrubland Alliance (A.1024)
- *Amaranthus cannabinus* Tidal Herbaceous Alliance (A.1706)
- *Amorpha fruticosa* Tidal Shrubland Alliance (A.3024)
- *Baccharis halimifolia - Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Carex hyalinolepis* Tidal Herbaceous Alliance (A.3019)
- *Decodon verticillatus* Semipermanently Flooded Shrubland Alliance (A.1013)
- *Eriocaulon parkeri* Tidal Herbaceous Alliance (A.1701)
- *Isoetes riparia* Tidal Herbaceous Alliance (A.1879)

- *Morella cerifera* - *Rosa palustris* Tidal Shrubland Alliance (A.806)
- *Nelumbo lutea* Tidal Herbaceous Alliance (A.3020)
- *Nuphar lutea* Tidal Herbaceous Alliance (A.1708)
- *Peltandra virginica* - *Pontederia cordata* Tidal Herbaceous Alliance (A.1703)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Zizania aquatica* Tidal Herbaceous Alliance (A.1484)

DISTRIBUTION

Range: This system is best developed on the Chesapeake and Delaware Bay drainages, including the rivers of southern New Jersey, but extends northeast and includes inland portions of the Hudson, Connecticut, Merrimack, Kennebec, and Penobscot rivers and their tributaries.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NJ, NY, PA, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 211D:CC, 221A:CC, 221B:CC, 232A:CC, 232B:CC

TNC Ecoregions: 58:C, 62:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723075#references

Description Author: R. Evans and L. Sneddon, mod. S.C. Gawler

Version: 05 May 2008

Concept Author: R. Evans and L. Sneddon

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN POND (CES203.518)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9283

CONCEPT

Summary: This system includes vegetation of groundwater-flooded depressions characterized by a flora generally restricted to the Coastal Plain from the southern portion of the Delmarva peninsula to Cape Cod, Massachusetts, and with peripheral occurrences to southern Maine. Ponds may contain permanent water, such as the deep glacial kettleholes of Cape Cod and Long Island, New York, or may be shallow basins where groundwater drops below the surface late in the growing season. This system occurs on sandy deposits such as outwash plains of the glaciated region (Long Island and Cape Cod), on the deep sands of the New Jersey Pine Barrens, or on finer sediments of the Coastal Plain of Cape May, New Jersey, the Delmarva peninsula, and the Chesapeake Bay region. The vegetation of steeper-sided basins (generally those containing permanent water) are characterized by strong zonation, with a border of tall shrubs, such as *Vaccinium corymbosum*, and several essentially concentric bands or zones dominated by different associations, depending on geography. Characteristic species in Massachusetts and Long Island include *Rhexia virginica*, *Cyperus dentatus*, *Gratiola aurea*, *Panicum verrucosum*, *Euthamia caroliniana* (= *Euthamia tenuifolia*), *Carex striata*, *Juncus pelocarpus*, *Rhynchospora capillacea*, *Rhynchospora macrostachya*, *Xyris difformis*, *Fimbristylis autumnalis*, *Scleria reticularis*, *Sabatia kennedyana*, *Drosera filiformis*, *Juncus militaris*, and many others.

Ponds of the New Jersey Pine Barrens share many of these species, with others including *Juncus repens*, *Muhlenbergia torreyi*, *Rhynchospora oligantha*, *Rhynchospora cephalantha*, *Rhynchospora chalarocephala*, and many others. In shallow basins, such strong zonation is generally lacking but still remains evident in some cases. On Cape Cod, Long Island, and New Jersey, this system most often occurs within the pitch pine barrens. From Cape May and south, the system occurs within an upland matrix of mixed hardwood forests and generally supports a seasonally flooded swamp forest characterized by *Liquidambar styraciflua*, *Acer rubrum*, wetland oaks such as *Quercus palustris* and *Quercus phellos*, and in Virginia and scattered locations on the Inner Coastal Plain of Maryland *Nyssa biflora*. The vegetation is characterized by many of the species from New England, New York and New Jersey and also includes *Juncus repens*, *Boltonia asteroides*, *Fimbristylis perpusilla*, *Coelorachis rugosa*, *Dichanthelium spretum*, *Saccharum giganteum*, *Eleocharis quadrangulata*, and others. *Cephalanthus occidentalis* often occurs as scattered individuals or as a shrub swamp with less diversity and cover of Coastal Plain flora.

Classification Comments: In some cases, these are locally known as "Delmarva bays."

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Northern Atlantic Coastal Plain Pitch Pine Lowland (CES203.374)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Dichanthelium meridionale* - (Mixed Shrub) Herbaceous Vegetation (CEGL006243, GNR)
- *Carex striata* var. *brevis* Herbaceous Vegetation (CEGL004120, G3G4)
- *Cephalanthus occidentalis* / *Polygonum hydropiperoides* - *Panicum verrucosum* Shrubland (CEGL006242, G3?)
- *Cladium mariscoides* - *Coelorachis rugosa* Herbaceous Vegetation (CEGL006332, G1)
- *Cladium mariscoides* - *Eleocharis equisetoides* Herbaceous Vegetation (CEGL006016, GNR)
- *Decodon verticillatus* / *Triadenum virginicum* Shrubland (CEGL006087, GNR)
- *Decodon verticillatus* Semipermanently Flooded Shrubland (CEGL005089, GNR)
- *Dulichium arundinaceum* - *Juncus canadensis* - *Juncus pelocarpus* Herbaceous Vegetation (CEGL006415, GNR)
- *Eleocharis (obtusata, flavescens)* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL006261, G3G5)
- *Eleocharis flavescens* - *Xyris difformis* Herbaceous Vegetation (CEGL006400, GNR)
- *Eragrostis hypnoides* - *Ludwigia sphaerocarpa* - *Polygonum hydropiperoides* Herbaceous Vegetation (CEGL006608, GNR)
- *Eriocaulon aquaticum* - *Lobelia dortmanna* Herbaceous Vegetation (CEGL006346, GNR)
- *Fraxinus pennsylvanica* - *Juglans nigra* - *Ulmus americana* / *Cornus amomum* / *Onoclea sensibilis* Forest (CEGL006918, GNR)
- *Juncus militaris* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL006345, GNR)
- *Juncus repens* - *Boltonia asteroides* Herbaceous Vegetation (CEGL006610, GNR)
- *Leersia hexandra* - (*Panicum verrucosum*, *Scleria reticularis*) Herbaceous Vegetation [Provisional] (CEGL004047, G2G3)
- *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa biflora* / *Carex jorii* Forest (CEGL006223, G1G2)
- *Liquidambar styraciflua* - *Acer rubrum* - *Quercus phellos* / *Leucothoe racemosa* Forest (CEGL006110, G4G5)
- *Lysimachia terrestris* - *Dulichium arundinaceum* - *Rhexia virginica* Herbaceous Vegetation (CEGL006035, G2G3)

- *Nymphaea odorata* - *Eleocharis robbinsii* Herbaceous Vegetation (CEGL006086, G2)
- *Panicum hemitomon* - *Panicum verrucosum* Herbaceous Vegetation (CEGL006338, GNR)
- *Polygonum (hydropiperoides, punctatum)* - *Leersia* spp. Herbaceous Vegetation (CEGL004290, G4?)
- *Populus heterophylla* - *Acer rubrum* - *Quercus palustris* - *Liquidambar styraciflua* Forest (CEGL006469, GNR)
- *Rhexia virginica* - *Crotalaria sagittalis* Herbaceous Vegetation (CEGL006300, G2)
- *Rhexia virginica* - *Panicum verrucosum* Herbaceous Vegetation (CEGL006264, G2G3)
- *Rhynchospora capitellata* - *Cyperus dentatus* - *Rhexia virginica* - *Xyris difformis* Herbaceous Vegetation (CEGL006210, G2)
- *Rhynchospora capitellata* - *Rhexia virginica* - *Rhynchospora scirpoides* - *Schoenoplectus hallii* Herbaceous Vegetation (CEGL005108, G2?)
- *Saccharum giganteum* - (*Dichantheium spretum*, *Panicum verrucosum*) Herbaceous Vegetation (CEGL006609, G1G2)
- *Spartina pectinata* North Atlantic Coast Herbaceous Vegetation (CEGL006095, GNR)
- *Taxodium distichum* - *Nyssa biflora* Chesapeake Bay Forest (CEGL006214, GNR)
- *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland (CEGL006371, G4)

Alliances:

- *Acer (rubrum, saccharinum)* - *Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex striata* Seasonally Flooded Herbaceous Alliance (A.1426)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Cladium mariscoides* Seasonally Flooded Herbaceous Alliance (A.1368)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Decodon verticillatus* Semipermanently Flooded Shrubland Alliance (A.1013)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Eleocharis* spp. - *Eriocaulon aquaticum* Semipermanently Flooded Herbaceous Alliance (A.1429)
- *Eragrostis hypnoides* - *Lipocarpa micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Juncus militaris* Semipermanently Flooded Herbaceous Alliance (A.1430)
- *Juncus repens* - *Eleocharis microcarpa* Seasonally Flooded Herbaceous Alliance (A.1376)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Vaccinium formosum* - *Vaccinium fuscatum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

DISTRIBUTION

Range: This system ranges from the southern portion of the Delmarva peninsula to Cape Cod, Massachusetts, with scattered Coastal Plain occurrences north to southern Maine; also in limited, highly disjunct occurrences on sand lakeplain near southern Lake Michigan and in southeastern Vermont.

Divisions: 202:C; 203:C

Nations: US

Subnations: DE, MA, MD, ME, MI, NJ, NY, VA, VT, WI

Map Zones: 49:?, 51:C, 60:C, 63:P, 64:P, 65:C

USFS Ecomap Regions: 212Ha:CCC, 212Hb:CCC, 212T:CC, 221A:CC, 222Ja:CCC, 222Jb:CCC, 222Jg:CCC, 222Jh:CCC, 222R:CC, 232A:CC

TNC Ecoregions: 48:C, 58:C, 61:C, 62:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723074#references

Description Author: SC. Gawler, R. Evans, L. Sneddon, M. Pyne

Version: 05 May 2008

Concept Author: SC. Gawler, R. Evans, L. Sneddon, M. Pyne

Stakeholders: East, Midwest, Southeast
ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN SEAGRASS BED (CES203.246)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9273

CONCEPT

Summary: This ecological system represents submerged aquatic vegetation found in marine environments from Chesapeake Bay northward to the Maine coast. In contrast to Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243) to the south, which can be generally characterized as *Zostera - Halodule*, this system is more typically characterized as *Zostera - Ruppia* (Thayer et al. 1984). A host of marine algae is also an important component of this system.

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243)
- North Atlantic Tidal Sand Flat (CES201.049)

DESCRIPTION

Environment: Found in quiet, polyhaline waters of tidal embayments where saline fluctuations are relatively minor (Edinger et al. 2002).

Vegetation: The vegetation dominants are *Zostera* and *Ruppia* (Thayer et al. 1984) with some segregation along salinity gradients. *Zostera marina* is dominant in the most saline areas, while *Ruppia* tends to be most common in somewhat less saline water (Edinger et al. 2002) of the bay where salinity is highest. However, mixed beds of the two species do occur. Thayer et al. (1984) point out that these mixed beds of *Zostera* and *Ruppia* vary in seasonal dominance, with *Ruppia* largely replacing *Zostera* during the midsummer. A diverse array of algae are also present (Edinger et al. 2002).

Dynamics: The dynamics of tidal, aquatic communities dominated by vascular plants are complex and poorly understood. The distribution and abundance of vascular plants in these habitats are probably controlled by responses to water chemistry, water clarity and light penetration, the impact of currents and boat wakes, and herbivory by aquatic animals (Fleming et al. 2001).

MEMBERSHIP

Associations:

- *Ruppia maritima* Acadian/Virginian Zone Temperate Herbaceous Vegetation (CEGL006167, GNR)
- *Zostera marina* Herbaceous Vegetation (CEGL004336, G4G5)

Alliances:

- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Zostera marina* Permanently Flooded - Tidal Herbaceous Alliance (A.1766)

DISTRIBUTION

Range: The southern boundary may need clarification. The conceptual boundary occurs where *Halodule* beds become important; it is presumed that this transition occurs at or around Cape Hatteras, North Carolina.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

TNC Ecoregions: 57:C, 58:C, 62:C

SOURCES

References: Comer et al. 2003, Edinger et al. 2002, Fleming et al. 2001, Orth and Moore 1988, Thayer et al. 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723239#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN SUBTIDAL AQUATIC BED (CES203.521)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9280

CONCEPT

Summary: This system represents submerged aquatic beds of brackish - freshwater tidal upper bays, rivers, and tributaries, ranging from Chesapeake Bay northward to the Massachusetts coast. Typical species include *Stuckenia pectinata*, *Potamogeton perfoliatus*, *Zannichellia palustris*, and others.

DESCRIPTION

Vegetation: Typical species in examples of this system include *Stuckenia pectinata*, *Potamogeton perfoliatus*, *Zannichellia palustris*, and others.

MEMBERSHIP

Associations:

- *Ceratophyllum demersum* - *Utricularia macrorhiza* - *Nymphaea odorata* Herbaceous Vegetation (CEGL004661, G3?)
- *Ceratophyllum demersum* - *Vallisneria americana* - *Najas* spp. Tidal Herbaceous Vegetation (CEGL006048, GNR)
- *Potamogeton* spp. - *Ceratophyllum demersum* - *Crassula aquatica* Herbaceous Vegetation (CEGL006340, GNR)
- *Stuckenia pectinata* - *Potamogeton perfoliatus* - (*Zannichellia palustris*) Tidal Herbaceous Vegetation (CEGL006027, G3G5)

Alliances:

- *Ceratophyllum demersum* Permanently Flooded - Tidal Herbaceous Alliance (A.1767)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Stuckenia pectinata* - *Zannichellia palustris* Permanently Flooded Herbaceous Alliance (A.1768)

DISTRIBUTION

Range: This system ranges from Chesapeake Bay northward to the Maine coast.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NH, NJ, NY, RI?, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 211D:CC, 221A:CC, 232A:CC, 232H:CC, 232I:CP

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723071#references

Description Author: R. Evans

Version: 05 Feb 2009

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN TIDAL SALT MARSH (CES203.519)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: North Atlantic Coastal Plain; Tidal / Estuarine; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9282

CONCEPT

Summary: This system encompasses the mesohaline to saline intertidal marshes of the North Atlantic Coastal Plain, ranging from Chesapeake Bay north to Cape Cod, Massachusetts, and sporadically to the southern Maine coast. It includes a number of different broad vegetation types including salt pannes, salt marshes, and salt shrublands. This system occurs on the bay side of barrier beaches and the outer mouth of tidal rivers where salinity is not much diluted by freshwater input. The typical salt marsh profile, from sea to land, can be summarized as follows: a low regularly flooded marsh strongly dominated by *Spartina alterniflora*; a higher irregularly flooded marsh dominated by *Spartina patens* and *Distichlis spicata*; low hypersaline pannes characterized by *Salicornia* spp.; and a salt scrub ecotone characterized by *Iva frutescens*, *Baccharis halimifolia*, and *Panicum virgatum*. Salt marsh "islands" of slightly higher elevation also support *Juniperus virginiana*. This system also includes the rare sea-level fen vegetation, which occurs at the upper reaches of the salt marsh where groundwater seepage creates a freshwater fen.

Classification Comments: A continuous gradation in salinity presents challenges in separating salt from brackish marsh systems. This system is defined by its landscape position in saltwater bays and outer river mouths as well as actual salinity ranges. Moving up a tidal river, brackish marshes have less cover of *Spartina patens* and increased cover of associated species including tall graminoids such as *Schoenoplectus americanus* and *Typha angustifolia*. Further southward along the East Coast, salt and brackish marshes fall within the same system because the differences in hydrodynamics and landforms in that region produce less distinct habitats.

Similar Ecological Systems:

- Acadian Coastal Salt Marsh (CES201.578)

MEMBERSHIP

Associations:

- *Baccharis halimifolia* - *Iva frutescens* / *Panicum virgatum* Shrubland (CEGL003921, G5)
- *Cladium mariscoides* - *Drosera intermedia* - *Eleocharis rostellata* Herbaceous Vegetation (CEGL006310, G1)
- *Eleocharis rostellata* - *Spartina patens* Herbaceous Vegetation (CEGL006611, GNR)
- *Iva frutescens* / *Spartina patens* Shrubland (CEGL006848, G5)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Morella cerifera* / *Spartina patens* Shrubland (CEGL003839, G3G4)
- *Panicum virgatum* - *Spartina patens* Herbaceous Vegetation (CEGL006150, GNR)
- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Pinus taeda* / *Morella cerifera* / *Spartina patens* Tidal Woodland (CEGL006849, GNR)
- *Ruppia maritima* - *Stuckenia pectinata* Herbaceous Vegetation (CEGL006370, GNR)
- *Salicornia* (*virginica*, *bigelovii*, *maritima*) - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308, G5)
- *Schoenoplectus pungens* - *Eleocharis parvula* Herbaceous Vegetation (CEGL006398, GNR)
- *Spartina alterniflora* - *Distichlis spicata* Tidal Herbaceous Vegetation [Provisional] (CEGL006586, GNR)
- *Spartina alterniflora* / (*Ascophyllum nodosum*) Acadian/Virginian Zone Herbaceous Vegetation (CEGL004192, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus gerardii*) Herbaceous Vegetation (CEGL006006, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus roemerianus*) Herbaceous Vegetation (CEGL004197, G4G5)
- *Spartina patens* - *Festuca rubra* - (*Spartina pectinata*) Herbaceous Vegetation (CEGL006368, GNR)
- *Spartina patens* - *Thinopyrum pycnanthum* Herbaceous Vegetation (CEGL006149, GNR)

Alliances:

- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Morella cerifera* Saturated Shrubland Alliance (A.1906)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Pinus taeda* Woodland Alliance (A.526)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)

- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)

DISTRIBUTION

Range: This system is found from the southern Maine coast south to the Chesapeake Bay.

Divisions: 202:C; 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723073#references

Description Author: R. Evans, mod. S.C. Gawler

Version: 12 Oct 2004

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN CALIFORNIA CLAYPAN VERNAL POOL (CES206.948)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Circumneutral Water; Saline Water Chemistry; Impermeable Layer; Vernal Pool Mosaic; Depressional; Forb

Non-Diagnostic Classifiers: Shallow (<15 cm) Water; Intermittent Flooding; Lowland [Foothill]; Lowland [Lowland]; Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Isolated Wetland [Strictly Isolated]; Depression

National Mapping Codes: ESLF 9251

CONCEPT

Summary: These systems are shallow ephemeral water bodies found in depressions (up to several hectares in size) among grasslands and open woodlands throughout the northern Central Valley of California. Northern claypan vernal pools include a clay hardpan that retains water inputs throughout some portion of the spring, but typically the depression dries down entirely into early summer months. They tend to be circumneutral to alkaline and slightly saline wetlands with characteristic plant species including *Downingia bella*, *Downingia insignis*, *Cressa truxillensis*, *Plagiobothrys leptocladius* (= *Allocarya leptoclada*), *Pogogyne douglasii*, *Eryngium aristulatum*, *Veronica peregrina*, *Lasthenia ferrisiae*, *Lasthenia glaberrima*, and *Spergularia salina* (= *Spergularia marina*). Due to draw-down characteristics, vernal pools typically form concentric rings of similar forb-rich vegetation. Given their relative isolation in upland-dominated landscapes, many endemic plant species are common in California vernal pools.

Related Concepts:

- Valley Grassland (215) (Shiflet 1994) Intersecting. The SRM valley grassland includes vernal pools and serpentine seeps occurring in Central Valley grassland areas.

DISTRIBUTION

Range: Found in depressions among grasslands and open woodlands throughout the northern Central Valley of California.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:P, 5:C, 7:C

USFS Ecomap Regions: 262A:CC, M261C:??, M261F:??

TNC Ecoregions: 13:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722733#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

NORTHERN CALIFORNIA VOLCANIC VERNAL POOL (CES206.949)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; Impermeable Layer; Intermittent Flooding; Vernal Pool Mosaic; Mediterranean [Mediterranean Xeric-Oceanic]; Depressional; Forb

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Herbaceous; Isolated Wetland [Strictly Isolated]; Depression

National Mapping Codes: ESLF 9250

CONCEPT

Summary: These systems are shallow ephemeral water bodies found in very small depressions (typically no larger than 50 square meters) throughout foothills of the southern Cascades and Sierra Nevada. They are often on solid volcanic bedrock, but also can be found on volcanic ash flows (lahars) over bedrock. Hydrologically, they vary from flashy to more persistent hydrological regimes, typically due to the amount and periodicity of precipitation received. Where hydrology is flashy, they fill and evaporate rapidly; several times during the wet season. Typically these vernal pools do not support species requiring long inundation periods. Those on volcanic ash flows are less flashy and have pools that are larger and deeper. Where short inundation periods are characteristic, *Lasthenia californica*, *Downingia bicornuta*, *Psathyrotes* spp., and *Sedella* spp. (= *Parvisedum* spp.) are often present. Where longer inundation periods are characteristic, *Eryngium constancei* and *Eleocharis acicularis* may be found.

DISTRIBUTION

Range: Throughout foothills of the southern Cascades and Sierra Nevada.

Divisions: 204:?: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 6:C, 7:C

USFS Ecomap Regions: M261D:PP, M261E:PP, M261G:PP

TNC Ecoregions: 4:C, 5:P, 12:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722732#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

NORTHERN COLUMBIA PLATEAU BASALT POTHOLE PONDS (CES304.058)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Impermeable Layer; Depressional

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Temperate [Temperate Oceanic]; Isolated Wetland [Strictly Isolated]; Consolidated

National Mapping Codes: ESLF 9233

CONCEPT

Summary: This system includes shallow freshwater water bodies found in small depressions gouged into basalt by Pleistocene floods. These are found throughout channeled scablands of the Columbia Plateau in Washington's eastern Columbia River Gorge. They typically occupy the bottom of a basalt cliff (1-20+ m tall) lined circular or linear depression. Characteristic shoreline vegetation lining the aquatic environment is an emergent marsh that includes species of *Scirpus* and/or *Schoenoplectus*, *Typha*, *Juncus*, *Potamogeton*, *Polygonum*, *Nuphar*, and *Phalaris*. This system may also include areas of relatively deep water with floating-leaved plants (*Lemna*, *Potamogeton*, and *Brasenia*). Woody plants, including *Populus tremuloides*, *Salix exigua*, *Crataegus douglasii*, or *Rosa woodsii*, are present adjacent to more northerly potholes. Ponds are within *Artemisia* shrub-steppe and *Pinus ponderosa* savanna or woodland. The wetland vegetation occupies a narrow zone (0.5-10 m) between open water and upland vegetation.

Classification Comments: This may be a subset of North American Arid West Emergent Marsh (CES300.729), or it could be a freshwater aquatic system with primarily zoological species composition (amphibians and invertebrates).

MEMBERSHIP

Associations:

- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Lemna* spp. Permanently Flooded Herbaceous Vegetation (CEGL003059, G5)
- *Nuphar lutea ssp. polysepala* Herbaceous Vegetation (CEGL002001, G5)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Phragmites australis* Western North America Temperate Semi-natural Herbaceous Vegetation (CEGL001475, G5)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)
- *Schoenoplectus americanus* Western Herbaceous Vegetation (CEGL001841, G3Q)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)

Alliances:

- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Lemna* spp. Permanently Flooded Herbaceous Alliance (A.1747)
- *Nymphaea odorata - Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Schoenoplectus acutus - (Schoenoplectus tabernaemontani)* Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Typha (angustifolia, latifolia) - (Schoenoplectus spp.)* Semipermanently Flooded Herbaceous Alliance (A.1436)

SPATIAL CHARACTERISTICS

Size: Depressions (50-10,000 sq m)

Adjacent Ecological System Comments: Primarily Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) and Columbia Plateau Scabland Shrubland (CES304.770).

DISTRIBUTION

Range: Restricted to the northern Columbia Plateau ecoregion commonly called the Columbia Basin.

Divisions: 304:C

Nations: US

Subnations: OR, WA

Map Zones: 7:C, 8:C, 9:P
USFS Ecomap Regions: 342H:CP, 342I:CC, M333A:??
TNC Ecoregions: 6:C, 68:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722653#references

Description Author: R. Crawford

Version: 08 Sep 2005

Concept Author: R. Crawford

Stakeholders: West

ClassifResp: West

NORTHERN GREAT LAKES COASTAL MARSH (CES201.722)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9296

CONCEPT

Summary: This system is found throughout the northern Great Lakes Basin in the United States and Canada. This system, which can include many associated wetlands, occurs along the Great Lakes shoreline directly affected by Great Lakes water regimes. Species distributions and community patterns are determined by multiple abiotic factors, including Great Lakes water-level fluctuations, surficial bedrock, glacial landform, climate, and land use. Although wetland species are generally widely distributed, those of more boreal and subarctic regions are found in the northern parts of the basin.

Vegetation types found across this diverse set of abiotic factors vary in any number of ways, but they can be placed into a number of zones, though not all are present at a given site. The first four zones are typically inundated directly by lake waters: (a) submergent marsh; (b) emergent marsh; (c) shore fen; and (d) shoreline or strand. The next set of zones are inland from the water's edge and include: (e) herbaceous and shrubby wet meadows and (f) shrub or wooded swamps.

This system can be divided into a number of geographical variants, based on the various community types found across the range of the system: (1) Lake Superior Poor Fen; (2) Northern Rich Fen; (3) Northern Great Lakes Marsh; (4) Green Bay Disturbed Marsh; (5) Lake Michigan Lacustrine Estuary; (6) Saginaw Bay Lakeplain Marsh; (7) Lake Erie-St. Clair Lakeplain Marsh; (8) Lake Ontario Lagoon Marsh; and (9) St Lawrence River Estuary.

Classification Comments: Differs from Great Lakes Freshwater Estuary and Delta (CES202.033) based on its lakeshore setting; the estuary system occurs along rivers, where there is typically more nutrient (e.g., from silts).

Similar Ecological Systems:

- Great Lakes Freshwater Estuary and Delta (CES202.033)

DESCRIPTION

Environment: Species distributions and community patterns are determined by multiple abiotic factors. Great Lakes water-level fluctuations, surficial bedrock, glacial landform, climate, and land use. Great Lakes water level fluctuate over at least three temporal time scales: first, short-term fluctuations caused by winds or barometric pressures; second, seasonal fluctuations reflecting the annual hydrologic cycle in the basin; and third, interannual fluctuations in lake level as a result of variable precipitation and evaporation within the drainage basin. Interannual fluctuations can be as much as 1.3-2.5 m, with apparently little or no periodicity. These fluctuations, which also alter turbidity, nutrient availability, ice scour zones, etc., cause locational shifts in vegetation zones, but also in the composition of these zones, as species have individual tolerance limits.

The major bedrock distinction in the Great Lakes Basin is between igneous and metamorphic bedrock of the Precambrian period and younger (Paleozoic) sedimentary bedrock. The igneous and metamorphic bedrock form the rugged north shore of Lake Superior and Georgian Bay, and line much of the St. Lawrence River; they are locally present on the south shore of western Lake Superior. They lack the shallow protected waters and fine-textured substrates that support broad coastal wetlands. Where such bedrock is at or near the surface, it forms soils that are nutrient-poor and acidic. The rest of the basin is dominated by softer, sedimentary bedrock, which, with its broad, horizontal depositions, favors broad zones of shallow waters. The sedimentary rocks are typically more alkaline (calcareous), forming soils that are nutrient- and moisture-rich loams and clays. Bedrock patterns are overlaid by glacial landforms that, in combination with recent long-shore transport processes, create the prevalent physiographic features of the shorelines. In the lakes themselves, sand lakeplains, clay lakeplains, and moraines are shaped by currents, and the long-shore transportation of sediments has created sand-spit embayments and swales, dune-swale complexes, and tombolos. Channels and rivers contain channel-side wetlands, embayments, and deltas, and estuaries form as either open or barred river mouths. It is this diversity of landforms that has given rise to a diverse set of vegetation types.

Finally, regional patterns of climate affect the basin. The strong latitudinal gradient from southern Lake Erie to northern Lake Superior creates marked differences in length of growing season and solar radiation. Although wetland species are generally widely distributed, those of more boreal and subarctic regions are found in the northern parts of the basin, whereas those of more temperate and prairie regions are found in the southern parts.

Vegetation: Vegetation types found across this diverse set of abiotic factors vary in any number of ways, but they can be placed into a number of zones, though not all are present at a given site. The first four zones are typically inundated directly by lake waters: (a) submergent marsh - containing submergent and/or floating vegetation; (b) emergent marsh - characterized by shallow water or semipermanently flooded soils, and typically dominated by bulrushes, cattails, and other emergent species, but also containing submergent and/or floating vegetation; (c) shore fen - saturated vegetation mats characterized by groundwater influence from shoreline habitats but affected by lake level fluctuations, and dominated by herbaceous or shrubby species; and (d) shoreline or strand

- a narrow zone at or just above the water level where seasonal water-level fluctuations and waves cause erosion, and which is dominated by annual or pioneer herbaceous species. The next set of zones are inland from the water's edge and include: (e) herbaceous and shrubby wet meadows - characterized by saturated or seasonally flooded soils, and typically dominated by sedges, grasses, and other herbs, but occasionally dominated by shrubs; and (f) shrub or wooded swamps - characterized by seasonal flooding and dominated by woody species. Species assemblages in these zones change depending on the interaction of factors across the Great Lakes Basin.

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Carex viridula* - *Cladium mariscoides* - *Lobelia kalmii* Herbaceous Vegetation (CEGL005115, G1G2)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Dasiphora fruticosa ssp. floribunda* - *Myrica gale* Rich Shore Fen Shrubland (CEGL005275, G1G2)
- *Nuphar lutea ssp. advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Potamogeton gramineus* - *Potamogeton natans* Northern Great Lakes Shore Herbaceous Vegetation (CEGL005273, G3?)
- *Potamogeton zosteriformis* - *Ceratophyllum demersum* - *Elodea canadensis* Southern Great Lakes Shore Herbaceous Vegetation (CEGL005152, G3G4)
- *Schoenoplectus acutus* - *Schoenoplectus subterminalis* - *Eleocharis palustris* - (*Schoenoplectus americanus*) Northern Great Lakes Shore Herbaceous Vegetation (CEGL005274, G3?)

Alliances:

- *Calamagrostis canadensis* - *Carex viridula* - *Cladium mariscoides* - *Lobelia kalmii* Saturated Herbaceous Alliance (A.3525)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Dasiphora fruticosa ssp. floribunda* - *Myrica gale* - (*Carex lasiocarpa*) Saturated Shrubland Alliance (A.1017)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

DISTRIBUTION

Range: This system is found throughout the northern Great Lakes Basin in the United States and Canada.

Divisions: 201:C

Nations: CA, US

Subnations: MI, ON, WI

Map Zones: 41:C, 49:?, 50:C, 51:C

USFS Ecomap Regions: 212Ha:CCC, 212Hf:CCC, 212Hj:CCC, 212Hl:CCC, 212J:CC, 212Lb:CCP, 212Ra:CCC, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212Sc:CCC, 212Sn:CCC, 212Sq:CCC, 212Te:CCC, 212Tf:CCC, 212Y:CC, 212Z:CC, 222Ja:CCC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 48:C

SOURCES

References: Comer et al. 2003, Minc and Albert 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722948#references

Description Author: D. Albert

Version: 11 Apr 2007

Concept Author: D. Albert

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

NORTHERN GREAT LAKES INTERDUNAL WETLAND (CES201.034)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermittent Flooding; Coastal Dune Mosaic; Mineral: W/ A-Horizon <10 cm

Non-Diagnostic Classifiers: Herbaceous; Depressional [Lakeshore]; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9269

CONCEPT

Summary: This system occurs in scattered location along the northern Great Lakes shoreline where coastal dunes are low and support swales close to lake water levels. The swale immediately behind the foredune is influenced by short-term variation in lake levels and can be partially or occasionally completely filled by dune sands following major storm events. Species common to this first swale include *Juncus balticus*, *Juncus pelocarpus*, *Juncus nodosus*, *Eleocharis acicularis*, species of *Solidago* such as *Oligoneuron houghtonii* (= *Solidago houghtonii*), and *Schoenoplectus americanus* (= *Scirpus americanus*). Occasionally, such swales may contain lake-influenced, calcareous sands, and the shallow swale may contain moderately alkaline indicators, such as *Cladium mariscoides*, *Myrica gale*, *Dasiphora fruticosa ssp. floribunda* (= *Pentaphylloides floribunda*), and others.

Classification Comments: While this type is most commonly described from the northern Great Lakes region, there are likely more occurrences across the southern half of the Great Lakes that may vary in floristic composition from the type described here. Interdunal wetlands are treated as a separate type from dune and swale because in more active wave environments there are single swales immediately adjacent to the shore, with no series of swales/ridges further inlands (D. Albert pers. comm.). The flora is typically herb-dominated and the dynamics are extreme due to water-level fluctuations (D. Albert pers. comm.).

Similar Ecological Systems:

- Great Lakes Wooded Dune and Swale (CES201.726)

MEMBERSHIP

Associations:

- *Dasiphora fruticosa ssp. floribunda* / *Cladium mariscoides* - *Juncus balticus* - (*Rhynchospora capillacea*) Herbaceous Vegetation (CEGL005105, G3?)

Alliances:

- *Cladium mariscoides* Seasonally Flooded Herbaceous Alliance (A.1368)

SPATIAL CHARACTERISTICS

Spatial Summary: small, sometimes linear patches

Size: <0.5 up to 10s of acres

Adjacent Ecological System Comments: Open dunes

DISTRIBUTION

Range: This system occurs in scattered locations along the northern Great Lakes shoreline.

Divisions: 201:C; 202:?

Nations: CA, US

Subnations: MI, ON, WI

Map Zones: 49:?, 50:C, 51:C

USFS Ecomap Regions: 212Ha:CCC, 212Hf:CCC, 212Hj:CCC, 212Hi:CCC, 212Ra:CCC, 212Rc:CCC, 212Rd:CCP, 212Re:CCC, 212Sb:CCC, 212Sc:CCC, 212Sn:CCC, 212Sq:CCC, 212Te:CCC, 212Ya:CCP, 222Ja:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 48:C

SOURCES

References: Comer and Albert 1993, Comer and Albert 1997, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722673#references

Description Author: P. Comer

Version: 11 Apr 2007

Concept Author: P. Comer

Stakeholders: Canada, Midwest

ClassifResp: Midwest

NORTHERN GULF OF MEXICO SEAGRASS BED (CES203.263)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9267

CONCEPT

Summary: Northern Gulf of Mexico seagrass beds are found behind protective barrier islands and in near-shore areas ranging about 560 km (350 miles) from the panhandle of Florida (approximately St. Marks National Wildlife Refuge, Lighthouse Point) westward to Mississippi. Within this area, the drowned alluvial plain and barriers protect the seagrass beds from normal storm surges; such protection is absent in the region immediately to the east. However, such protection alone is insufficient to allow for development of expansive beds. The total acreage of submerged vegetation in this region is relatively small, and individual patches rarely exceed several thousand acres. Beds are locally abundant in St. Joseph Bay, St. Andrews Bay, Santa Rosa Sound, Perdido Bay, Mississippi Sound, and Chandeleur Islands. Of the true seagrasses, *Ruppia maritima* displays the most tolerance to freshwater and consequently is an important component of this system. *Vallisneria americana*, which is not often considered a true seagrass, is a component of this system due to the prevalence of oligohaline waters. The other species, *Halodule*, *Thalassia*, and *Cymodocea*, are also present, usually in monospecific, typically small beds.

Similar Ecological Systems:

- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: The largely temperate climate of the region tests the limits of many of the seagrass species which attain their best development in tropical climates. Further, the prevalence of sandy substrates is not optimal for rooting of most species which prefer softer, even mucky sediments. Finally, salinity in this region is dramatically affected by freshwater inputs from the Apalachicola, Mobile, and the Mississippi rivers, in the vicinity of which seagrasses are generally absent. Although most seagrasses are able to tolerate fluctuations in salinity, optimum salt concentrations vary by species. Long periods of exposure to freshwater kill seagrass leaves, rhizomes, and eventually decimate the entire plant (Wieland 1994a). Due to the large freshwater inputs in this system, *Vallisneria americana*, which is not often considered a true seagrass, is a component of this system, found in oligohaline waters.

Dynamics: *Thalassia* and *Cymodocea* do not grow in areas with low salinity levels (less than 17 ppt); significant leaf loss can occur at these levels. *Thalassia* does not photosynthesize well in less than full strength sea water (Zieman and Zieman 1989). Both species may be more damaged by the effects of freshwater runoff resulting from hurricanes than from high winds and tidal surges (Thomas et al. 1961).

MEMBERSHIP

Associations:

- *Cymodocea filiformis* - (*Thalassia testudinum*) Herbaceous Vegetation (CEGL004317, G4?)
- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Ruppia maritima* Louisianian Zone Herbaceous Vegetation (CEGL004450, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)
- *Vallisneria americana* Estuarine Bayou Herbaceous Vegetation (CEGL004634, G3G5)

Alliances:

- *Cymodocea filiformis* Permanently Flooded - Tidal Herbaceous Alliance (A.1732)
- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)
- *Vallisneria americana* Permanently Flooded - Tidal Herbaceous Alliance (A.1770)

DISTRIBUTION

Range: Northern Gulf of Mexico seagrass beds range from the panhandle of Florida (approximately St. Marks National Wildlife Refuge, Lighthouse Point) westward to Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C
TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Thomas et al. 1961, Wieland 1994a, Zieman and Zieman 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723223#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

OZARK-OUACHITA FEN (CES202.052)

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Central Interior and Appalachian (202)**Land Cover Class:** Herbaceous Wetland**Spatial Scale & Pattern:** Small patch**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Herbaceous; Ozark/Ouachita; Seepage-Fed Sloping; Circumneutral Soil; Aquic**Non-Diagnostic Classifiers:** Isolated Wetland [Partially Isolated]**National Mapping Codes:** ESLF 9227**CONCEPT**

Summary: This fen system is found in the Ozarks region of the United States. Stands occur on the sideslopes of hills in narrow valleys, bases of bluffs, rock ledges, and terraces of streams and rivers, where the soil or substrate is saturated by calcareous groundwater seepage. Soils are moist to wet, mucky peat or mineral, with pH above 6.5, and vary from shallow (0-40 cm) to moderately deep (40-100 cm), depending on natural disturbance and slope. The parent material is a mixture of gravel and dolomite with fragments of deeply weathered bedrock present, or colluvium over bedrock. The bedrock strata are exposed, especially in hanging fens where the slope is greater than 35 degrees. Hydrophytic plants dominate the fen, which varies from mixed grass or sedge fen with complex zonation to more tallgrass prairie species mixed with calciphiles. Fires are possible in some of the larger prairie fens.

Classification Comments: Some fens are typically associated with riparian vegetation. Seeps in the Ozarks are typically acidic to circumneutral and differ substantially in floristics and groundwater chemistry from these alkaline fens.

Similar Ecological Systems:

- Interior Low Plateau Seepage Fen (CES202.346)

Related Concepts:

- Sedge-Shrub Fen (Orzell et al. 1985) Finer
- Streamside Seep-fen (Orzell et al. 1985) Finer

DESCRIPTION

Vegetation: Stands of this small-scale system are typically dominated by primarily wetland obligate species of sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species such as *Impatiens capensis* and *Parnassia grandifolia*.

MEMBERSHIP**Associations:**

- (*Carex interior*, *Carex lurida*) - *Carex leptalea* - *Parnassia grandifolia* - *Rhynchospora capillacea* Herbaceous Vegetation (CEGL002404, G2G3)
- *Carex interior* - *Carex lurida* - *Andropogon gerardii* - *Parnassia grandifolia* Herbaceous Vegetation (CEGL002416, G1G2)

Alliances:

- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)

DISTRIBUTION

Range: This fen community type is found in the Ozarks region of the United States.

Divisions: 202:C**Nations:** US**Subnations:** AR, MO**Map Zones:** 44:C**TNC Ecoregions:** 38:C**SOURCES**

References: Comer et al. 2003, Nelson 1985, Orzell et al. 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722657#references

Description Author: D. Faber-Langendoen, mod. M. Pyne**Version:** 17 Jan 2006**Concept Author:** D. Faber-Langendoen**Stakeholders:** Midwest, Southeast**ClassifResp:** Midwest

ROCKY MOUNTAIN ALPINE-MONTANE WET MEADOW (CES306.812)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Montane [Upper Montane]; Herbaceous; Seepage-Fed Sloping [Mineral]; Depressional [Lakeshore]; Depressional [Pond]; Graminoid

Non-Diagnostic Classifiers: Mesotrophic Water; Saturated Soil; Montane [Montane]; Temperate [Temperate Continental]; Mineral: W/ A-Horizon >10 cm; Mineral: W/ A-Horizon <10 cm; Forb

National Mapping Codes: ESLF 9217

CONCEPT

Summary: These are high-elevation communities found throughout the Rocky Mountains and Intermountain regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from montane to alpine (1000-3600 m). These types occur as large meadows in montane or subalpine valleys, as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this system may be mineral or organic. In either case, soils show typical hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Calamagrostis stricta*, *Caltha leptosepala*, *Cardamine cordifolia*, *Carex illota*, *Carex microptera*, *Carex nigricans*, *Carex scopulorum*, *Carex utriculata*, *Carex vernacula*, *Deschampsia caespitosa*, *Eleocharis quinqueflora*, *Juncus drummondii*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Trifolium parryi*, and *Trollius laxus*. Often alpine dwarf-shrublands, especially those dominated by *Salix*, are immediately adjacent to the wet meadows. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.

Classification Comments: Similar systems to this one include Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998) and Boreal Wet Meadow (CES103.873). Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) occurs to the east of the coastal and Sierran mountains, in the semi-arid interior regions of western North America. Boreal wet meadow systems occur farther north and east in boreal regions where the climatic regime is generally colder than that of the Rockies or Pacific Northwest regions. Floristics of these three systems are somewhat similar, but there are differences related to biogeographic affinities of the species composing the vegetation.

Similar Ecological Systems:

- Rocky Mountain Subalpine-Montane Mesic Meadow (CES306.829)

Related Concepts:

- Alpine Rangeland (410) (Shiflet 1994) Intersecting. Alpine wet meadows are included in this SRM type.
- Tall Forb (409) (Shiflet 1994) Intersecting. Forb-dominated wet meadows are included in this ecological system.
- Tufted Hairgrass - Sedge (313) (Shiflet 1994) Intersecting. Wetter portions of this SRM type overlap with this system.

DESCRIPTION

Environment: Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral, or permanent pools may be present. These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be one meter or more below the surface.

Soils typically possess a high proportion of organic matter, but this may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et. al. 1998). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material of up to 120 cm thick. Soils may exhibit gleying and/or mottling throughout the profile. Wet meadow ecological systems provide important water filtration, flow attenuation, and wildlife habitat functions.

Dynamics: Associations in this ecological system are adapted to soils that may be flooded or saturated throughout the growing season. They may also occur on areas with soils that are only saturated early in the growing season, or intermittently. Typically these associations are tolerant of moderate-intensity ground fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

MEMBERSHIP

Associations:

- *Betula glandulosa* / *Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula glandulosa* / *Carex utriculata* Shrubland (CEGL001079, G4?)
- *Betula glandulosa* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653, G3G4)

- *Calamagrostis canadensis* - *Carex scopulorum* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001560, GUQ)
- *Calamagrostis canadensis* - *Senecio triangularis* Herbaceous Vegetation (CEGL001561, G2Q)
- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Calamagrostis stricta* Herbaceous Vegetation [Provisional] (CEGL002891, GU)
- *Caltha leptosepala* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001956, G2Q)
- *Caltha leptosepala* - *Rhodiola rhodantha* Herbaceous Vegetation (CEGL001957, GNRQ)
- *Caltha leptosepala* Herbaceous Vegetation (CEGL001954, G4)
- *Camassia cusickii* Herbaceous Vegetation (CEGL003440, G2)
- *Cardamine cordifolia* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001958, GU)
- *Cardamine cordifolia* - *Mertensia ciliata* - *Senecio triangularis* Herbaceous Vegetation (CEGL002662, G4)
- *Carex amplifolia* Herbaceous Vegetation (CEGL003427, G3)
- *Carex aperta* Herbaceous Vegetation (CEGL001801, G1?)
- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803, G4)
- *Carex aquatilis* - *Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804, GU)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826, G4)
- *Carex capillaris* - *Polygonum viviparum* Herbaceous Vegetation (CEGL001872, GU)
- *Carex duriuscula* Herbaceous Vegetation (CEGL001874, GUQ)
- *Carex illota* Herbaceous Vegetation (CEGL001876, GUQ)
- *Carex lachenalii* Herbaceous Vegetation (CEGL001871, GU)
- *Carex microglochis* Herbaceous Vegetation (CEGL001877, GU)
- *Carex microptera* Herbaceous Vegetation (CEGL001792, G4)
- *Carex nebrascensis* - *Carex microptera* Herbaceous Vegetation (CEGL001815, G3G4)
- *Carex nebrascensis* - *Catabrosa aquatica* Herbaceous Vegetation (CEGL001814, G1?)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex nebrascensis* Slope Herbaceous Vegetation (CEGL002890, GU)
- *Carex nigricans* - *Juncus drummondii* Herbaceous Vegetation (CEGL001818, GU)
- *Carex nigricans* - *Sibbaldia procumbens* Herbaceous Vegetation (CEGL005824, G4G5)
- *Carex nigricans* Herbaceous Vegetation (CEGL001816, G4)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)
- *Carex praegracilis* - *Carex aquatilis* Herbaceous Vegetation (CEGL001821, G3)
- *Carex praegracilis* Herbaceous Vegetation (CEGL002660, G3G4)
- *Carex pyrenaica* Herbaceous Vegetation (CEGL001860, GU)
- *Carex saxatilis* Herbaceous Vegetation (CEGL001769, G3)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Vegetation (CEGL001865, G3?)
- *Carex scopulorum* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001823, G4)
- *Carex scopulorum* - *Elymus trachycaulus* Herbaceous Vegetation (CEGL001824, GU)
- *Carex scopulorum* Herbaceous Vegetation (CEGL001822, G5)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)
- *Carex spectabilis* - *Arnica X diversifolia* Herbaceous Vegetation (CEGL005867, G3G4)
- *Carex stramineiformis* Herbaceous Vegetation (CEGL001793, G3?)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vernacula* - *Poa fendleriana* Herbaceous Vegetation (CEGL001869, G2G3)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex* spp. Shrubland (CEGL001106, G3?)
- *Dasiphora fruticosa* ssp. *floribunda* / *Deschampsia caespitosa* Shrubland (CEGL001107, G4)
- *Dasiphora fruticosa* ssp. *floribunda* Shrubland [Provisional] (CEGL001105, G5?)
- *Deschampsia caespitosa* - *Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880, G5)
- *Deschampsia caespitosa* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001882, G4)
- *Deschampsia caespitosa* - *Carex douglasii* Herbaceous Vegetation (CEGL001602, G2)
- *Deschampsia caespitosa* - *Carex microptera* Herbaceous Vegetation (CEGL001883, G2G3)
- *Deschampsia caespitosa* - *Carex nebrascensis* Herbaceous Vegetation (CEGL001601, G3?Q)
- *Deschampsia caespitosa* - *Carex* spp. Herbaceous Vegetation (CEGL001603, G4Q)
- *Deschampsia caespitosa* - *Geum rossii* Herbaceous Vegetation (CEGL001884, G5)
- *Deschampsia caespitosa* - *Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885, GU)
- *Deschampsia caespitosa* - *Luzula multiflora* Herbaceous Vegetation (CEGL001886, G2Q)
- *Deschampsia caespitosa* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001887, GU)
- *Deschampsia caespitosa* - *Phleum alpinum* Herbaceous Vegetation (CEGL001888, G3Q)
- *Deschampsia caespitosa* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001889, G5)
- *Deschampsia caespitosa* - *Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881, G2Q)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Eleocharis acicularis* Herbaceous Vegetation (CEGL001832, G4?)

- *Eleocharis palustris* - *Distichlis spicata* Herbaceous Vegetation (CEGL001834, G2G4)
- *Eleocharis palustris* - *Juncus balticus* Herbaceous Vegetation (CEGL001835, G2G4)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Eleocharis quinqueflora* - *Carex scopulorum* Herbaceous Vegetation (CEGL001837, G3G4)
- *Eleocharis quinqueflora* Herbaceous Vegetation (CEGL001836, G4)
- *Eleocharis rostellata* Herbaceous Vegetation (CEGL003428, G3)
- *Equisetum arvense* Herbaceous Vegetation (CEGL003314, G5)
- *Equisetum fluviatile* Herbaceous Vegetation (CEGL002746, G4)
- *Equisetum laevigatum* Herbaceous Vegetation (CEGL002241, GNR)
- *Geum rossii* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001967, G4G5)
- *Geum rossii* - *Sibbaldia procumbens* Herbaceous Vegetation (CEGL001969, GU)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Glyceria grandis* Herbaceous Vegetation (CEGL003429, G2?)
- *Glyceria striata* Herbaceous Vegetation (CEGL000219, G3)
- *Heracleum maximum* - *Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940, G4)
- *Heracleum maximum* Herbaceous Vegetation (CEGL005857, G3G4)
- *Juncus balticus* - *Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Juncus drummondii* - *Antennaria lanata* Herbaceous Vegetation (CEGL001904, G3?)
- *Juncus drummondii* - *Carex* spp. Herbaceous Vegetation (CEGL001905, G4)
- *Juncus parryi* - *Erigeron ursinus* Herbaceous Vegetation (CEGL001906, G2?)
- *Juncus parryi* / *Sibbaldia procumbens* Herbaceous Vegetation (CEGL005871, G3G4)
- *Phippsia algida* Herbaceous Vegetation (CEGL002892, GU)
- *Phleum alpinum* - *Carex aquatilis* Herbaceous Vegetation (CEGL001921, G2Q)
- *Phleum alpinum* - *Carex microptera* Herbaceous Vegetation (CEGL001922, G2Q)
- *Poa glauca* Herbaceous Vegetation (CEGL001926, GU)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Primula parryi* Herbaceous Vegetation (CEGL001983, GNR)
- *Rhodiola rhodantha* Herbaceous Vegetation (CEGL001931, GU)
- *Rorippa alpina* Herbaceous Vegetation (CEGL002009, GU)
- *Saxifraga odontoloma* Herbaceous Vegetation (CEGL001985, GU)
- *Senecio triangularis* - *Mimulus guttatus* Herbaceous Vegetation (CEGL001988, G3?)
- *Senecio triangularis* - *Veratrum californicum* Herbaceous Vegetation (CEGL001989, G4)
- *Senecio triangularis* Herbaceous Vegetation (CEGL001987, G5?)
- *Trichophorum caespitosum* - *Carex livida* Herbaceous Vegetation (CEGL001842, G1)
- *Trollius laxus* - *Parnassia fimbriata* Herbaceous Vegetation (CEGL005858, G3?)
- *Valeriana sitchensis* - *Veratrum viride* Herbaceous Vegetation (CEGL001998, G4)

Alliances:

- *Betula glandulosa* Seasonally Flooded Shrubland Alliance (A.995)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Calamagrostis stricta* Temporarily Flooded Herbaceous Alliance (A.2594)
- *Caltha leptosepala* Saturated Herbaceous Alliance (A.1698)
- *Camassia (cusickii, quamash)* Seasonally Flooded Herbaceous Alliance (A.2587)
- *Cardamine cordifolia* Saturated Herbaceous Alliance (A.1699)
- *Carex (lachenalii, capillaris, illota)* Seasonally Flooded Herbaceous Alliance (A.1424)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex amplifolia* Saturated Herbaceous Alliance (A.2584)
- *Carex aperta* Saturated Herbaceous Alliance (A.1468)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex aquatilis var. dives* Seasonally Flooded Herbaceous Alliance (A.1412)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Carex microglochis* Saturated Herbaceous Alliance (A.1470)
- *Carex microptera* Seasonally Flooded Herbaceous Alliance (A.1411)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex nigricans* Seasonally Flooded Herbaceous Alliance (A.1418)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex praegracilis* Seasonally Flooded Herbaceous Alliance (A.1419)
- *Carex pyrenaica* Herbaceous Alliance (A.1320)
- *Carex saxatilis* Temporarily Flooded Herbaceous Alliance (A.1357)
- *Carex scirpoidea ssp. pseudoscirpoidea* Herbaceous Alliance (A.1306)
- *Carex scopulorum* Seasonally Flooded Herbaceous Alliance (A.1420)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)

- *Carex spectabilis* Herbaceous Alliance (A.1300)
- *Carex stramineiformis* Herbaceous Alliance (A.1314)
- *Carex vernacula* Herbaceous Alliance (A.1309)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance (A.958)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Eleocharis (quinqueflora, rostellata)* Saturated Herbaceous Alliance (A.1423)
- *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance (A.1421)
- *Equisetum (arvense, variegatum, hyemale)* Semipermanently Flooded Herbaceous Alliance (A.3539)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Equisetum laevigatum* Semipermanently Flooded Herbaceous Alliance (A.2648)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Glyceria (grandis, striata)* Seasonally Flooded Herbaceous Alliance (A.2578)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Heracleum maximum* Temporarily Flooded Herbaceous Alliance (A.1661)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Juncus drummondii* Herbaceous Alliance (A.1324)
- *Juncus parryi* Herbaceous Alliance (A.1325)
- *Phippisia algida* Saturated Herbaceous Alliance (A.2595)
- *Pheum alpinum* Temporarily Flooded Herbaceous Alliance (A.1360)
- *Poa glauca* Temporarily Flooded Herbaceous Alliance (A.1361)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Primula parryi* Temporarily Flooded Herbaceous Alliance (A.1665)
- *Rhodiola rhodantha* Temporarily Flooded Herbaceous Alliance (A.1659)
- *Rorippa alpina* Saturated Herbaceous Alliance (A.1700)
- *Saxifraga odontoloma* Temporarily Flooded Herbaceous Alliance (A.1666)
- *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance (A.1680)
- *Senecio triangularis* Temporarily Flooded Herbaceous Alliance (A.1667)
- *Trichophorum caespitosum* Semipermanently Flooded Herbaceous Alliance (A.1446)
- *Trollius laxus* Saturated Herbaceous Alliance (A.2631)
- *Valeriana sitchensis* Herbaceous Alliance (A.1611)

DISTRIBUTION

Range: This system is found throughout the Rocky Mountains and Intermountain West regions, ranging in elevation from montane to alpine (1000-3600 m).

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Map Zones: 9:C, 10:C, 12:P, 13:C, 15:?, 16:C, 17:P, 18:P, 19:C, 21:C, 22:P, 23:C, 24:P, 25:C, 27:C, 28:C, 29:P

USFS Ecomap Regions: 313A:CP, 313B:CC, 313D:C?, 315A:C?, 315B:C?, 315H:CC, 321A:??, 322A:CC, 331H:CP, 331I:CP, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, 341G:CP, 342B:CC, 342C:CC, 342D:C?, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342J:CP, M242D:PP, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:PP, M341A:CP, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Cooper 1986b, Crowe and Clausnitzer 1997, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Meidinger and Pojar 1991, Nachlinger 1985, Nachlinger et al. 2001, Neely et al. 2001, Padgett et al. 1988a, Reed 1988, Sanderson and Kettler 1996, Tuhy et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722861#references

Description Author: NatureServe Western Ecology Team

Version: 14 Dec 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

ROCKY MOUNTAIN SUBALPINE-MONTANE FEN (CES306.831)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Extreme (Mineral) Rich and Iron-Rich; Saturated Soil; Moss/Lichen (Nonvascular); Seepage-Fed Sloping [Peaty]; Organic Peat (>40 cm); Graminoid; Bryophyte

Non-Diagnostic Classifiers: Shallow (<15 cm) Water; Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Temperate [Temperate Continental]; Depressional [Pond]

National Mapping Codes: ESLF 9234

CONCEPT

Summary: This system occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. This system includes extreme rich fens and iron fens, both being quite rare. Fens form at low points in the landscape or near slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, the extreme rich and iron fens have distinct soil and water chemistry, with high levels of one or more minerals such as calcium, magnesium, or iron. These fens usually occur as a mosaic of several plant associations dominated by *Carex aquatilis*, *Carex limosa*, *Carex lasiocarpa*, *Betula glandulosa*, *Kobresia myosuroides*, *Kobresia simpliciuscula*, and *Trichophorum pumilum* (= *Scirpus pumilus*). *Sphagnum* spp. (peatmoss) is indicative of iron fens. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests.

Classification Comments: Need to clarify this system in relation to Boreal Fen system. In Montana, small fens are found in scattered locations in the plains and the small isolated mountain ranges of the central part of the state; these are included here.

Related Concepts:

- Tufted clubrush - Star moss (ESSFdc2/Wf11) (Steen and Coupe 1997) Intersecting

DESCRIPTION

Environment: The montane fen ecological system is a small-patch system comprised of mountain wetlands that support a unique ecology of rare plants not found in other types of wetlands. These fens are confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. Fens form at low points in the landscape or near slopes where groundwater intercepts the soil surface (Rondeau 2001). Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels lead to accumulations of organic material (Rondeau 2001).

Within the region this system occurs at montane elevations ranging from 2440-3500 m (8000-11480 feet) and is characterized by mosaics of plant communities. These communities typically occur in seeps and wet sub-irrigated meadows in narrow to broad valley bottoms. Surface topography is typically smooth to concave with slopes ranging from 0-10%. The soils within this system are organic Histosols with 40 cm or more of organic material. These Histosols range in texture from clayey-skeletal to loamy-skeletal and fine-loams. They may occur on a variety of parent materials including alluvial and colluvial deposits of granitic and gneiss origins (NatureServe 2001). The pH of wetlands within this system is generally between 4.8 and 6.0-7.0.

Dynamics: Mountain fens act as natural filters cleaning ground and surface water. Fens also act as sponges by absorbing heavy precipitation, slowly releasing it downstream, minimizing erosion and recharging groundwater systems (Windell et al. 1986). The persistent groundwater and cold temperatures allow organic matter to accumulate (forming peat) which allows classification of wetlands within this system as fens. Fens produce peat that accumulates at the rate of 8 to 11 inches per 1000 years, making peatlands a repository of 10,000 years of post glacial history (Windell et al. 1986).

MEMBERSHIP

Associations:

- *Betula glandulosa* / *Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula glandulosa* / *Sphagnum* spp. Shrubland (CEGL002899, GU)
- *Carex aquatilis* - *Sphagnum* spp. Herbaceous Vegetation (CEGL002898, G2G3)
- *Carex buxbaumii* Herbaceous Vegetation (CEGL001806, G3)
- *Carex lasiocarpa* Herbaceous Vegetation (CEGL001810, G4?)
- *Carex limosa* Herbaceous Vegetation (CEGL001811, G2)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex utriculata* Perched Wetland Herbaceous Vegetation (CEGL002922, G3?)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation (CEGL001831, G3)
- *Kobresia myosuroides* - *Thalictrum alpinum* Herbaceous Vegetation (CEGL002900, G2)
- *Kobresia simpliciuscula* - *Trichophorum pumilum* Saturated Herbaceous Vegetation (CEGL002901, G2)

- *Ledum glandulosum* Shrubland [Provisional] (CEGL002739, G4)

Alliances:

- *Betula glandulosa* Seasonally Flooded Shrubland Alliance (A.995)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex buxbaumii* Seasonally Flooded Herbaceous Alliance (A.1413)
- *Carex lasiocarpa* Seasonally Flooded Herbaceous Alliance (A.1415)
- *Carex limosa* Seasonally Flooded Herbaceous Alliance (A.1416)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Kobresia myosuroides* - (*Kobresia simpliciuscula*) Saturated Herbaceous Alliance (A.2504)
- *Ledum glandulosum* Saturated Shrubland Alliance (A.2514)

DISTRIBUTION

Range: This system occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. In Montana, small fens included here are found in scattered locations in the plains and the small isolated mountain ranges of the central part of the state. Similarly, recent inventory in Wyoming has revealed the occurrence of small fens throughout the mountain ranges of that state.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NV, OR, UT, WA, WY

Map Zones: 9:P, 10:C, 12:?, 16:C, 17:?, 19:C, 20:C, 21:C, 22:?, 23:?, 24:?, 25:?, 27:?, 28:C, 29:C

USFS Ecomap Regions: 331J:CC, 331N:C?, M331A:CC, M331B:CC, M331D:CC, M331E:CP, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CP, M332B:CP, M332D:CC, M332E:CP, M332F:CP, M332G:CP, M333A:PP, M333B:PP, M333C:PP, M333D:PP

TNC Ecoregions: 7:C, 8:P, 9:P, 11:P, 18:C, 19:P, 20:C, 21:P, 68:P

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper 1986b, Cooper and Sanderson 1997, Neely et al. 2001, Rondeau 2001, Windell et al. 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722842#references

Description Author: NatureServe Western Ecology Team

Version: 23 Jan 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

SOUTH COASTAL CALIFORNIA VERNAL POOL (CES206.950)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Impermeable Layer; 1-29-day hydroperiod; Vernal Pool Mosaic; Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Forb

Non-Diagnostic Classifiers: Shallow (<15 cm) Water; Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Depressional; Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 9249

CONCEPT

Summary: These systems are shallow ephemeral water bodies found in small depressions that range from Baja Norte, Mexico, north through Santa Barbara County, California. They are found from sea level to 2600 m (7800 feet), and concomitant temperature and moisture ranges, but floristically distinct from more northerly distributed vernal pool types. These vernal pool systems are found on flat-topped marine terraces with Si-Fe cemented hardpans, volcanic bedrock, and acidic intrusive rock underlying thin soils.

Characteristic plant species include *Trichostema austromontanum*, *Pogogyne abramsii*, *Eryngium aristulatum*, *Orcuttia californica*, *Pogogyne nudiuscula*, *Navarretia fossalis*, *Hemizonia parryi ssp. australis*, and *Lasthenia glabrata ssp. coulteri*.

Related Concepts:

- Wetlands (217) (Shiflet 1994) Broader

DISTRIBUTION

Range: Baja Norte, Mexico, north through Santa Barbara County, California.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C

USFS Ecomap Regions: 261B:CC

TNC Ecoregions: 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722731#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

SOUTH FLORIDA DEPRESSION POND SHORE (CES411.054)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9228

CONCEPT

Summary: This system occupies shallow depressional wetlands in southern and south-central Florida. As currently defined, this system includes a variety of wetlands occupying somewhat different environments. Included for now in this concept are isolated drainages or seasonal ponds as well as solution holes (may have only subsurface or historic water presence), and possibly the shores of large natural lakes. Examples found in these different environments tend to have obviously different landscape contexts, and often different floristics. For instance, examples embedded in Florida Dry Prairie (CES203.380) and/or South Florida Pine Flatwoods (CES411.381) tend to display distinct vegetation zones (Winchester et al. 1985, Huffman and Judd 1998). In contrast, solution holes embedded in South Florida Pine Rockland (CES411.367) and/or South Florida Hardwood Hammock (CES411.287) are small (may be less than 1 to 15 m across and less than 1 to 3+ m deep) and therefore tend to lack zonal vegetation (M. Fellows pers. comm.). More detailed information is needed on the range of vegetation present across this system. Huffman and Judd (1998) provide information on some examples of this system in southwestern Florida.

Classification Comments: Examples of South Florida Slough, Gator Hole, and Willow Head (CES411.485) are generally larger and deeper water wetlands, usually connected with distinct drainageways.

Similar Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Depression Marsh (FNAI 1990) Broader

DESCRIPTION

Vegetation: According to Huffman and Judd (1998), some examples of this system tend to display distinct vegetation zones [see also Winchester et al. (1985)]. In these cases, *Aristida palustris* is characteristic and possibly *Hypericum fasciculatum*, depending upon fire history. A large number of other wetland species may be present, such as *Xyris jupicai*, *Rhexia cubensis*, *Rhynchospora filifolia*, and others. Deeper zones dominated by *Pontederia cordata*, as well as "heads" of woody species (*Cephalanthus occidentalis*, *Salix caroliniana*, *Persea palustris*), also may be present. More floristic information is needed from examples of this system found in other parts of south Florida.

MEMBERSHIP

Associations:

- *Eleocharis cellulosa* Herbaceous Vegetation (CEGL003972, G3?)
- *Eleocharis interstincta* - *Pontederia cordata* - *Crinum americanum* Herbaceous Vegetation (CEGL003975, G2G3)
- *Panicum hemitomon* Tropical Herbaceous Vegetation (CEGL003980, G3?)
- *Schoenoplectus tabernaemontani* Tropical Herbaceous Vegetation (CEGL003986, G3G5)
- *Typha domingensis* - *Pontederia cordata* Herbaceous Vegetation (CEGL003988, G3?)
- *Zizaniopsis miliacea* Subtropical Herbaceous Vegetation (CEGL003989, G2G4Q)

Alliances:

- *Eleocharis cellulosa* - (*Rhynchospora tracyi*) Seasonally Flooded Herbaceous Alliance (A.1158)
- *Eleocharis interstincta* - *Sagittaria lancifolia* Seasonally Flooded Herbaceous Alliance (A.1159)
- *Panicum hemitomon* Seasonally Flooded Tropical Herbaceous Alliance (A.1162)
- *Schoenoplectus tabernaemontani* Semipermanently Flooded Tropical Herbaceous Alliance (A.1173)
- *Typha domingensis* Semipermanently Flooded Tropical Herbaceous Alliance (A.1175)
- *Zizaniopsis miliacea* Semipermanently Flooded Subtropical Herbaceous Alliance (A.1176)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Florida Dry Prairie (CES203.380)
- South Florida Hardwood Hammock (CES411.287)
- South Florida Pine Flatwoods (CES411.381)
- South Florida Pine Rockland (CES411.367)

Adjacent Ecological System Comments: May be embedded in Florida Dry Prairie (CES203.380), South Florida Pine Flatwoods (CES411.381), South Florida Pine Rockland (CES411.367) and/or South Florida Hardwood Hammock (CES411.287).

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Fellows pers. comm., Huffman and Judd 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722656#references

Description Author: R. Evans

Version: 25 Aug 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1483 SOUTH FLORIDA EVERGLADES SAWGRASS MARSH (CES411.286)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Extensive Wet Flat; Graminoid

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2483; ESLF 9204; ESP 1483

CONCEPT

Summary: This marsh system was a dominant type throughout much of the Everglades region of southeastern Florida. It consists largely of herbaceous marsh vegetation across a range of soil and hydrologic conditions, but generally falls within conditions outlined by Duever et al. (1986), i.e., hydroperiod of 225-275 days per year, maximum wet-season water level of 40 cm., and occurrence on peat soils. Several individual marsh community associations have been recognized based on species composition, structure, and aspect. Variations are largely due to the interrelated effects of fire, soils, and hydroperiod. Sawgrass beds or "glades" may have been the single most extensive component of this system (Hilsenbeck et al. 1979), and large areas may have the appearance of nearly monotypic stands of *Cladium mariscus ssp. jamaicense*. However, local variation in composition and stature are also often apparent. For example, two broad aspect types of *Cladium* marsh are often recognized based on density and/or height (Kushlan 1990, Gunderson and Loftus 1993) with denser and taller stands typically occurring on higher topographic positions and deeper organic soils, while sparser, shorter stands occur in lower topography on shallower soils. In addition, other marsh types are also interfingering in the sawgrass matrix where wetter depressions are found and/or where fires have burned away peat soils.

Classification Comments: The term "wet prairie" has often been used to describe a variety of marsh types which are included in the concept of this system. We follow the definition of Duever et al. (1986) in which prairies occupy mineral soils and marshes occupy peats. The community components of these systems are largely based on Davis (1943) and Hilsenbeck et al. (1979). Open and emergent marshes of the region are generally covered by South Florida Slough, Gator Hole, and Willow Head (CES411.485); these are generally small patches included in the sawgrass matrix.

Similar Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)
- South Florida Wet Marl Prairie (CES411.370)

Related Concepts:

- Swale (FNAI 1990) Equivalent

DESCRIPTION

Environment: A range of conditions are present. Soils vary from shallow marl to relatively deep peat. Hydroperiod ranges from 5-12 months. The effect of fire is influenced by both factors and affects them in turn. For example, peat accumulates in the absence of fire, but under certain conditions, fires may burn away accumulated sawgrass peat resulting in a thin, residual, marly soil and relative increase of effective water depth (resulting in community change).

Vegetation: Marsh communities present in this system include tall and short-statured *Cladium mariscus ssp. jamaicense*, spikerush - beaksedge flats, and maidencane flats. In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

Dynamics: In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

MEMBERSHIP

Associations:

- Algal Periphyton Nonvascular Vegetation (CEGL004390, G3?)
- *Cladium mariscus ssp. jamaicense* - *Bacopa caroliniana* Herbaceous Vegetation (CEGL003969, G3)
- *Cladium mariscus ssp. jamaicense* / Algal Periphyton Herbaceous Vegetation (CEGL003970, G2?)
- *Eleocharis cellulosa* - *Rhynchospora tracyi* / (Algal Periphyton) Herbaceous Vegetation (CEGL003973, G2G3)
- *Panicum hemitomon* Tropical Herbaceous Vegetation (CEGL003980, G3?)
- *Salix caroliniana* / *Bacopa caroliniana* - *Blechnum serrulatum* Forest (CEGL007409, G2?)

Alliances:

- Algal Periphyton Seasonally Flooded Nonvascular Alliance (A.1830)
- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Tropical Herbaceous Alliance (A.1157)
- *Eleocharis cellulosa* - (*Rhynchospora tracyi*) Seasonally Flooded Herbaceous Alliance (A.1158)
- *Panicum hemitomon* Seasonally Flooded Tropical Herbaceous Alliance (A.1162)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

DISTRIBUTION

Range: This system is endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Davis 1943, Duever et al. 1986, Gunderson and Loftus 1993, Hilsenbeck et al. 1979, Kushlan 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723202#references

Description Author: R. Evans, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH FLORIDA SLOUGH, GATOR HOLE, AND WILLOW HEAD (CES411.485)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: >180-day hydroperiod; Woody-Herbaceous; Herbaceous; Depressional [Peaty]

National Mapping Codes: ESLF 9407

CONCEPT

Summary: This system includes a series of wetlands of southern Florida, ranging in physiognomy from open and herbaceous-dominated to tree-dominated patches, including nearly monospecific stands of *Salix caroliniana* (Davis 1943, Loveless 1959, Craighead 1971). These wetlands hold water for much of the year and have some of the longest hydroperiods (8-12 months) in a region characterized by wetlands. Most are maintained, at least historically, by American alligators. Alligators were such a dominant disturbance force in many plant communities of south Florida that their role has been compared with that of bison in the prairies (Craighead 1971). Through constant movement, they create numerous small pools and ponds (analogous to buffalo wallows) as well as trails to and from these pools through sawgrass marshes. These paths eventually widen and deepen into creeks. Many of these small freshwater creeks have been invaded by mangroves and hardwoods, including *Salix caroliniana*, in the absence of fire and with decreases in alligator populations (Craighead 1971). Some emergent wetlands included within the concept of this system may also have originated from soil and topographic changes in former sawgrass marshes following severe fires that consume organic substrate and decrease soil elevation (Gunderson and Loope 1982b). One component of this system ("heads" may originate as circular or oval-shaped solution holes or basins, being maintained and possibly enhanced by the alligator activity. Without this activity, there would be a tendency for the hole or basin to fill with organic material and succeed to other systems. Soils are mucky peats. In addition, *Salix caroliniana* seeds are readily dispersed by wind and may rapidly colonize wet depressions and disturbed areas. In the absence of fire and disturbance, these areas may remain in a forested condition. Otherwise, they would cycle between different physiognomic states, including sawgrass marsh.

Similar Ecological Systems:

- Florida River Floodplain Marsh (CES203.055)
- Floridian Highlands Freshwater Marsh (CES203.077)
- South Florida Depression Pondshore (CES411.054)
- South Florida Everglades Sawgrass Marsh (CES411.286)
- South Florida Pond-apple/Popash Slough (CES411.486)

Related Concepts:

- Slough (FNAI 1990) Broader

DESCRIPTION

Environment: Examples of this system may originate as solution holes in sawgrass marsh, with a longer hydroperiod, but expand and contract in size and extent with disturbance, including fire and American alligator activity. Some examples are directly caused by alligator activity and/or the effect of severe fire in sawgrass marshes, South Florida Everglades Sawgrass Marsh (CES411.286) (Craighead 1971, Hilsenbeck et al. 1979). At least some examples attributed to this system occupy "marshes" with long hydroperiods (8-12 months) and deep organic soils (Hilsenbeck et al. 1979).

Vegetation: A number of discrete communities may be recognized as part of this system. Two of the most common types can be considered cattail marshes and flag - pickerelweed communities (Hilsenbeck et al. 1979). Also included are nearly monospecific stands of *Salix caroliniana* (Davis 1943, Loveless 1959, Craighead 1971) called "willow heads."

Dynamics: The American Alligators was a dominant force that helped maintain this system, at least historically. Their role has been compared with that of bison in the prairies (Craighead 1971). Through constant movement they create numerous small pools and ponds (analogous to buffalo wallows) as well as trails to and from these pools through sawgrass marshes. These paths eventually widen and deepen into creeks. Many of these small freshwater creeks have been invaded by mangroves and hardwoods in the absence of fire and decrease in Alligator populations (Craighead 1971). Other examples of this system may have originated following severe fires in former sawgrass marshes (Gunderson and Loope 1982).

MEMBERSHIP

Associations:

- *Najas guadalupensis* - *Ceratophyllum demersum* - *Utricularia inflata* Herbaceous Vegetation (CEGL004313, G2G4)
- *Nuphar lutea* ssp. *advena* / *Chara* sp. Tropical Herbaceous Vegetation (CEGL004315, G2G3)
- *Nymphaea odorata* Tropical Herbaceous Vegetation (CEGL004316, G4?)
- *Pistia stratiotes* Herbaceous Vegetation (CEGL004902, G4?)
- *Pontederia cordata* Tropical Herbaceous Vegetation (CEGL004261, G3G4)
- *Sabal palmetto* - *Quercus virginiana* - *Ulmus americana* - *Ficus aurea* / *Acrostichum danaeifolium* - *Nephrolepis exaltata* Forest (CEGL004409, G2?)

- *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004262, G3?Q)
- *Salix caroliniana* / *Bacopa caroliniana* - *Blechnum serrulatum* Forest (CEGL007409, G2?)
- *Schoenoplectus tabernaemontani* Tropical Herbaceous Vegetation (CEGL003986, G3G5)
- *Thalia geniculata* - *Pontederia cordata* Herbaceous Vegetation (CEGL004264, G2)
- *Typha domingensis* - *Pontederia cordata* Herbaceous Vegetation (CEGL003988, G3?)
- *Zizaniopsis miliacea* Subtropical Herbaceous Vegetation (CEGL003989, G2G4Q)

Alliances:

- *Najas guadalupensis* - *Ceratophyllum demersum* - *Utricularia inflata* Permanently Flooded Herbaceous Alliance (A.1720)
- *Nuphar lutea* Permanently Flooded Tropical Herbaceous Alliance (A.1723)
- *Nymphaea odorata* Permanently Flooded Tropical Herbaceous Alliance (A.1725)
- *Pistia stratiotes* Permanently Flooded Herbaceous Alliance (A.1727)
- *Pontederia cordata* Semipermanently Flooded Tropical Herbaceous Alliance (A.1587)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Saturated Forest Alliance (A.380)
- *Sagittaria lancifolia* Semipermanently Flooded Herbaceous Alliance (A.1588)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)
- *Schoenoplectus tabernaemontani* Semipermanently Flooded Tropical Herbaceous Alliance (A.1173)
- *Thalia geniculata* Semipermanently Flooded Herbaceous Alliance (A.1589)
- *Typha domingensis* Semipermanently Flooded Tropical Herbaceous Alliance (A.1175)
- *Zizaniopsis miliacea* Semipermanently Flooded Subtropical Herbaceous Alliance (A.1176)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Everglades Sawgrass Marsh (CES411.286)

Adjacent Ecological System Comments: This system is generally embedded in a matrix of South Florida Everglades Sawgrass Marsh (CES411.286).

DISTRIBUTION

Range: This system is endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Craighead 1971, Davis 1943, Gunderson and Loope 1982b, Hilsenbeck et al. 1979, Loveless 1959, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723101#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1484 SOUTH FLORIDA WET MARL PRAIRIE (CES411.370)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Graminoid

Non-Diagnostic Classifiers: Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2484; ESLF 9205; ESP 1484

CONCEPT

Summary: This system includes marl prairies of the southern Florida Everglades region and related vegetation of the Florida Keys. This system occurs only on shallower soils with bedrock close to the surface (Gunderson and Loftus 1993). Composition and variability in this system is heavily influenced by hydrology, with the predominant community types occurring on seasonally flooded (3-7 months per year) soils; with diminished hydroperiod species composition changes (Hilsenbeck et al. 1979). Possibly the most unique vegetational component are small-patch communities found on elevated areas of oolitic rocks referred to as pinnacle rock (Gunderson and Loftus 1993) or table rock (Hilsenbeck et al. 1979). This system also includes embedded solution holes (depressions formed from limestone collapse).

Classification Comments: Plant community components have been variously and often confusingly described. For example, the term wet prairie has often been used to describe a variety of marsh types which are NOT included in the concept of this system [see South Florida Everglades Sawgrass Marsh (CES411.286)]. We follow the definition of Duever et al. (1986) in which prairies occupy mineral soils and marshes occupy peats.

Similar Ecological Systems:

- South Florida Everglades Sawgrass Marsh (CES411.286)

Related Concepts:

- Marl Prairie (FNAI 1990) Broader

MEMBERSHIP

Associations:

- *Croton linearis* - *Morinda umbellata* / *Sporobolus* spp. - *Panicum* spp. Shrub Herbaceous Vegetation (CEGL003999, G1)
- *Muhlenbergia filipes* - *Andropogon glomeratus* var. *pumilus* - *Saccharum giganteum* Herbaceous Vegetation (CEGL003977, GNA)
- *Muhlenbergia filipes* - *Rhynchospora microcarpa* - *Centella erecta* Herbaceous Vegetation (CEGL003978, G2)
- *Schizachyrium rhizomatum* - *Aristida purpurascens* var. *tenuispica* - *Eragrostis spectabilis* Herbaceous Vegetation (CEGL003962, G1)
- *Schoenus nigricans* Herbaceous Vegetation (CEGL003984, G2?)

Alliances:

- *Muhlenbergia filipes* Seasonally Flooded Tropical Herbaceous Alliance (A.1161)
- *Schizachyrium rhizomatum* Herbaceous Alliance (A.1150)
- *Schoenus nigricans* Seasonally Flooded Herbaceous Alliance (A.1165)
- *Sporobolus* spp. - *Panicum* spp. Shrub Herbaceous Alliance (A.1184)

DISTRIBUTION

Range: Southern Florida Everglades region and related vegetation of the Florida Keys.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 411A:CC

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Duever et al. 1986, Gunderson and Loftus 1993, Hilsenbeck et al. 1979

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723146#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHEASTERN COASTAL PLAIN INTERDUNAL WETLAND (CES203.258)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional; Coast

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9257

CONCEPT

Summary: This system encompasses the wettest dune swales and basins on barrier islands and coastal areas, supporting pond or marsh-like vegetation, from the Coastal Plain of Texas to southern Virginia. Most examples are permanently or semipermanently flooded with freshwater but are affected by salt spray or overwash during periodic storm events. It is broadly defined in terms of floristic composition and is wide-ranging throughout the southeastern Coastal Plain of the United States.

Classification Comments: This system is currently defined with a much broader geographic range than most other coastal systems in the Southeast. The extreme variability within even a limited geographic range limits the ability to find broader vegetational patterns. Examples may vary regionally with regard to the amount of wind or salt spray and the texture of the sand. The northern end of the range is not clearly defined.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)--(the primary range of which is north of this system) may have small interdunal swales embedded within it.
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Related Concepts:

- Coastal Interdunal Swale (FNAI 1990) Intersecting

DESCRIPTION

Environment: Occurs on barrier islands and similar immediate coastal areas, in dune swales or other basins. The ponds have standing water well into the growing season, and most are permanently flooded. The water is from rainfall or the local water table and is fresh, except perhaps during storm events that produce overwash. Soils are sand, sometimes with a thin layer of muck accumulated in the pond.

Vegetation: Vegetation is characterized by emergent or drawdown wetland plants, often tall graminoids. Vegetation varies substantially from one example to the next.

Dynamics: This system occurs in a geologically dynamic environment, where wind and waves may change landforms quickly. However, ponds usually occur in stable portions of islands, where they may last for decades. Salt spray, salt overwash, and heavy rainfall from storms may affect component communities, limiting vegetation to species that are somewhat salt-tolerant.

MEMBERSHIP

Associations:

- (*Morella cerifera*) - *Panicum virgatum* - *Spartina patens* Herbaceous Vegetation (CEGL004129, G2G4)
- (*Stillingia aquatica*) / *Panicum tenerum* - *Dichanthelium erectifolium* Herbaceous Vegetation (CEGL004954, G2?)
- *Carex hyalinolepis* Seasonally Flooded Herbaceous Vegetation (CEGL004724, G1G3)
- *Cladium mariscus ssp. jamaicense* - *Woodwardia virginica* Herbaceous Vegetation (CEGL004949, G2?)
- *Eleocharis elongata* - *Panicum tenerum* - *Nymphaea odorata* Herbaceous Vegetation (CEGL004961, G2?)
- *Fimbristylis castanea* - *Paspalum distichum* Herbaceous Vegetation (CEGL004110, G3)
- *Fimbristylis castanea* - *Schoenoplectus pungens* Seasonally Flooded Herbaceous Vegetation (CEGL003790, GNR)
- *Fuirena scirpoidea* - *Fuirena longa* - *Rhynchospora microcarpa* - *Rhynchospora divergens* Herbaceous Vegetation (CEGL004952, G2)
- *Hypericum reductum* - *Licania michauxii* / *Andropogon capillipes* - *Polygonella gracilis* - *Xyris caroliniana* Dwarf-shrubland (CEGL003953, G2)
- *Leptochloa fusca ssp. fascicularis* - *Sesuvium maritimum* Herbaceous Vegetation (CEGL004125, G1Q)
- *Panicum hemitomon* - (*Cladium mariscus ssp. jamaicense*, *Muhlenbergia filipes*) Herbaceous Vegetation (CEGL007716, G2G3)
- *Paspalum vaginatum* Herbaceous Vegetation (CEGL004114, G3G4)
- *Spartina bakeri* - *Muhlenbergia filipes* - *Andropogon glomeratus* - *Rhynchospora colorata* Herbaceous Vegetation (CEGL004511, G3?)
- *Spartina patens* - *Fimbristylis (caroliniana, castanea)* - (*Panicum virgatum*) Herbaceous Vegetation (CEGL007836, G2G3)
- *Typha domingensis* - *Setaria magna* Herbaceous Vegetation (CEGL004138, G2G3)
- *Typha domingensis* Seasonally Flooded Gulf Coastal Plain Herbaceous Vegetation (CEGL004137, G3?)

Alliances:

- *Carex hyalinolepis* Seasonally Flooded Herbaceous Alliance (A.1366)

- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Dichanthelium (erectifolium, wrightianum) - Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Eleocharis (elongata, equisetoides) - Rhynchospora tracyi* Semipermanently Flooded Herbaceous Alliance (A.1428)
- *Fimbristylis castanea - Schoenoplectus pungens* Seasonally Flooded Herbaceous Alliance (A.1372)
- *Fuirena scirpoidea - Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Hypericum reductum* Temporarily Flooded Dwarf-shrubland Alliance (A.1088)
- *Leptochloa fusca ssp. fascicularis* Seasonally Flooded Herbaceous Alliance (A.1377)
- *Panicum hemitomom* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Paspalum vaginatum* Temporarily Flooded Herbaceous Alliance (A.1344)
- *Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Typha domingensis* Seasonally Flooded Temperate Herbaceous Alliance (A.1392)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch.

Size: Occurs as small patches, with most individual ponds an acre or less in size. Often ponds will occur in complexes of up to a dozen.

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)

Adjacent Ecological System Comments: Surrounded by maritime forest or maritime grassland systems.

DISTRIBUTION

Range: Ranges along the Atlantic and Gulf coasts, from southern Texas to southern Virginia. It ranges into central and southern Florida as well.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS, NC, SC, TX, VA

Map Zones: 36:C, 37:C, 55:C, 56:C, 58:C, 60:C, 99:C

USFS Ecomap Regions: 232C:CC, 232D:CC, 232E:CC, 232G:CC, 232H:CP, 232I:CC, 232L:CC, 255D:CC, 315E:CC, 411A:CC

TNC Ecoregions: 31:C, 53:C, 54:?, 55:?, 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723228#references

Description Author: M. Schafale and R. Evans

Version: 05 May 2008

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN SEEPAGE WETLAND (CES202.317)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9259

CONCEPT

Summary: This system consists of seepage-fed wetlands in the southern Appalachians on gentle slopes, with substantial seepage flow. Vegetation is variable, both within and among examples, but lacks vegetation characteristic of bogs or floodplains. This is a small-patch system occurring over a wide elevational range, nearly to the highest peaks, but is generally lacking from flat valley bottoms.

Classification Comments: This system is fairly heterogeneous, covering a broad range of environments and vegetation, but without apparent breaks. At one extreme, the system contains rich, low-elevation, forb-dominated seeps closely related floristically to cove forests; at the other extreme, it contains acidic, sedge- and moss-dominated, bog-like, high-elevation seeps. This system is distinguished from Southern and Central Appalachian Bog and Fen (CES202.300) by occurrence in sloping settings rather than flat valley bottoms, with more rapid flow of water, and by lack of dominance by the characteristic bog or fen flora (though some of it may be present). The only other systems with wetland systems within its range, floodplains and upland pools, are more distinct floristically as well as associated with very different landforms.

Similar Ecological Systems:

- High Allegheny Wetland (CES202.069)
- North-Central Appalachian Seepage Fen (CES202.607)
- Piedmont Seepage Wetland (CES202.298)
- Southern and Central Appalachian Bog and Fen (CES202.300)

DESCRIPTION

Environment: This system occurs in small patches where seepage creates saturated soil conditions permanently or seasonally. Wetness may vary substantially over short distances in response to amounts of seepage, flow, and pooling by topography or impermeable substrate. The system occurs over a wide elevational range, nearly to the highest peaks. Landforms are usually concave slopes but may be convex slopes or even ridgetop gaps. This system is almost never found on flat valley bottoms, though it may be found on the edge of them. Soils may be muck or coarse boulders but are usually saturated mineral soils. They may be residual or colluvial and deep or shallow. The most extensive and wettest examples occur at elevations above 1525 m (5000 feet), where cool temperatures and high rainfall make more water available. In Kentucky, this system consists of streamhead seepages on Pine and Cumberland mountains.

Vegetation: Vegetation consists of a series of forested and open associations united by presence of wetland flora but lack of floodplain species and most bog species. Vegetation consists of a series of forested and open associations united by presence of wetland flora but lack of floodplain species and most bog species. Some tree cover by mesophytic species is usually present, but often only by trees rooted on the edge of adjacent systems. Shrubs may be sparse, or may form dense zones around the edge. Shrub species are mostly mesophytic rather than obligate wetland species. The herb layer is generally well-developed, and is usually dominated either by characteristic forbs such as *Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, *Chelone* spp., and *Rudbeckia triloba*, or by *Carex* spp. *Sphagnum* may occur in a minority of examples.

Dynamics: The presence of seepage is the primary determinant of this system. Long-term droughts that affect seepage flow presumably have an effect, but this has not been documented. Canopy dynamics are not well known and potentially may vary substantially over short distances in response to wetness. Wetness may limit recruitment of most tree and shrub seedlings to drier microsites, making canopy gaps persist longer than in adjacent forests and creating a more open canopy. Fire may penetrate from the adjacent forest systems, but only in the driest conditions are they likely to be intense enough to have much effect within this system. Seeps are fairly permanent features of the landscape, but may potentially be created, destroyed, or changed in extent because of changes in groundwater flow, stream entrenchment or headward erosion, mass movement on slopes, or long-term climatic cycles. Examples are often left undisturbed when surrounding forests are logged. Effects of logging on water infiltration or surface flow may have significant indirect effects.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest (CEGL007443, G3?)
- *Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Shrubland (CEGL003909, G2?)
- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)

- *Calamagrostis cainii* - *Carex ruthii* - *Parnassia asarifolia* / *Sphagnum* spp. Herbaceous Vegetation (CEGL007877, G1Q)
- *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* - *Carex atlantica* / *Sphagnum* spp. Herbaceous Vegetation (CEGL007697, G2)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Herbaceous Vegetation (CEGL004296, G3)
- *Glyceria striata* - *Carex gynandra* - *Chelone glabra* - *Symphyotrichum puniceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008438, G2G3)
- *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata var. humilis* Herbaceous Vegetation (CEGL004293, G3)
- *Pinus strobus* - *Physocarpus opulifolius* / *Rhamnus alnifolia* / *Parnassia grandifolia* Woodland (CEGL006034, G2)
- *Schoenoplectus robustus* - *Juncus gerardii* - *Hordeum jubatum* - *Atriplex patula* Herbaceous Vegetation (CEGL006234, G1)
- *Trichophorum caespitosum* - *Osmunda cinnamomea* - *Carex barrattii* - *Carex buxbaumii* Herbaceous Vegetation (CEGL007723, G1Q)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Carex ruthii* - *Carex gynandra* Saturated Herbaceous Alliance (A.1898)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* Saturated Herbaceous Alliance (A.1688)
- *Impatiens (capensis, pallida)* - *Monarda didyma* Saturated Herbaceous Alliance (A.1690)
- *Pinus strobus* - *Acer rubrum* Saturated Woodland Alliance (A.582)
- *Schoenoplectus robustus* Semipermanently Flooded Herbaceous Alliance (A.1434)
- *Symphyotrichum puniceum* - *Vernonia noveboracensis* - *Solidago (patula, rugosa)* Saturated Herbaceous Alliance (A.2016)
- *Trichophorum caespitosum* Saturated Herbaceous Alliance (A.1915)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, from less than one to no more than several acres in size, potentially surrounded by a number of different systems.

Size: Occurs as small patches, most less than one acre in size. The largest patches at high elevations are several acres. Patches occasionally occur in complexes but more often occur singly.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Adjacent Ecological System Comments: This system may be embedded in a variety of other systems. Most common are Southern Appalachian Northern Hardwood Forest (CES202.029) and Southern and Central Appalachian Cove Forest (CES202.373).

DISTRIBUTION

Range: This system ranges throughout the southern Appalachians, from northern Georgia and South Carolina north through Virginia, and westward into eastern Tennessee and Kentucky.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA

Map Zones: 57:C, 61:C

TNC Ecoregions: 50:C, 51:C, 59:?

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723181#references

Description Author: M. Schafale and R. Evans, mod. S.C. Gawler

Version: 05 May 2008

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN FRESH AND OLIGOHALINE TIDAL MARSH (CES203.376)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Tidal / Estuarine [Oligohaline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9413

CONCEPT

Summary: This ecological system represents tidally influenced freshwater herbaceous marshes and tidal shrublands ranging from the vicinity of Morehead City, North Carolina (south of the Embayed Region), southward to Flagler County, Florida. This system occurs where there is adequate river flow and discharge to maintain fresh to oligohaline conditions, while still within tidal range. These marshes most often occur well inside the mouths of tidal creeks and rivers. Elevation differences within the marsh correspond to the occurrence of different vegetation types.

Classification Comments: Montague and Wiegert (1990) state that "Northeast Florida salt marshes" occur "south to Marineland," which is in northern Flagler County, Florida. These "Northeast Florida salt marshes" are assumed to be the Florida part of Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270) which ranges north to southern North Carolina. It is further assumed that the range of CES203.270 and Southern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376) are basically identical.

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Most of the region where this system occurs consists of marshy shores and sea islands.

MEMBERSHIP

Associations:

- *Alnus serrulata* / (*Zizania aquatica*, *Zizaniopsis miliacea*) Shrubland (CEGL004627, G3?)
- *Baccharis halimifolia* - *Iva frutescens* - *Morella cerifera* - (*Ilex vomitoria*) Shrubland (CEGL003920, G4?)
- *Borrichia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Carex stricta* - *Peltandra virginica* - *Sagittaria (lancifolia ssp. media, latifolia)* Tidal Herbaceous Vegetation (CEGL004314, G2?)
- *Schoenoplectus pungens* - (*Osmunda regalis var. spectabilis*) Herbaceous Vegetation (CEGL004189, G2G3)
- *Spartina cynosuroides* Herbaceous Vegetation (CEGL004195, G4)
- *Zizania aquatica* Tidal Herbaceous Vegetation (CEGL004202, G4?)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Alnus (incana, serrulata, maritima)* Tidal Shrubland Alliance (A.1024)
- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Borrichia frutescens* Tidal Shrubland Alliance (A.1026)
- *Peltandra virginica* - *Pontederia cordata* Tidal Herbaceous Alliance (A.1703)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina cynosuroides* Tidal Herbaceous Alliance (A.1480)
- *Zizania aquatica* Tidal Herbaceous Alliance (A.1484)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

DISTRIBUTION

Range: This system ranges from the vicinity of Morehead City, North Carolina (south of the Embayed Region), south to the vicinity of Marineland (Flagler County) in northern Florida (Montague and Wiegert 1990).

Divisions: 203:C

Nations: US

Subnations: FL?, GA, NC, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232C:CC, 232G:CC, 232I:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990, Odum et al. 1984, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723140#references

Description Author: R. Evans, mod. M. Pyne

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN SALT AND BRACKISH TIDAL MARSH (CES203.270)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9236

CONCEPT

Summary: This system encompasses the brackish to saline intertidal marshes of the Atlantic Coast ranging from the vicinity of Morehead City, North Carolina (south of the Embayed Region), south to the vicinity of Marineland (Flagler County) in northern Florida. It is dominated by medium to extensive expanses of *Spartina alterniflora*, flooded twice daily by lunar tides. *Juncus roemerianus* and other brackish marshes occur upstream in tidal creeks, and a variety of small-patch associations occur near the inland edges. Examples of this system may also support inclusions of shrublands dominated by either *Baccharis halimifolia* and/or *Borrchia frutescens*, as well as forests or woodlands with *Juniperus virginiana* var. *silicicola* in the overstory.

Classification Comments: This system is distinguished from Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260) because of the characteristic hydrology of the Embayed Region and what it implies about ecosystem dynamics. This system is dominated by salt marshes regularly flooded by lunar tides, while the Embayed Region is dominated by brackish marshes irregularly flooded by wind tides. This system is distinguished from salt marsh systems of the Gulf Coast because of the differences in tidal dynamics and energy.

The range of this system is somewhat larger than the "Embayed Region" tidal marshes (which range southward only to Cape Lookout). This is due to the fact that submerged aquatic vegetation occurs throughout the region without discernable patterns of change, whereas the tidal marshes do vary across this range.

Montague and Wiegert (1990) state that "Northeast Florida salt marshes" occur "south to Marineland," which is in northern Flagler County, Florida. These "Northeast Florida salt marshes" are assumed to be the Florida part of Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270) which ranges north to southern North Carolina. It is further assumed that the range of CES203.270 and Southern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376) are basically identical.

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
- Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)

Related Concepts:

- Northeast Florida salt marshes (Montague and Wiegert 1990) Finer
- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: This system occurs on intertidal flats that are tidally flooded with salt to brackish water along the Atlantic Coast south of the Embayed Region of North Carolina, extending to northern Florida (south to the vicinity of Marineland in Flagler County). Regular tidal flooding occurs over most of the system, with irregular flooding in unusually high tides occurring in the upper zones. Tidal ranges vary, but are two feet or more. The water is salty over most of the expanse of this system, grading to brackish upstream in tidal rivers and creeks. Upper zones tend to have vegetation suggestive of brackish water as well, but this is apparently the result of a combination of irregular saltwater flooding with freshwater input. Local depressions in upper zones may be hypersaline due to concentration of salt by evaporation. Flooding depth and salinity are the primary determinants of the boundary of this system and of the variation in associations within it. Soils are either sandy or clayey and often are sulfidic and high in organic matter. The input of cations in sea water prevents them from being strongly acidic, but they may rapidly become extremely acidic if drained.

Vegetation: Vegetation is primarily marsh. *Spartina alterniflora* is the predominant vegetation. *Juncus roemerianus* may dominate fairly large expanses along brackish portions of tidal creeks and rivers. Upper zones include a few herbaceous and shrubland associations with plants tolerant of occasional to frequent saltwater, and a few herbaceous to sparse vegetation associations in hypersaline depressions. All associations are low in plant species richness. Salt marsh communities are known for their high primary productivity, much of which is exported to estuarine systems with tidal flushing.

Dynamics: Tidal flooding is the ecological factor that distinguishes this system from others. Tides bring nutrients, making the regularly flooded marshes fertile. Storms may push saltwater into brackish areas and higher zones, acting as a disturbance to vegetation. In salt marshes, storms locally concentrate debris into piles or bands (wrack) that smother vegetation. For marshes on the back of barrier islands, storm overwash may deposit sand in the marsh. Marshes usually recover from this, but if sufficient sand is deposited, a different system may develop on the site. Fire may be a natural force in some patches that are connected to the mainland. Most salt marshes are probably too wet to burn. Rising sea level will affect this system strongly, drowning some marsh areas, promoting shoreline erosion, and causing salt or brackish marshes to spread inland into freshwater marsh areas.

MEMBERSHIP

Associations:

- *Baccharis halimifolia* - *Iva frutescens* / *Panicum virgatum* Shrubland (CEGL003921, G5)
- *Borrchia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Cladium mariscus ssp. jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Juniperus virginiana var. silicicola* - (*Quercus virginiana*, *Sabal palmetto*) Forest (CEGL007813, G3?)
- *Juniperus virginiana var. silicicola* / *Morella cerifera* / *Kosteletzkya virginica* - *Bacopa monnieri* Woodland (CEGL007166, G1?)
- *Phragmites australis* Temperate Upland Herbaceous Vegetation (CEGL004019, GNA)
- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Salicornia (virginica, bigelovii, maritima)* - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308, G5)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Spartina alterniflora* Carolinian Zone Herbaceous Vegetation (CEGL004191, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus roemerianus*) Herbaceous Vegetation (CEGL004197, G4G5)

Alliances:

- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Borrchia frutescens* Tidal Shrubland Alliance (A.1026)
- *Cladium mariscus ssp. jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Juniperus virginiana var. silicicola* Tidal Woodland Alliance (A.1887)
- *Phragmites australis* Herbaceous Alliance (A.1196)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system.

Size: Occurs in small to large patches, with a few ranging up to 1000 acres or more.

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)
- Southern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376)

Adjacent Ecological System Comments: Grades to Southern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376) upstream on tidal rivers. Grades to a variety of systems on adjacent higher area dune and coastal grassland types, Central Atlantic Coastal Plain Maritime Forest (CES203.261), and various mainland upland systems.

DISTRIBUTION

Range: This systems ranges from central North Carolina to south to the vicinity of Daytona Beach in northern Florida. The northern boundary is roughly the eastern end of Carteret County, North Carolina.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232C:CC, 232I:CC

TNC Ecoregions: 55:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723216#references

Description Author: R. Evans, mod. M. Pyne

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1515 SOUTHERN COASTAL PLAIN HERBACEOUS SEEP AND BOG (CES203.078)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: EVT 2515; ESLF 9404; ESP 1515

CONCEPT

Summary: This small-patch ecological system includes wet, fire-maintained, seepage communities in the outermost portions of the East Gulf Coastal Plain, east of the Mississippi River in Louisiana, Mississippi, Alabama, and extending across northern Florida. These wetlands are generally found on gentle, almost imperceptible slopes maintained by constant seepage zones and/or perched water tables. Examples are typically grass and sedge dominated, and are often species-rich. *Sarracenia* spp. are notable indicators of many community types in this system. Shrubs frequently encroach in the absence of fire; due to greater topographic isolation, the most interior examples are often naturally shrubbier.

Classification Comments: Known from Clay County (Jennings State Forest) and Nassau County (Ralph E. Simmons State Forest), Florida, based on EORs reported from Florida (A. Johnson pers. comm.).

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shrub Bog (CES203.385)

Related Concepts:

- Seepage Slope (FNAI 1990) Undetermined

DESCRIPTION

Environment: Kindell et al. (1997) document examples for the Leefield, Albany, Pactolus, Pamlico, Rutledge, and Pansey soil series. Clewell (1981) describes these bogs as commonly occurring between bay swamps and pine flatwoods.

Vegetation: Examples are typically grass- and sedge dominated, and are often species-rich. Pitcher plants (*Sarracenia* spp.) are notable indicators of many community types in this system. *Rhynchospora* spp. are dominant or codominant in many examples. Shrubs (e.g., *Lyonia lucida*, *Ilex glabra*, *Cyrilla racemiflora*) frequently encroach in the absence of fire. Scattered *Pinus elliotii* var. *elliottii*, *Pinus palustris*, and/or *Pinus serotina* may be present.

Dynamics: Frequent fires are necessary to maintain this system. In the absence of fire, shrubs encroach, eventually shading out understory plants.

MEMBERSHIP

Associations:

- *Andropogon arctatus* - *Rhynchospora chapmanii* Herbaceous Vegetation (CEGL008596, G1G2)
- *Aristida beyrichiana* - *Rhynchospora oligantha* - *Panicum nudicaule* - (*Eurybia eryngiifolia*) Herbaceous Vegetation (CEGL004155, G2)
- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Hypericum fasciculatum* - *Hypericum chapmanii* / *Aristida palustris* - *Sarracenia (flava, psittacina)* Shrubland (CEGL008594, G1)
- *Pinus elliotii* var. *elliottii* - (*Pinus serotina*) / *Aristida beyrichiana* - *Rhynchospora oligantha* - *Sarracenia (flava, minor, psittacina)* Woodland (CEGL003673, G2?)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* / *Ctenium aromaticum* Woodland (CEGL003860, G3)
- *Pinus serotina* / *Lyonia lucida* - *Ilex glabra* - (*Cyrilla racemiflora*) Shrubland (CEGL003846, G3)
- *Rhynchospora macra* - *Rhynchospora stenophylla* - *Panicum nudicaule* - *Xyris chapmanii* - *Carex exilis* Herbaceous Vegetation (CEGL004667, G1)
- *Rhynchospora oligantha* - *Sarracenia (alata, psittacina)* - *Carphephorus pseudoliatris* Herbaceous Vegetation (CEGL004687, G2)
- *Rhynchospora stenophylla* - *Rhynchospora macra* - *Panicum nudicaule* - *Eriocaulon nigrobacteatum* - *Pleea tenuifolia* Herbaceous Vegetation (CEGL004177, G1)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Hypericum (chapmanii, fasciculatum)* Seasonally Flooded Shrubland Alliance (A.844)
- *Lyonia lucida* - *Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Pinus elliotii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Rhynchospora oligantha* - *Sarracenia* spp. - (*Aristida beyrichiana*, *Ctenium aromaticum*) - *Osmunda cinnamomea* / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)

DISTRIBUTION

Range: This systems is found in the northern Gulf of Mexico region, east of the Mississippi River in Louisiana, Mississippi, Alabama, and extending across northern Florida.

Divisions: 203:C

Nations: US

Subnations: AL, FL, LA, MS

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232B:CC, 232C:CC, 232D:CC, 232J:CC, 232K:CC, 232L:CC, 234A:CC

TNC Ecoregions: 53:C, 56:C

SOURCES

References: Clewell 1981, Comer et al. 2003, Kindell et al. 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723251#references

Description Author: R. Evans, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN SPRING-RUN STREAM AQUATIC VEGETATION (CES203.275)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Whitewater]

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9258

CONCEPT

Summary: Spring-run streams are perennial watercourses fed with artesian waters originating in karstic or limestone topography in the outer portions of the southeastern Coastal Plain of the United States. Such areas are rare in the Gulf and Atlantic coastal plains and apparently confined to Florida and small areas of Georgia. Waters are mineral-rich and circumneutral to alkaline with pH of 7.0-8.2 (FNAI 1990, Nordlie 1990). Water temperatures are relatively cool; clarity is often high. These factors contribute to sometimes lush growth of submerged aquatic vegetation which may include *Vallisneria americana*, *Sagittaria kurziana*, *Potamogeton* spp., and *Myriophyllum* spp. Emergent marshes dominated by *Cladium* and/or *Zizania* may occur along the edges. Floodplain development is not usually advanced, but many of these streams are bordered by forests in which *Taxodium distichum* is present.

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Southern Coastal Plain Hydric Hammock (CES203.501)

Related Concepts:

- Spring-run Stream (FNAI 1990) Equivalent

DESCRIPTION

Environment: Channels may have sandy bottoms or exposed limestone. Spring "boils" and "blue holes" are encountered with some frequency (Wharton 1978, FNAI 1990).

MEMBERSHIP

Associations:

- *Cladium mariscus* ssp. *jamaicense* - *Typha domingensis* - *Fimbristylis caroliniana* - *Bacopa monnieri* Herbaceous Vegetation (CEGL008591, G3?)
- *Nuphar lutea* ssp. *ulvacea* Herbaceous Vegetation (CEGL004329, G2)
- *Sagittaria kurziana* - *Potamogeton illinoensis* - *Vallisneria americana* Herbaceous Vegetation (CEGL004332, G2)
- *Stuckenia pectinata* - *Vallisneria americana* Herbaceous Vegetation (CEGL008590, G2G3)
- *Zizania aquatica* - *Cicuta maculata* - *Hydrocotyle umbellata* Herbaceous Vegetation (CEGL004716, G2?)

Alliances:

- *Cladium mariscus* ssp. *jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Vallisneria americana* Permanently Flooded Temperate Herbaceous Alliance (A.1757)
- *Zizania (aquatica, texana)* - *Potamogeton illinoensis* Semipermanently Flooded Herbaceous Alliance (A.1437)

DISTRIBUTION

Range: This system is endemic to Florida and Georgia.

Divisions: 203:C

Nations: US

Subnations: FL, GA

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, FNAI 1990, Nordlie 1990, Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723211#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHWEST FLORIDA SEAGRASS BED (CES203.274)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9224

CONCEPT

Summary: This system is found along Florida's west coast ranging from Anclote Key (Tarpon Springs) south to Charlotte Harbor. Estuarine grassbeds of this region have been among the most extensively studied in Florida [see references in Zieman and Zieman (1989)] and at least 5 types of seagrass meadows are known to be present. Some types are comprised of mixed species while others are essentially pure stands of individual species. In general, these meadows are found along the fringes of Tampa Bay and Boca Ciega Bay landward of unvegetated sandbars. Composition varies according to water depth and position relative to shoals and shorelines. Mixed beds of *Halodule*, *Cymodocea*, and *Thalassia* are found in mid-bay shoals. Fringing beds support *Ruppia* nearest the shore in shallowest waters, followed by almost pure stands of *Halodule*, *Thalassia*, and *Cymodocea*.

Similar Ecological Systems:

- Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)
- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Florida Keys Seagrass Bed (CES411.285)
- Northern Gulf of Mexico Seagrass Bed (CES203.263)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: This system is found along Florida's west coast ranging from Anclote Key (Tarpon Springs) south to Charlotte Harbor. Beds in this region are found behind barrier islands and within sounds and bays, protected from normal storm surges. Within this region, by far the largest acreages of submerged vegetation are found in the Pine Island Sound and Charlotte Harbor. Other large bays with abundant submerged vegetation include Tampa Bay, Boca Ciega Bay, and Sarasota Bay (Zieman and Zieman 1989). The seagrasses are rooted primarily in soft muddy sands and are essentially absent from sandier substrates. Beds occur generally landward of unvegetated sandbars which when destabilized may lead to the disappearance of the beds.

Vegetation: Seagrasses are monocots which carry out their entire life cycle completely submerged in the marine environment.

Dynamics: Colonization of seagrasses often follows a generalized successional sequence. Non-vegetated areas may first be colonized by rhizophytic macroalgae which have some sediment-binding capacity. Possibly more importantly they contribute sedimentary particles as they die and decompose (Zieman and Zieman 1989). *Halodule beaudettei* (= *Halodule wrightii*) is the local pioneering species which colonizes areas from seed or vegetative reproduction. *Cymodocea* often appears next and may mix with *Halodule*. *Thalassia* occupies beds as succession advances. This pattern marks a progressive increase of biomass in the system with increased leaf areas, increased sediment-trapping capacity, and increased microbial cycling.

MEMBERSHIP

Associations:

- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Tropical Herbaceous Vegetation (CEGL004906, G4G5)
- *Thalassia testudinum* - *Cymodocea filiformis* Herbaceous Vegetation (CEGL008384, GNR)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Tropical Herbaceous Alliance (A.1737)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: This system is found along Florida's west coast ranging from Anclote Key south to Charlotte Harbor to the outlet of the Caloosahatche River.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 56:C
TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003, Lewis et al. 1985a, Zieman and Zieman 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723212#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1664 TEMPERATE PACIFIC FRESHWATER AQUATIC BED (CES200.876)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Temperate [Temperate Continental]; Depressional [Pond]; Aquatic Herb

Non-Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]

National Mapping Codes: EVT 2664; ESLF 9219; ESP 1664

CONCEPT

Summary: Freshwater aquatic beds are found throughout the humid temperate regions of the Pacific Coast of North America. They are small patch in size, confined to lakes, ponds, oxbows, and slow-moving portions of rivers and streams. In large bodies of water, they are usually restricted to the littoral region where penetration of light is the limiting factor for growth. A variety of rooted or floating aquatic herbaceous species may dominate, including *Azolla* spp., *Nuphar lutea*, *Polygonum* spp., *Potamogeton* spp., *Ranunculus* spp., and *Wolffia* spp. Submerged vegetation, such as *Myriophyllum* spp., *Ceratophyllum* spp., and *Elodea* spp., is often present. These communities occur in water too deep for emergent vegetation.

Classification Comments: The aquatic beds in the Alaska systems classification for the maritime region are included here. However, aquatic beds on Kodiak Island, Alaska, are placed into Aleutian Freshwater Aquatic Bed (CES105.234).

Similar Ecological Systems:

- Aleutian Freshwater Aquatic Bed (CES105.234)

Related Concepts:

- III.D.1.a - Pondlily (Viereck et al. 1992) Intersecting
- III.D.1.b - Common maretail (Viereck et al. 1992) Intersecting
- III.D.1.c - Aquatic buttercup (Viereck et al. 1992) Intersecting
- III.D.1.d - Burreed (Viereck et al. 1992) Intersecting
- III.D.1.f - Fresh pondweed (Viereck et al. 1992) Intersecting
- III.D.1.h - Cryptogam (Viereck et al. 1992) Intersecting
- Wetlands (217) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Brasenia schreberi* Herbaceous Vegetation (CEGL004527, G4?)
- *Callitriche heterophylla* Herbaceous Vegetation [Provisional] (CEGL003301, G5)
- *Ceratophyllum demersum* Western Herbaceous Vegetation [Provisional] (CEGL004017, G5)
- *Elodea canadensis* Herbaceous Vegetation [Provisional] (CEGL003303, G5)
- *Fontinalis antipyretica* (var. *antipyretica*, var. *oregonensis*) Nonvascular Vegetation (CEGL003304, G5)
- *Lemna minor* Herbaceous Vegetation (CEGL003305, G5)
- *Menyanthes trifoliata* Herbaceous Vegetation [Provisional] (CEGL003410, G5)
- *Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation (CEGL002001, G5)
- *Polygonum amphibium* Permanently Flooded Herbaceous Vegetation [Placeholder] (CEGL002002, G5)
- *Ranunculus aquatilis* Herbaceous Vegetation [Provisional] (CEGL003307, G5)
- *Ranunculus lobbii* Herbaceous Vegetation [Provisional] (CEGL003308, G2)
- *Schoenoplectus subterminalis* Herbaceous Vegetation [Provisional] (CEGL003309, G3)
- *Utricularia macrorhiza* Herbaceous Vegetation [Provisional] (CEGL003310, G5)
- *Wolffia* (*borealis*, *columbiana*) Herbaceous Vegetation [Provisional] (CEGL003311, G4)

Alliances:

- *Brasenia schreberi* Permanently Flooded Herbaceous Alliance (A.1742)
- *Fontinalis* spp. Saturated Nonvascular Alliance (A.2628)
- *Lemna* spp. Permanently Flooded Herbaceous Alliance (A.1747)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)

DISTRIBUTION

Range: This system is found throughout the humid temperate regions of the Pacific Coast of North America, from the Gulf of Alaska through southeastern Alaska into central California.

Divisions: 204:C; 206:C

Nations: CA, US

Subnations: AK, BC, CA, OR, WA

Map Zones: 1:C, 2:P, 3:C, 4:C, 6:P, 7:C, 8:C, 9:C, 10:C, 77:C, 78:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 342I:??, M242A:CC, M242B:CC, M242C:CP, M242D:CC, M261G:CC

TNC Ecoregions: 1:C, 14:C, 15:C, 69:C, 70:C, 71:C

SOURCES

References: Boggs 2000, Boggs et al. 2008a, Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995, Shephard 1995, Shiflet 1994, Viereck et al. 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722799#references

Description Author: G. Kittel, P. Comer, C. Chappell, K. Boggs

Version: 17 Oct 2008

Concept Author: G. Kittel, P. Comer, C. Chappell, K. Boggs

Stakeholders: Canada, West

ClassifResp: West

1662 TEMPERATE PACIFIC FRESHWATER EMERGENT MARSH (CES200.877)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Temperate [Temperate Continental]; Depressional [Pond]

Non-Diagnostic Classifiers: 30-180-day hydroperiod; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Depressional [Lakeshore]; Depressional [Sinkhole]

National Mapping Codes: EVT 2662; ESLF 9260; ESP 1662

CONCEPT

Summary: Freshwater marshes are found at all elevations below timberline throughout the temperate Pacific Coast and mountains of western North America. In the Pacific Northwest, they are mostly small-patch, confined to limited areas in suitable floodplain or basin topography. They are mostly semipermanently flooded, but some marshes have seasonal hydrologic flooding. Water is at or above the surface for most of the growing season. Soils are muck or mineral (in Alaska typically muck over a mineral soil), and water is high-nutrient. Occurrences of this system typically are found in a mosaic with other wetland systems. It is often found along the borders of ponds, lakes or reservoirs that have more open basins and a permanent water source throughout all or most of the year. Some of the specific communities will also be found in floodplain systems where more extensive bottomlands remain. By definition, freshwater marshes are dominated by emergent herbaceous species, mostly graminoids (*Carex*, *Scirpus* and/or *Schoenoplectus*, *Eleocharis*, *Juncus*, *Typha latifolia*) but also some forbs. Common emergent and floating vegetation includes species of *Scirpus* and/or *Schoenoplectus*, *Typha*, *Eleocharis*, *Sparganium*, *Sagittaria*, *Bidens*, *Cicuta*, *Rorippa*, *Mimulus*, and *Phalaris*. Maritime Alaska freshwater marshes are described as having *Carex rostrata*, *Equisetum fluviatile* (often pure stands), *Carex aquatilis* var. *dives* (= *Carex sitchensis*), *Menyanthes trifoliata*, *Comarum palustre*, *Eleocharis palustris*, and *Schoenoplectus tabernaemontani*. In relatively deep water, there may be occurrences of the freshwater aquatic bed system, where there are floating-leaved genera such as *Lemna*, *Potamogeton*, *Polygonum*, *Nuphar*, *Hydrocotyle*, and *Brasenia*. A consistent source of freshwater is essential to the function of these systems.

Classification Comments: In Alaska, freshwater marshes found in floodplain wetland mosaics are not included in this system. Also, freshwater marshes on Kodiak Island, Alaska, are placed into Aleutian Freshwater Marsh (CES105.235). This system encompasses a very large geographic range. We may want to split it into two types, on a north-south gradient. However, the species composition and environmental settings of freshwater marshes throughout the temperate Pacific region are markedly similar. Where to make a split that would make sense biogeographically is hard to determine. For now, they are maintained as one ecological system.

Similar Ecological Systems:

- Aleutian Freshwater Marsh (CES105.235)

Related Concepts:

- *Equisetum fluviatile* (Shephard 1995) Finer
- *Menyanthes trifoliata* - *Potentilla palustris* (Shephard 1995) Undetermined
- Cattail (IDFdk3/Wm05) (Steen and Coupe 1997) Intersecting
- Great bulrush (BGxw2/Wm06) (Steen and Coupe 1997) Intersecting
- Great bulrush (ICHwk1/Wm06) (Lloyd et al. 1990) Intersecting
- Great bulrush (IDFdk3/Wm06) (Steen and Coupe 1997) Intersecting
- Great bulrush (IDFdk4/Wm06) (Steen and Coupe 1997) Intersecting
- Great bulrush (IDFxm/Wm06) (Steen and Coupe 1997) Intersecting
- Great bulrush (SBPSmk/Wm06) (Steen and Coupe 1997) Intersecting
- Great bulrush (SBPSxc/Wm06) (Steen and Coupe 1997) Intersecting
- Great bulrush (SBSmk2/Wm06) (MacKinnon et al. 1990) Intersecting
- III.A.3.d - Fresh sedge marsh (Viereck et al. 1992) Intersecting
- III.B.3.a - Fresh herb marsh (Viereck et al. 1992) Intersecting
- Inflated sedge (CWHvm2/Wm09) (Banner et al. 1993) Intersecting
- Inflated sedge (ESSFxc/Wm09) (Steen and Coupe 1997) Intersecting
- Inflated sedge (ICHmw3/Wm09) (Steen and Coupe 1997) Intersecting
- Inflated sedge (ICHvc/Wm09) (Banner et al. 1993) Intersecting
- Inflated sedge (ICHwk1/Wm09) (Lloyd et al. 1990) Intersecting
- Inflated sedge (ICHwk4/Wm09) (Steen and Coupe 1997) Intersecting
- Inflated sedge (MSxv/Wm09) (Steen and Coupe 1997) Intersecting
- Inflated sedge (SBPSxc/Wm09) (Steen and Coupe 1997) Intersecting
- Northern mannagrass (MSxv/Wm10) (Steen and Coupe 1997) Intersecting
- Northern mannagrass (SBPSxc/Wm10) (Steen and Coupe 1997) Intersecting
- Sharp bulrush (IDFxm/Wm08) (Steen and Coupe 1997) Intersecting

- Three-way sedge (ICHwk1/Wm51) (Lloyd et al. 1990) Intersecting
- Wetlands (217) (Shiflet 1994) Broader

DESCRIPTION

Environment: In Alaska marshes, standing water is usually persistent throughout the growing season and is generally at least 10 cm above the ground surface.

MEMBERSHIP

Associations:

- *Bidens cernua* Herbaceous Vegetation [Provisional] (CEGL003324, G3)
- *Carex exsiccata* Herbaceous Vegetation [Provisional] (CEGL003312, G2G3)
- *Carex obnupta* - *Argentina egedii* ssp. *egedii* Herbaceous Vegetation (CEGL001820, G4)
- *Carex obnupta* - *Juncus patens* Herbaceous Vegetation (CEGL003379, G3)
- *Carex obnupta* Herbaceous Vegetation (CEGL003313, G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation (CEGL001831, G3)
- *Equisetum fluviatile* Herbaceous Vegetation (CEGL002746, G4)
- *Juncus balticus* - *Carex obnupta* Herbaceous Vegetation [Provisional] (CEGL003413, G4)
- *Juncus effusus* var. *brunneus* Pacific Coast Herbaceous Vegetation (CEGL003317, G5)
- *Oenanthe sarmentosa* Herbaceous Vegetation [Provisional] (CEGL003319, G4)
- *Paspalum distichum* Herbaceous Vegetation [Provisional] (CEGL003320, G3)
- *Sagittaria latifolia* Herbaceous Vegetation [Provisional] (CEGL003321, G3)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Scirpus microcarpus* Herbaceous Vegetation (CEGL003322, G4)
- *Sparganium angustifolium* Herbaceous Vegetation (CEGL001990, G4)
- *Sparganium eurycarpum* Herbaceous Vegetation (CEGL003323, G4)
- *Typha* (*latifolia*, *angustifolia*) Western Herbaceous Vegetation (CEGL002010, G5)

Alliances:

- *Carex* (*rostrata*, *utriculata*) Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex obnupta* Seasonally Flooded Herbaceous Alliance (A.2582)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Scirpus microcarpus* Herbaceous Alliance (A.2619)
- *Sparganium angustifolium* Permanently Flooded Herbaceous Alliance (A.1760)
- *Sparganium eurycarpum* Permanently Flooded Herbaceous Alliance (A.2598)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

SPATIAL CHARACTERISTICS

Spatial Summary: For Alaska mapping: need to define percentage of surface water and need to differentiate from fen/wet meadow. For boreal region, we used 10-cm water depth as classifier but that may not be mappable.

DISTRIBUTION

Range: This system occurs throughout the temperate Pacific Coast and coastal mountains of western North America, from southern coastal California north into coastal areas of British Columbia and Alaska.

Divisions: 204:C; 206:C

Nations: CA, US

Subnations: AK, BC, CA, OR, WA

Map Zones: 1:C, 2:C, 3:C, 4:C, 6:P, 7:C, 8:P, 9:P, 77:C, 78:C

USFS Ecomap Regions: 242A:CC, 242B:CC, 342B:CC, 342H:CP, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261D:CC, M261G:CC, M332G:CC

TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 12:P, 13:C, 14:C, 15:C, 16:C, 69:C, 70:C, 81:C

SOURCES

References: Banner et al. 1986, Banner et al. 1993, Boggs 2000, Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995, Lloyd et al. 1990, MacKinnon et al. 1990, Shephard 1995, Steen and Coupe 1997, Viereck et al. 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722798#references

Description Author: C. Chappell and G. Kittel, mod. M.S. Reid

Version: 22 Aug 2008

Concept Author: C. Chappell and G. Kittel

Stakeholders: Canada, West

ClassifResp: West

TEMPERATE PACIFIC SUBALPINE-MONTANE WET MEADOW (CES200.998)

CLASSIFIERS

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: 30-180-day hydroperiod; Herbaceous; Muck; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Montane; Temperate [Temperate Oceanic]; Depressional; Riverine / Alluvial

National Mapping Codes: ESLF 9265

CONCEPT

Summary: Montane and subalpine wet meadows occur in open wet depressions, basins and flats among montane and subalpine forests from California's Transverse and Peninsular ranges north to British Columbian coastal forests at varying elevations depending on latitude. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Soils are mostly mineral and may show typical hydric soil characteristics, and shallow organic soils may occur as inclusions. This system often occurs as a mosaic of several plant associations with varying dominant herbaceous species that may include *Camassia quamash*, *Carex bolanderi*, *Carex utriculata*, *Carex exsiccata*, *Dodecatheon jeffreyi*, *Glyceria striata* (= *Glyceria elata*), *Carex nigricans*, *Calamagrostis canadensis*, *Juncus nevadensis*, *Caltha leptosepala* ssp. *howellii*, *Veratrum californicum*, and *Scirpus* and/or *Schoenoplectus* spp. Trees occur peripherally or on elevated microsites and include *Picea engelmannii*, *Abies lasiocarpa*, *Abies amabilis*, *Tsuga mertensiana*, and *Chamaecyparis nootkatensis*. Common shrubs may include *Salix* spp., *Vaccinium uliginosum*, *Betula glandulosa*, and *Vaccinium macrocarpon*. Wet meadows are tightly associated with snowmelt and typically are not subjected to high disturbance events such as flooding.

Classification Comments: Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) occurs to the east of the coastal and Sierran mountains, in the semi-arid interior regions of western North America. Boreal wet meadow systems occur further north and east in boreal regions where the climatic regime is generally colder than that of the Rockies or Pacific Northwest regions. Floristics of these three systems are somewhat similar, but there are differences related to biogeographic affinities of the species composing the vegetation. Wet meadows in southeastern Alaska have been placed into a new system (2008), Alaskan Pacific Maritime Fen and Wet Meadow (CES204.158).

Similar Ecological Systems:

- Alaskan Pacific Maritime Fen and Wet Meadow (CES204.158)

Related Concepts:

- Alpine Grassland (213) (Shiflet 1994) Broader. SRM type 213 includes all alpine communities in Sierra, Klamath and California Cascades, both herbaceous and shrub dominated, and wet meadows.
- Awned sedge (BGxw2/Wm03) (Steen and Coupe 1997) Intersecting
- Awned sedge (IDFdk3/Wm03) (Steen and Coupe 1997) Intersecting
- Awned sedge (IDFdk4/Wm03) (Steen and Coupe 1997) Intersecting
- Awned sedge (IDFxm/Wm03) (Steen and Coupe 1997) Intersecting
- Awned sedge (SBPSdc/Wm03) (Steen and Coupe 1997) Intersecting
- Awned sedge (SBPSdc/Wm03) (MacKenzie and Moran 2004) Intersecting
- Awned sedge (SBPSxc/Wm03) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (BWBSdk1/Wm01) (MacKinnon et al. 1990) Intersecting
- Beaked sedge - Water sedge (BWBSdk1/Wm01) (Banner et al. 1993) Intersecting
- Beaked sedge - Water sedge (BWBSmw2/Wm01) (DeLong et al. 1990) Intersecting
- Beaked sedge - Water sedge (ESSFmc/Wm01) (Banner et al. 1993) Intersecting
- Beaked sedge - Water sedge (ESSFmw/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (ESSFxc/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (ESSFv2/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (ICHmc1/Wm01) (Banner et al. 1993) Intersecting
- Beaked sedge - Water sedge (ICHmc1/Wm01) (Meidinger et al. 1988) Intersecting
- Beaked sedge - Water sedge (ICHmc2/Wm01) (Banner et al. 1993) Intersecting
- Beaked sedge - Water sedge (ICHwk1/Wm01) (Lloyd et al. 1990) Intersecting
- Beaked sedge - Water sedge (ICHwk2/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (IDFdk3/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (MSdc2/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (MSxc/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (MSxv/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (SBPSdc/Wm01) (MacKenzie and Moran 2004) Intersecting
- Beaked sedge - Water sedge (SBPSdc/Wm01) (Steen and Coupe 1997) Intersecting

- Beaked sedge - Water sedge (SBPSxc/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (SBSdk/Wm01) (DeLong et al. 1993) Intersecting
- Beaked sedge - Water sedge (SBSdk/Wm01) (Banner et al. 1993) Intersecting
- Beaked sedge - Water sedge (SBSdk/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (SBSdw1/Wm01) (Steen and Coupe 1997) Intersecting
- Beaked sedge - Water sedge (SBSdw3/Wm01) (DeLong et al. 1993) Intersecting
- Beaked sedge - Water sedge (SBSdw3/Wm01) (Banner et al. 1993) Intersecting
- Beaked sedge - Water sedge (SBSmc2/Wm01) (DeLong et al. 1993) Intersecting
- Beaked sedge - Water sedge (SBSmc2/Wm01) (Banner et al. 1993) Intersecting
- Beaked sedge - Water sedge (SBSmk1/Wm01) (DeLong et al. 1993) Intersecting
- Beaked sedge - Water sedge (SBSmk2/Wm01) (MacKinnon et al. 1990) Intersecting
- Beaked sedge - Water sedge (SBSvk/Wm01) (DeLong 2003) Intersecting
- Beaked sedge - Water sedge (SBSwk1/Wm01) (DeLong 2003) Intersecting
- Beaked sedge - Water sedge (SBSwk1/Wm01) (Steen and Coupe 1997) Intersecting
- Common spike-rush (BGxw2/Wm04) (Steen and Coupe 1997) Intersecting
- Common spike-rush (IDFxm/Wm04) (Steen and Coupe 1997) Intersecting
- Common spike-rush (SBSdk/Wm04) (Steen and Coupe 1997) Intersecting
- Common spike-rush (SBSdk/Wm04) (DeLong et al. 1993) Intersecting
- Common spike-rush (SBSdk/Wm04) (Banner et al. 1993) Intersecting
- Common spike-rush (SBSmk2/Wm04) (MacKinnon et al. 1990) Intersecting
- Montane Meadows (216) (Shiflet 1994) Broader
- Seaside arrow-grass (IDFdk3/Wm13) (Steen and Coupe 1997) Intersecting
- Seaside arrow-grass (MSxv/Wm13) (Steen and Coupe 1997) Intersecting
- Seaside arrow-grass (SBPSxc/Wm13) (Steen and Coupe 1997) Intersecting
- Sitka sedge - Hemlock-parsley (CWHvh2/Wm50) (Banner et al. 1993) Intersecting
- Sitka sedge - Hemlock-parsley (CWHwm/Wm50) (Banner et al. 1993) Intersecting
- Swamp horsetail - Beaked sedge (BWBSdk1/Wm02) (Banner et al. 1993) Intersecting
- Swamp horsetail - Beaked sedge (BWBSdk1/Wm02) (MacKinnon et al. 1990) Intersecting
- Swamp horsetail - Beaked sedge (ESSFmw/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (ICHmw3/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (ICHwk4/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (MSdc2/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (MSxk/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (MSxv/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (SBPSdc/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (SBPSdc/Wm02) (MacKenzie and Moran 2004) Intersecting
- Swamp horsetail - Beaked sedge (SBPSmk/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (SBPSxc/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (SBSdk/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (SBSdk/Wm02) (DeLong et al. 1993) Intersecting
- Swamp horsetail - Beaked sedge (SBSdk/Wm02) (Banner et al. 1993) Intersecting
- Swamp horsetail - Beaked sedge (SBSdw3/Wm02) (DeLong et al. 1993) Intersecting
- Swamp horsetail - Beaked sedge (SBSdw3/Wm02) (Banner et al. 1993) Intersecting
- Swamp horsetail - Beaked sedge (SBSmk2/Wm02) (MacKinnon et al. 1990) Intersecting
- Swamp horsetail - Beaked sedge (SBSwk1/Wm02) (Steen and Coupe 1997) Intersecting
- Swamp horsetail - Beaked sedge (SBSwk1/Wm02) (DeLong 2003) Intersecting
- Wetlands (217) (Shiflet 1994) Broader
- Woolly sedge (IDFdk4/Wm12) (Steen and Coupe 1997) Intersecting
- Woolly sedge (IDFxm/Wm12) (Steen and Coupe 1997) Intersecting

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Carex amplifolia* Herbaceous Vegetation (CEGL003427, G3)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex lasiocarpa* Herbaceous Vegetation (CEGL001810, G4?)
- *Carex nebrascensis* - *Carex microptera* Herbaceous Vegetation (CEGL001815, G3G4)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex nigricans* - *Erythronium montanum* Herbaceous Vegetation (CEGL001817, G4)
- *Carex nigricans* - *Luetkea pectinata* Herbaceous Vegetation (CEGL001819, G4)
- *Carex nigricans* Herbaceous Vegetation (CEGL001816, G4)
- *Carex scopulorum* Herbaceous Vegetation (CEGL001822, G5)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)

- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Eleocharis acicularis* Herbaceous Vegetation (CEGL001832, G4?)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Senecio triangularis* - *Mimulus guttatus* Herbaceous Vegetation (CEGL001988, G3?)
- *Senecio triangularis* - *Veratrum californicum* Herbaceous Vegetation (CEGL001989, G4)
- *Vaccinium uliginosum* / *Deschampsia caespitosa* Dwarf-shrubland (CEGL001250, G2)
- *Veratrum californicum* - *Juncus nevadensis* Herbaceous Vegetation (CEGL001946, G3G4)

Alliances:

- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex amplifolia* Saturated Herbaceous Alliance (A.2584)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex lasiocarpa* Seasonally Flooded Herbaceous Alliance (A.1415)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex nigricans* Seasonally Flooded Herbaceous Alliance (A.1418)
- *Carex scopulorum* Seasonally Flooded Herbaceous Alliance (A.1420)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Eleocharis* (*palustris*, *macrostachya*) Seasonally Flooded Herbaceous Alliance (A.1422)
- *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance (A.1421)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance (A.1680)
- *Senecio triangularis* Temporarily Flooded Herbaceous Alliance (A.1667)
- *Vaccinium uliginosum* Saturated Dwarf-shrubland Alliance (A.1123)
- *Veratrum californicum* Temporarily Flooded Herbaceous Alliance (A.1663)

DISTRIBUTION

Range: This system is found from California's Transverse and Peninsular ranges north to British Columbian coastal forests at varying elevations depending on latitude.

Divisions: 204:C; 206:C

Nations: CA, US

Subnations: BC, CA, NV, OR, WA

Map Zones: 1:C, 2:C, 3:C, 4:C, 6:C, 7:C, 8:?, 9:P, 12:?

USFS Ecomap Regions: 262A:PP, 263A:PP, 322A:CC, 331A:PP, 341D:CC, 342B:C?, 342H:CC, 342I:CP, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261B:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 3:C, 4:C, 5:C, 12:C, 16:C, 69:?, 81:C

SOURCES

References: Banner et al. 1993, Barbour and Major 1988, Comer et al. 2003, DeLong 2003, DeLong et al. 1990, DeLong et al. 1993, Holland and Keil 1995, Lloyd et al. 1990, MacKenzie and Moran 2004, MacKinnon et al. 1990, Meidinger et al. 1988, Sawyer and Keeler-Wolf 1995, Steen and Coupe 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722707#references

Description Author: P. Comer, mod. G. Kittel and C. Chappell

Version: 31 Mar 2005

Concept Author: P. Comer

Stakeholders: Canada, West

ClassifResp: West

1668 TEMPERATE PACIFIC TIDAL SALT AND BRACKISH MARSH (CES200.091)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saline Water Chemistry; 30-180-day hydroperiod; Temperate [Temperate Hyperoceanic]; Temperate [Temperate Oceanic]; Tidal / Estuarine [Haline]; Tidal / Estuarine [Oligohaline]

National Mapping Codes: EVT 2668; ESLF 9281; ESP 1668

CONCEPT

Summary: Intertidal salt and brackish marshes are found throughout the Pacific Coast, from Kodiak Island and south-central Alaska to the central California coast. They are primarily associated with estuaries or coastal lagoons. Salt marshes are limited to bays and behind sand spits or other locations protected from wave action. Typically these areas form with a mixture of inputs from freshwater sources into coastal saltwater, so they commonly co-occur with brackish marshes. This is a small-patch system, confined to specific environments defined by ranges of salinity, tidal inundation regime, and soil texture. Patches usually occur as zonal mosaics of multiple communities. They vary in location and abundance with daily and seasonal dynamics of freshwater input from inland balanced against evaporation and tidal flooding of saltwater. Summer-dry periods result in decreased freshwater inputs from inland. Hypersaline environments within salt marshes occur in "salt pans" where tidal water collects and evaporates. Characteristic plant species include *Distichlis spicata*, *Monanthochloe littoralis*, *Limonium californicum*, *Jaumea carnosa*, *Salicornia* spp., *Suaeda* spp., *Batis maritima*, and *Triglochin* spp. Low marshes are located in areas that flood every day and are dominated by a variety of low-growing forbs and low to medium-height graminoids, especially *Salicornia virginica*, *Distichlis spicata*, *Schoenoplectus maritimus* (= *Scirpus maritimus*), *Schoenoplectus americanus* (= *Scirpus americanus*), *Carex lyngbyei*, and *Triglochin maritima*. In Alaska, tidal marshes are often dominated by near-monotypic stands of *Carex lyngbyei*, while the frequently inundated lower salt marshes are often dominated by *Eleocharis palustris* or *Puccinellia* spp. Other common species in Alaska include *Hippuris tetraphylla*, *Plantago maritima*, *Cochlearia groenlandica* (= *Cochlearia officinalis*), *Spergularia canadensis*, *Honckenya peploides*, or *Glaux maritima*. In the Cook Inlet and Alaska Peninsula, *Carex ramenskii* may be an associated species. High marshes are located in areas that flood infrequently and are dominated by medium-tall graminoids and low forbs, especially *Deschampsia caespitosa*, *Argentina egedii*, *Juncus balticus*, and *Symphotrichum subspicatum* (= *Aster subspicatus*), and in Alaska *Poa eminens*, *Argentina egedii*, *Festuca rubra*, and *Deschampsia caespitosa*. Transition zone (slightly brackish) marshes are often dominated by *Typha* spp. or *Schoenoplectus acutus*. *Atriplex prostrata* (= *Atriplex triangularis*), *Juncus mexicanus*, *Phragmites* spp., *Cordylanthus* spp., and *Lilaeopsis masonii* are important species in California. The invasive weed *Lepidium latifolium* is a problem in many of these marshes. Rare plant species include *Cordylanthus maritimus* ssp. *maritimus*.

Classification Comments: Discussions with John Christy and Todd Keeler-Wolf led to lumping all West Coast salt and brackish marshes into one system because they co-occur so intimately and frequently, are not readily distinguished without detailed on-the-ground surveys, and are totally intergraded (seemingly continuous variation) in terms of degree of salinity and resulting vegetation. This system encompasses a very large geographic range. We may want to split it into two types, on a north-south gradient. However, the species composition and environmental settings of tidal marshes throughout the temperate Pacific region are markedly similar. Where to make a split that would make sense biogeographically is hard to determine. For now, they are maintained as one ecological system.

Related Concepts:

- III.A.3.h - Halophytic grass wet meadow (Viereck et al. 1992) Intersecting
- III.A.3.i - Halophytic sedge wet meadow (Viereck et al. 1992) Intersecting
- III.B.3.d - Halophytic herb wet meadow (Viereck et al. 1992) Intersecting
- III.D.2.a - Four-leaf marestalk (Viereck et al. 1992) Intersecting
- Wetlands (217) (Shiflet 1994) Broader

DESCRIPTION

Environment: The frequency of tidal flooding and salinity vary widely. Soils are usually fine-textured and saturated. Tidal marshes have a limited distribution along the Gulf of Alaska and British Columbia coastline due to the topography and geomorphology of the coast, which features steep slopes and deep fjords and offers limited protection from wave action (National Wetlands Working Group 1988).

MEMBERSHIP

Associations:

- *Argentina egedii* - *Juncus balticus* Herbaceous Vegetation (CEGL003382, G3G4)
- *Argentina egedii* - *Symphotrichum subspicatum* Herbaceous Vegetation (CEGL003288, G3G4)
- *Carex lyngbyei* - (*Distichlis spicata*, *Triglochin maritima*) Herbaceous Vegetation (CEGL003285, G4)
- *Carex lyngbyei* - *Argentina egedii* Herbaceous Vegetation (CEGL003289, G4)
- *Carex lyngbyei* Herbaceous Vegetation (CEGL003369, G4)

- *Deschampsia caespitosa* - (*Carex lyngbyei*, *Distichlis spicata*) Herbaceous Vegetation (CEGL003357, G3G4)
- *Deschampsia caespitosa* - *Argentina egedii* Herbaceous Vegetation (CEGL003383, G3G4)
- *Deschampsia caespitosa* - *Sidalcea hendersonii* Herbaceous Vegetation (CEGL003384, G2)
- *Distichlis spicata* - (*Salicornia virginica*) Herbaceous Vegetation (CEGL003356, G4)
- *Distichlis spicata* - *Frankenia salina* - *Jaumea carnosa* Herbaceous Vegetation (CEGL003462, G3)
- *Festuca rubra* - (*Argentina egedii*) Herbaceous Vegetation (CEGL003424, G1)
- *Glaux maritima* Herbaceous Vegetation [Provisional] (CEGL003286, G3)
- *Salicornia (bigelovii, virginica)* Tidal Herbaceous Vegetation [Provisional] (CEGL003123, GNRQ)
- *Salicornia virginica* - *Distichlis spicata* - *Triglochin maritima* - (*Jaumea carnosa*) Herbaceous Vegetation (CEGL003366, G3)
- *Salicornia virginica* Herbaceous Vegetation (CEGL003380, G3G4)
- *Schoenoplectus (americanus, pungens)* Tidal Herbaceous Vegetation [Provisional] (CEGL003367, G3)
- *Schoenoplectus maritimus* Tidal Herbaceous Vegetation [Provisional] (CEGL003287, G3)
- *Triglochin maritima* - (*Salicornia virginica*) Herbaceous Vegetation (CEGL003381, G4)

Alliances:

- *Argentina egedii* Tidal Herbaceous Alliance (A.2621)
- *Carex lyngbyei* Tidal Herbaceous Alliance (A.2622)
- *Deschampsia caespitosa* Tidal Herbaceous Alliance (A.2623)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Distichlis spicata* Pacific Coast Tidal Herbaceous Alliance (A.2666)
- *Festuca rubra* Tidal Herbaceous Alliance (A.2583)
- *Salicornia virginica* Tidal Herbaceous Alliance (A.2618)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Temperate Pacific Intertidal Flat (CES204.879)

DISTRIBUTION

Range: This system is found throughout the Pacific Coast, from Kodiak Island and south-central Alaska to the California coast.

Divisions: 204:C

Nations: CA, MX, US

Subnations: AK, BC, CA, MXBC(MX), OR, WA

Map Zones: 1:C, 2:C, 3:C, 4:C, 75:C, 76:C, 77:C, 78:C

USFS Ecomap Regions: 242A:CC, 261B:CC, 263A:CC, M242A:CC

TNC Ecoregions: 1:C, 2:C, 3:C, 14:C, 15:C, 16:C, 69:C, 70:C, 71:C

SOURCES

References: Barbour and Major 1988, Boggs 2000, Boggs 2002, Chappell and Christy 2004, Holland and Keil 1995, National Wetlands Working Group 1988, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Sparks et al. 1977, Viereck et al. 1992, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.768145#references

Description Author: K. Boggs, C. Chappell, G. Kittel, mod. T. Keeler-Wolf, M.S. Reid

Version: 22 Aug 2008

Stakeholders: Canada, Latin America, West

Concept Author: K. Boggs, C. Chappell, G. Kittel

ClassifResp: West

TEXAS COASTAL BEND SEAGRASS BED (CES203.474)

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Herbaceous Wetland**Spatial Scale & Pattern:** Matrix**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Tidal / Estuarine; Aquatic Herb**Non-Diagnostic Classifiers:** Herbaceous**National Mapping Codes:** ESLF 9287**CONCEPT**

Summary: This system includes seagrass beds occurring along the Texas Coast south of San Antonio Bay. Dominants may include, individually or in admixtures with other seagrasses, *Cymodocea filiformis*, which is restricted in Texas to this ecological system, *Halophila engelmannii* or *Halodule beaudettei*, which occupy thousands of acres of the Laguna Madre, and *Thalassia testudinum*. This system includes Texas' largest occurrences of *Thalassia testudinum* and *Halophila engelmannii*. Other dominants may include *Ruppia maritima*.

DESCRIPTION

Environment: This system occurs in clear shallow marine waters on muddy or sandy substrates.

Vegetation: As a result of natural climatic perturbations, such as tropical storms and hurricanes and human-induced disturbances, seagrass beds are often dynamic in their composition and size. As seagrasses are periodically uprooted by sea currents, turbulent waters, and exceptionally high tides, they are usually deposited in great masses on the beaches. *Thalassia testudinum*, along with *Cymodocea filiformis* are considered competitively superior to *Halodule beaudettei* and may succeed this species in bays with optimum environments. Dramatic conversion of shoal-grass beds to beds dominated by these other two species, especially *Thalassia testudinum*, has occurred in the Laguna Madre of Texas (Onuf 1995). *Halophila engelmannii* often occurs in deeper waters than other seagrasses.

MEMBERSHIP**Associations:**

- *Cymodocea filiformis* - (*Thalassia testudinum*) Herbaceous Vegetation (CEGL004317, G4?)
- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Louisianian Zone Herbaceous Vegetation (CEGL004450, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Cymodocea filiformis* Permanently Flooded - Tidal Herbaceous Alliance (A.1732)
- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: This system is found along the Gulf Coast of Texas south of San Antonio Bay.

Divisions: 203:C; 301:C**Nations:** US**Subnations:** TX**Map Zones:** 36:C**TNC Ecoregions:** 31:C**SOURCES****References:** Comer et al. 2003, Onuf 1995**Full References:**See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723112#references**Description Author:** J. Teague**Version:** 14 Jan 2003**Concept Author:** J. Teague**Stakeholders:** Southeast**ClassifResp:** Southeast

1486 TEXAS SALINE COASTAL PRAIRIE (CES203.543)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; West Gulf Coastal Plain; Extensive Wet Flat; Saline Substrate Chemistry

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2486; ESLF 9207; ESP 1486

CONCEPT

Summary: This system encompasses grassland vegetation occurring on saline soils that are often saturated by local rainfall and periodically flooded by saline waters during major storm events. It is located along the Gulf Coast of Texas. Saline prairie continues to occupy extensive areas, though quality of the system is often degraded by the invasion of woody shrubs due to the absence of regular fire. Fire is an important ecological process needed to maintain this system, though periodic submersion with saltwater during storm events also helps to control the invasion of woody species. This system is characteristically dominated by *Spartina spartinae*; other dominants may include *Schizachyrium littorale* and *Muhlenbergia capillaris*. This system includes depressions often dominated by *Spartina patens*.

DESCRIPTION

Environment: This system occurs on saline soils that are often saturated by local rainfall and periodically flooded by saline waters during major storm events.

Vegetation: This system is characteristically dominated by *Spartina spartinae*; other dominants may include *Schizachyrium littorale* and *Muhlenbergia capillaris*. This system includes depressions often dominated by *Spartina patens*. Some more disturbed stands of this system may contain *Baccharis halimifolia*.

Dynamics: Fire is an important ecological process needed to maintain this system, though periodic submersion with saltwater during storm events also helps to control the invasion of woody species.

MEMBERSHIP

Associations:

- *Baccharis halimifolia* Successional Shrubland (CEGL004657, GNA)
- *Muhlenbergia capillaris* Herbaceous Vegetation (CEGL004607, G1G2)
- *Spartina spartinae* - *Schizachyrium scoparium* Herbaceous Vegetation (CEGL002231, G3)
- *Spartina spartinae* Herbaceous Vegetation (CEGL004608, G4)

Alliances:

- *Baccharis halimifolia* Saturated Shrubland Alliance (A.1015)
- *Muhlenbergia capillaris* Herbaceous Alliance (A.1216)
- *Spartina spartinae* Saturated Herbaceous Alliance (A.1230)

DISTRIBUTION

Range: This system is only found along the Gulf Coast of Texas.

Divisions: 203:C

Nations: US

Subnations: TX

Map Zones: 36:C, 37:P

USFS Ecomap Regions: 255D:CC, 315E:PP

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723059#references

Description Author: J. Teague, mod. M. Pyne

Version: 27 Jun 2007

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

1487 TEXAS-LOUISIANA COASTAL PRAIRIE PONDSHORE (CES203.541)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: West Gulf Coastal Plain; Hardpan; Depressional; Graminoid

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]; Palustrine

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2487; ESLF 9208; ESP 1487

CONCEPT

Summary: This system includes small to moderately large ponds and swales in the coastal prairie of southeastern Texas and adjacent Louisiana. These wetlands contain surface water during much of the year, desiccating only in the driest summer months. They are often fed by water runoff but may result from percolation from adjacent sandy areas. Soils in the basins are finer-textured than surrounding areas and may be underlain by pans that enhance perched water tables in the winter. These wetlands occur within the coastal prairie matrix of southeastern Texas and Louisiana and are wetter than wet prairie dominated by *Tripsacum dactyloides* and *Panicum virgatum*. These wetlands may be dominated by *Eleocharis quadrangulata*. Other species that may be present include *Sagittaria papillosa*, *Sagittaria longiloba*, *Steinchisma hians*, *Panicum virgatum*, *Cyperus haspan*, *Cyperus virens*, *Ludwigia glandulosa*, *Ludwigia linearis*, *Fuirena squarrosa*, *Xyris jupicai*, *Leersia hexandra*, *Centella erecta*, *Symphyotrichum subulatum* (= *Aster subulatus*), *Sesbania* spp., and *Rhynchospora* spp. Open areas in the ponds may contain floating and submersed aquatic vegetation, including *Stuckenia pectinata*, *Ceratophyllum demersum*, *Brasenia schreberi*, *Nymphoides aquatica*, *Nuphar lutea*, and *Nelumbo lutea*.

Similar Ecological Systems:

- Texas-Louisiana Coastal Prairie (CES203.550)

DESCRIPTION

Environment: Examples of this system are often fed by water runoff but may result from percolation from adjacent sandy areas. Soils in the basins are finer-textured than surrounding areas and may be underlain by pans that enhance perched water tables in the winter.

Vegetation: Examples of this system are typically dominated by *Eleocharis quadrangulata*. Other species that may be present include *Sagittaria papillosa*, *Sagittaria longiloba*, *Steinchisma hians*, *Panicum virgatum*, *Cyperus haspan*, *Cyperus virens*, *Ludwigia glandulosa*, *Ludwigia linearis*, *Fuirena squarrosa*, *Xyris jupicai*, *Leersia hexandra*, *Centella erecta*, *Symphyotrichum subulatum* (= *Aster subulatus*), *Sesbania* spp., and *Rhynchospora* spp. Open areas in the ponds may contain floating and submersed aquatic vegetation, including *Stuckenia pectinata*, *Ceratophyllum demersum*, *Brasenia schreberi*, *Nymphoides aquatica*, *Nuphar lutea*, and *Nelumbo lutea*.

MEMBERSHIP

Associations:

- *Brasenia schreberi* Herbaceous Vegetation (CEGL004527, G4?)
- *Eleocharis quadrangulata* - *Sagittaria* spp. Herbaceous Vegetation (CEGL007929, G3?)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Potamogeton nodosus* Herbaceous Vegetation (CEGL004529, GNR)
- *Stuckenia pectinata* - *Ceratophyllum demersum* Texas Coastal Herbaceous Vegetation (CEGL004147, G3G4)

Alliances:

- *Brasenia schreberi* Permanently Flooded Herbaceous Alliance (A.1742)
- *Eleocharis quadrangulata* - *Sagittaria* spp. Seasonally Flooded Herbaceous Alliance (A.1990)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)

DISTRIBUTION

Range: This system is restricted to the coastal prairie of southeastern Texas and Louisiana.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 36:C, 37:C, 98:C

USFS Ecomap Regions: 232E:CC, 255D:CC

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723061#references

Description Author: J. Teague

Version: 18 Apr 2005

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

TEXAS-LOUISIANA FRESH-OLIGOHALINE SUBTIDAL AQUATIC VEGETATION (CES203.511)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9277

CONCEPT

Summary: This system includes subtidal beds of aquatic vegetation in fresh to oligohaline tidal waters of the Gulf of Mexico in Louisiana and Texas. Species composition may include *Stuckenia pectinata* (= *Potamogeton perfoliatus*), *Zannichellia palustris*, *Vallisneria americana*, *Najas guadalupensis*, and *Ruppia maritima*. It is found in the Trinity Bay portion of the Galveston Bay complex along the upper coast of Texas. Although the substrate of most Texas bays is sand, this system occurs on mud-dominated substrates (Adair et al. 1994). This system is also distinguished by the prevalence of oligohaline waters, whereas other Texas bays are considerably more saline. As a consequence, the predominant species, *Najas guadalupensis* and *Vallisneria americana*, which are salt intolerant, are able to attain dominance here. Both species are largely restricted to the northeastern portions of the bay where they are protected by a sand bar system which restricts wave action and turbidity. The extent and quality of this system have been heavily reduced by shoreline development and associated draining and filling, bulkheading, and channelization. Seagrass communities are declining in many bays along the Texas coast.

MEMBERSHIP

Associations:

- *Potamogeton perfoliatus* - (*Stuckenia pectinata*, *Zannichellia palustris*) Permanently Flooded - Tidal Herbaceous Vegetation (CEGL007689, GNR)
- *Vallisneria americana* Estuarine Bayou Herbaceous Vegetation (CEGL004634, G3G5)

Alliances:

- *Stuckenia pectinata* - *Zannichellia palustris* Permanently Flooded Herbaceous Alliance (A.1768)
- *Vallisneria americana* Permanently Flooded - Tidal Herbaceous Alliance (A.1770)

DISTRIBUTION

Range: Gulf of Mexico in Louisiana and Texas.

Divisions: 203:C

Nations: US

Subnations: LA, TX

Map Zones: 36:?, 37:C

TNC Ecoregions: 31:C

SOURCES

References: Adair et al. 1994, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723078#references

Description Author: J. Teague and R. Evans, mod. M. Pyne

Version: 30 Jan 2006

Concept Author: J. Teague and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

UPPER TEXAS COAST SEAGRASS BED (CES203.545)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline)

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9401

CONCEPT

Summary: This system includes seagrass communities occurring in bays along the upper Texas coast north of and including San Antonio Bay. It includes vegetation dominated by *Thalassia testudinum*, *Halophila engelmannii*, *Ruppia maritima*, or *Halodule beaudettei*. Many of these occurrences have declined in extent. Seagrass communities are declining in many bays along the Texas coast.

DESCRIPTION

Environment: See Adair et al. (1994). Examples are found in Christmas Bay, San Antonio Bay, and Copano Bay.

Vegetation: Some of the seagrass species found in examples of this system include *Halodule beaudettei*, *Halophila engelmannii*, *Ruppia maritima*, and *Thalassia testudinum*.

MEMBERSHIP

Associations:

- *Halodule wrightii* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Louisianian Zone Herbaceous Vegetation (CEGL004450, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Halodule wrightii* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: This system is found in bays along the upper Texas coast north of and including San Antonio Bay.

Divisions: 203:C

Nations: US

Subnations: TX

Map Zones: 37:C

TNC Ecoregions: 31:C

SOURCES

References: Adair et al. 1994, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723057#references

Description Author: J. Teague, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

WEST GULF COASTAL PLAIN HERBACEOUS SEEP AND BOG (CES203.194)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: West Gulf Coastal Plain; Seepage-Fed Sloping; Very Short Disturbance Interval; Graminoid

Non-Diagnostic Classifiers: Herbaceous; Palustrine

National Mapping Codes: ESLF 9298

CONCEPT

Summary: This wet, fire-maintained, hillside seepage system occurs in the Gulf Coastal Plain west of the Mississippi River where it is documented in eastern Texas, western Louisiana, and adjacent areas of southern Arkansas. This oligotrophic wetland is maintained by seepage at the zone between an overlying, permeable sandy layer and a lower layer of relatively impermeable material such as sandstone or clay. The vegetation of intact examples is dominated by a dense, species-rich graminoid-forb layer less than 1 m tall with continuous to nearly continuous cover, typically 80-90%. This type is intended to encompass the range of variation present in West Gulf Coastal Plain seepage bogs, although various authors have recognized a number of different subtypes. One of the most distinct variants that is included here for now is the "muck bog" of the Post Oak Savanna and Cross Timbers regions. It differs in a number of ways from most other examples of this system and may need to be recognized as a distinct ecological system.

DESCRIPTION

Environment: This oligotrophic wetland is maintained by seepage at the zone between an overlying, permeable sandy layer and a lower layer of relatively impermeable material such as sandstone or clay.

Vegetation: *Sarracenia alata* is often the aspect dominant of this system. Emergent stems of *Toxicodendron vernix*, *Magnolia virginiana*, *Persea borbonia*, and/or *Pinus palustris* may be present even in well-burned examples. Woody shrubs have a cover of less than 10% in frequently burned examples but increase greatly with reductions in fire frequency. This type is intended to encompass the range of variation present in West Gulf Coastal Plain seepage bogs, although various authors have recognized a number of different subtypes. For more information, see Bridges and Orzell (1989a).

Dynamics: Frequent fires are essential to control invasion by wetland shrubs, although the wettest areas may persist in an herbaceous-dominated condition without fire. However, fire may also be necessary to stimulate growth, flowering and seed production of many herbaceous species found in this community. In the absence of fire, these bogs may become heavily wooded, resulting in the eventual elimination of the bog (Folkerts 1982). Increased development of woody species suppresses herbaceous species and potentially produces some drying effect by pumping larger volumes of water.

MEMBERSHIP

Associations:

- *Carex lurida* - *Andropogon glomeratus* - *Sarracenia alata* - *Symphotrichum puniceum* var. *scabriceule* - *Doellingeria sericocarpoides* Herbaceous Vegetation (CEGL008417, G1)
- *Dichantherium scoparium* - *Boehmeria cylindrica* / *Sphagnum* spp. - *Polytrichum commune* Herbaceous Vegetation (CEGL004916, G2Q)
- *Osmunda regalis* - *Osmunda cinnamomea* - *Eupatorium perfoliatum* - *Utricularia* sp. Herbaceous Vegetation [Provisional] (CEGL007974, G3?)
- *Sarracenia alata* - *Rhynchospora gracilentia* - *Rudbeckia scabrifolia* - *Schoenolirion croceum* Herbaceous Vegetation (CEGL004175, G2G3)

Alliances:

- *Dichantherium scoparium* Saturated Herbaceous Alliance (A.1457)
- *Osmunda (cinnamomea, regalis)* Saturated Herbaceous Alliance (A.1692)
- *Rhynchospora oligantha* - *Sarracenia* spp. - (*Aristida beyrichiana*, *Ctenium aromaticum*) - *Osmunda cinnamomea* / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)

DISTRIBUTION

Range: This system occurs in the Gulf Coastal Plain west of the Mississippi River where it is documented in eastern Texas, western Louisiana, and adjacent areas of southern Arkansas. There are rare examples of this (or a related system) found in the Post Oak Savanna and Crosstimbers regions of Texas.

Divisions: 203:C; 205:C

Nations: US

Subnations: AR?, LA, TX

Map Zones: 32:?, 35:?, 36:C, 37:C

TNC Ecoregions: 32:C, 40:C, 41:C

SOURCES

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

References: Bridges and Orzell 1989a, Comer et al. 2003, Folkerts 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723247#references

Description Author: R. Evans, mod. M. Pyne

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

WESTERN GREAT PLAINS CLOSED DEPRESSION WETLAND (CES303.666)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Clay Subsoil Texture; Impermeable Layer; Saturated Soil; Lowland [Lowland]; Playa; Herbaceous; Depressional; Isolated Wetland [Strictly Isolated]; Depression

National Mapping Codes: ESLF 9252

CONCEPT

Summary: Communities associated with the playa lakes in the southern areas of this province and the rainwater basins in Nebraska characterize this system. They are primarily upland depressional basins. This hydric system is typified by the presence of an impermeable layer such as a dense clay, hydric soil and is usually recharged by rainwater and nearby runoff. They are rarely linked to outside groundwater sources and do not have an extensive watershed. Ponds and lakes associated with this system can experience periodic drawdowns during drier seasons and years, and are often replenished by spring rains. *Eleocharis* spp., *Hordeum jubatum*, along with common forbs such as *Coreopsis tinctoria*, *Symphytotrichum subulatum* (= *Aster subulatus*), and *Polygonum pensylvanicum* (= *Polygonum bicornne*) are common vegetation in the wetter and deeper depression, while *Pascopyrum smithii* and *Buchloe dactyloides* are more common in shallow depressions in rangeland. Species richness can vary considerably among individual examples of this system and is especially influenced by adjacent land use, which is often agriculture, and may provide nutrient and herbicide runoff. Dynamic processes that affect these depressions are hydrological changes, grazing, and conversion to agricultural use.

Classification Comments: Open and emergent marshes may be a separate system from wet meadows and wet prairies. This system needs to be more clearly distinguished from the similar open depressional wetlands of the western Great Plains, as well as from Great Plains Prairie Pothole (CES303.661).

Similar Ecological Systems:

- Inter-Mountain Basins Alkaline Closed Depression (CES304.998)
- North American Arid West Emergent Marsh (CES300.729)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)
- Western Great Plains Saline Depression Wetland (CES303.669)

Related Concepts:

- Bluestem Prairie (601) (Shiflet 1994) Intersecting. *Spartina pectinata* wet swales occur as inclusions in this SRM type, but are classed into a wetland ecological system.

DESCRIPTION

Environment: This system is typified by upland depressional basins with an impermeable layer such as dense clay, hydric soils. Rainwater and runoff primarily recharge this system and it is rarely linked to outside groundwater sources.

Vegetation: Species richness varies considerably among individual examples of this system. Commonly, *Eleocharis* spp., *Hordeum jubatum*, along with *Coreopsis tinctoria*, *Symphytotrichum subulatum* (= *Aster subulatus*), and *Polygonum pensylvanicum* (= *Polygonum bicornne*) are found in the wetter and deeper depression. Shallower depressions in rangelands commonly contain *Pascopyrum smithii* and *Buchloe dactyloides*.

Dynamics: Hydrological changes, grazing and conversion to agriculture are the primary processes influencing this system.

MEMBERSHIP

Associations:

- *Argentina anserina* Herbaceous Vegetation [Provisional] (CEGL005825, GNA)
- *Eleocharis palustris* - (*Eleocharis compressa*) - *Leptochloa fusca* ssp. *fascicularis* Herbaceous Vegetation (CEGL002259, GNR)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Heteranthera limosa* - *Bacopa rotundifolia* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL002279, GNR)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Panicum obtusum* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001573, GNRQ)
- *Panicum obtusum* - *Panicum hallii* Herbaceous Vegetation (CEGL001575, GNR)
- *Pascopyrum smithii* - (*Elymus trachycaulus*) Clay Pan Herbaceous Vegetation (CEGL002239, GNR)
- *Pascopyrum smithii* - *Buchloe dactyloides* - (*Phyla cuneifolia*, *Oenothera canescens*) Herbaceous Vegetation (CEGL002038, G2G3)
- *Pascopyrum smithii* - *Distichlis spicata* Herbaceous Vegetation (CEGL001580, G4)
- *Pascopyrum smithii* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001581, G1)
- *Pascopyrum smithii* - *Hordeum jubatum* Herbaceous Vegetation (CEGL001582, G4)
- *Pleuraphis mutica* - *Panicum obtusum* Herbaceous Vegetation (CEGL001639, G3)
- *Polygonum* spp. - *Echinochloa* spp. - *Distichlis spicata* Playa Lake Herbaceous Vegetation (CEGL002039, G2G4)

- *Sarcobatus vermiculatus* / *Leymus cinereus* Shrubland (CEGL001366, G3)
- *Schoenoplectus americanus* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)

Alliances:

- *Argentina anserina* Herbaceous Alliance [Provisional] (A.2642)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Eleocharis palustris* Temporarily Flooded Herbaceous Alliance (A.1342)
- *Heteranthera limosa* Permanently Flooded Herbaceous Alliance (A.1744)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Panicum obtusum* Herbaceous Alliance (A.1238)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Pascopyrum smithii* Intermittently Flooded Herbaceous Alliance (A.1328)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Pleuraphis mutica* Intermittently Flooded Herbaceous Alliance (A.1330)
- *Polygonum* spp. - *Echinochloa* spp. Temporarily Flooded Herbaceous Alliance (A.1348)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

DISTRIBUTION

Range: This system can be found throughout the eastern portion of the Western Great Plains Division, however, it is most prevalent in the central states of Nebraska, Kansas and Oklahoma. In addition, it does occur farther to the west, in central and eastern Montana and eastern Wyoming.

Divisions: 205:P; 303:C

Nations: US

Subnations: CO, KS, MT, NE, NM, OK, SD, TX, WY

Map Zones: 20:?, 22:C, 25:?, 26:P, 29:P, 30:P, 31:P, 32:P, 33:C, 34:C, 35:?, 36:P, 38:C

USFS Ecomap Regions: 251F:CC, 251G:CC, 251H:CC, 315F:PP, 331B:CP, 331C:CC, 331D:C?, 331E:CC, 331F:CC, 331G:CP, 331H:CC, 331K:CP, 331L:CP, 331M:CP, 332B:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC

TNC Ecoregions: 26:C, 27:C, 28:C, 32:P, 33:C

SOURCES

References: Comer et al. 2003, Hoagland 2000, Lauver et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722992#references

Description Author: S. Menard and K. Kindscher

Version: 14 Dec 2004

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

WESTERN GREAT PLAINS OPEN FRESHWATER DEPRESSION WETLAND (CES303.675)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saturated Soil; Herbaceous; Depressional; Isolated Wetland [Partially Isolated]; Depression

National Mapping Codes: ESLF 9218

CONCEPT

Summary: This Great Plains emergent marsh ecological system is composed of lowland depressions; it also occurs along lake borders that have more open basins and a permanent water source through most of the year, except during exceptional drought years. These areas are distinct from Western Great Plains Closed Depression Wetland (CES303.666) by having a large watershed and/or significant connection to the groundwater table. A variety of species are part of this system, including emergent species of *Typha*, *Carex*, *Eleocharis*, *Juncus*, *Spartina*, and *Schoenoplectus*, as well as floating genera such as *Potamogeton*, *Sagittaria*, *Stuckenia*, or *Ceratophyllum*. The system includes submergent and emergent marshes and associated wet meadows and wet prairies. These types can also drift into stream margins that are more permanently wet and linked directly to the basin via groundwater flow from/into the pond or lake. Some of the specific communities will also be found in the floodplain system and should not be considered a separate system in that case. These types should also not be considered a separate system if they are occurring in lowland areas of the prairie matrix only because of an exceptional wet year.

Classification Comments: This system occurs widely throughout the western Great Plains, but in the arid shortgrass region, it is replaced by North American Arid West Emergent Marsh (CES300.729). Open and emergent marshes may be a separate system from wet meadows and wet prairies. More clarification needs to be made between this system and other depressional wetlands occurring in Wyoming and Montana, such as the Inter-Mountain Basins Alkaline Closed Depression (CES304.998), Great Plains Prairie Pothole (CES303.661), and the other western Great Plains depressional wetland systems.

Similar Ecological Systems:

- North American Arid West Emergent Marsh (CES300.729)
- Western Great Plains Closed Depression Wetland (CES303.666)
- Western Great Plains Saline Depression Wetland (CES303.669)

DESCRIPTION

Environment: This system is found within lowland depressions and along lakes that have more permanent water sources throughout the year. These areas typically have a large watershed and are connected to the groundwater sources. Examples may also drift into stream margins that are more permanently wet and linked to a basin via groundwater flow from/into a pond or lake. Those areas that are found within larger prairie matrix that are only lowland or wet because of an exceptional wet year are not part of this system.

Vegetation: Many species can be associated with this system with *Typha* spp. and *Schoenoplectus* spp. being common.

Dynamics: Hydrology is the primary process influencing this system. Grazing and conversion to agriculture can significantly impact the hydrology and species composition of this system.

MEMBERSHIP

Associations:

- *Alnus incana* Swamp Shrubland (CEGL002381, G5)
- *Betula occidentalis* - *Dasiphora fruticosa* ssp. *floribunda* Shrubland (CEGL001083, G2Q)
- *Calamagrostis canadensis* - *Juncus* spp. - *Carex* spp. Sandhills Herbaceous Vegetation (CEGL002028, G3G4)
- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex aquatilis* - *Carex* spp. Herbaceous Vegetation (CEGL002262, G4?)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex atherodes* Herbaceous Vegetation (CEGL002220, G3G5)
- *Carex interior* - *Eleocharis elliptica* - *Thelypteris palustris* Herbaceous Vegetation (CEGL002390, G1G2)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex pellita* - *Calamagrostis stricta* Herbaceous Vegetation (CEGL002254, G3G5)
- *Carex prairea* - *Schoenoplectus pungens* - *Rhynchospora capillacea* Herbaceous Vegetation (CEGL002267, G2)
- *Carex* spp. - *Triglochin maritima* - *Eleocharis quinqueflora* Marl Fen Herbaceous Vegetation (CEGL002268, G1?)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Cephalanthus occidentalis* / *Ampelopsis arborea* Shrubland (CEGL004182, GNA)
- *Ceratophyllum demersum* - *Stuckenia pectinata* Herbaceous Vegetation (CEGL004528, G4G5)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Eleocharis palustris* - (*Eleocharis compressa*) - *Leptochloa fusca* ssp. *fascicularis* Herbaceous Vegetation (CEGL002259, GNR)

- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Panicum virgatum* - (*Pascopyrum smithii*) Herbaceous Vegetation (CEGL001484, G2Q)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Polygonum amphibium* Permanently Flooded Herbaceous Vegetation [Placeholder] (CEGL002002, G5)
- *Polygonum pennsylvanicum* - *Polygonum lapathifolium* Herbaceous Vegetation (CEGL002277, G4?)
- *Polygonum* spp. - *Echinochloa* spp. - *Distichlis spicata* Playa Lake Herbaceous Vegetation (CEGL002039, G2G4)
- *Potamogeton nodosus* Herbaceous Vegetation (CEGL004529, GNR)
- *Potamogeton richardsonii* - *Myriophyllum spicatum* Herbaceous Vegetation (CEGL002006, G2Q)
- *Potamogeton* spp. - *Ceratophyllum demersum* Great Plains Herbaceous Vegetation (CEGL002044, G4G5)
- *Sagittaria cuneata* - *Sagittaria longiloba* Herbaceous Vegetation (CEGL004525, GNR)
- *Sagittaria latifolia* - *Leersia oryzoides* Herbaceous Vegetation (CEGL005240, GNR)
- *Salix nigra* / (*Cephalanthus occidentalis*) Forest (CEGL004773, G4G5)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Scolochloa festucacea* Herbaceous Vegetation (CEGL002260, G4G5)
- *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002027, G3?)
- *Spartina pectinata* - *Carex* spp. Herbaceous Vegetation (CEGL001477, G3?)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)
- *Spartina pectinata* - *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001478, G3?)
- *Stuckenia pectinata* - *Myriophyllum (sibiricum, spicatum)* Herbaceous Vegetation (CEGL002003, G3G4)
- *Stuckenia pectinata* - *Zannichellia palustris* Herbaceous Vegetation (CEGL002005, G3G4)
- *Typha (angustifolia, domingensis, latifolia)* - *Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032, G3G4)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)
- *Typha latifolia* - *Equisetum hyemale* - *Carex (hystericina, pellita)* Seep Herbaceous Vegetation (CEGL002033, G3)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)
- *Typha* spp. Great Plains Herbaceous Vegetation (CEGL002389, G4G5)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex atherodes* Seasonally Flooded Herbaceous Alliance (A.1396)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Carex* spp. - *Typha* spp. Saturated Herbaceous Alliance (A.1465)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Eleocharis palustris* Temporarily Flooded Herbaceous Alliance (A.1342)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Polygonum* spp. - *Echinochloa* spp. Temporarily Flooded Herbaceous Alliance (A.1348)
- *Potamogeton richardsonii* Permanently Flooded Herbaceous Alliance (A.1765)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Sagittaria latifolia* Semipermanently Flooded Herbaceous Alliance (A.1675)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Scolochloa festucacea* Seasonally Flooded Herbaceous Alliance (A.1401)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

- *Stuckenia pectinata* Permanently Flooded Herbaceous Alliance (A.1764)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system can occur throughout the Northwestern Great Plains Division but not in the arid shortgrass region.

Divisions: 205:P; 303:C

Nations: US

Subnations: KS, MT, ND, NE, OK, SD, TX, WY

Map Zones: 25:P, 26:C, 27:C, 29:C, 30:C, 31:C, 33:C, 34:C, 38:C

USFS Ecomap Regions: 331F:??

TNC Ecoregions: 26:C, 28:C, 29:C, 33:C, 34:C, 37:?, 66:P, 67:P

SOURCES

References: Comer et al. 2003, Hoagland 2000, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722983#references

Description Author: S. Menard and K. Kindscher

Version: 29 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

WESTERN GREAT PLAINS SALINE DEPRESSION WETLAND (CES303.669)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saline Water Chemistry; Herbaceous; Depressional; Isolated Wetland [Partially Isolated]; Depression

National Mapping Codes: ESLF 9256

CONCEPT

Summary: This ecological system is very similar to Western Great Plains Open Freshwater Depression Wetland (CES303.675) and Western Great Plains Closed Depression Wetland (CES303.666). However, strongly saline soils cause both the shallow lakes and depressions and the surrounding areas to be more brackish. Salt encrustations can occur on the surface in some examples of this system, and the soils are severely affected and have poor structure. Species that typify this system are salt-tolerant and halophytic species such as *Distichlis spicata*, *Sporobolus airoides*, and *Hordeum jubatum*. Other commonly occurring taxa include *Puccinellia nuttalliana*, *Salicornia rubra*, *Schoenoplectus maritimus*, *Schoenoplectus americanus*, *Suaeda calceoliformis*, *Spartina* spp., *Triglochin maritima*, and shrubs such as *Sarcobatus vermiculatus* and *Krascheninnikovia lanata*. During exceptionally wet years, an increase in precipitation can dilute the salt concentration in the soils of some examples of this system which may allow for less salt-tolerant species to occur. Communities found within this system may also occur in floodplains (i.e., more open depressions) but probably should not be considered a separate system unless they transition to areas outside the immediate floodplain.

Classification Comments: Open and emergent saline marshes may be a separate system from saline wet meadows and prairies. This system is often intimately associated (in space) with greasewood flats, and there is some overlap in the associations between the two. This system tends to be more of an herbaceous wetlands, whereas Inter-Mountain Basins Greasewood Flat (CES304.780) is more strongly shrub-dominated with patches of herb-dominance.

Similar Ecological Systems:

- North American Arid West Emergent Marsh (CES300.729)
- Western Great Plains Closed Depression Wetland (CES303.666)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)

Related Concepts:

- Wheatgrass - Saltgrass - Grama (615) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This system is distinct from the freshwater depression systems by its brackish nature caused by strongly saline soils. Salt encrustations could occur near the surface in some examples of this system.

Vegetation: Salt-tolerant and halophytic species such as *Distichlis spicata*, *Sporobolus airoides*, and *Hordeum jubatum* typify the system.

Dynamics: Hydrology processes primarily drive this system. Increases in precipitation and/or runoff can dilute the salt concentration and allow for less salt-tolerant species to occur. Conversion to agriculture and pastureland can also impact this system, especially when it alters the hydrology of the system.

MEMBERSHIP

Associations:

- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Distichlis spicata* - (*Hordeum jubatum*, *Poa arida*, *Sporobolus airoides*) Herbaceous Vegetation (CEGL002042, G3)
- *Distichlis spicata* - *Hordeum jubatum* - (*Poa arida*, *Iva annua*) Herbaceous Vegetation (CEGL002031, G2G3)
- *Distichlis spicata* - *Hordeum jubatum* - *Puccinellia nuttalliana* - *Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273, G2G3)
- *Distichlis spicata* - *Schoenoplectus maritimus* - *Salicornia rubra* Herbaceous Vegetation (CEGL002043, G1G2)
- *Distichlis spicata* - *Spartina* spp. Herbaceous Vegetation (CEGL002275, G4)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Pascopyrum smithii* - *Distichlis spicata* Herbaceous Vegetation (CEGL001580, G4)
- *Pascopyrum smithii* - *Hordeum jubatum* Herbaceous Vegetation (CEGL001582, G4)
- *Puccinellia nuttalliana* Herbaceous Vegetation (CEGL001799, G3?)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Sarcobatus vermiculatus* / *Distichlis spicata* - (*Puccinellia nuttalliana*) Shrub Herbaceous Vegetation (CEGL002146, GNR)
- *Sarcobatus vermiculatus* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Schoenoplectus americanus* - *Carex* spp. Herbaceous Vegetation (CEGL004144, GNR)
- *Schoenoplectus americanus* Great Plains Herbaceous Vegetation (CEGL002226, GNR)

- *Schoenoplectus maritimus* - *Schoenoplectus acutus* - (*Triglochin maritima*) Herbaceous Vegetation (CEGL002227, G3G5)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus pungens* - *Suaeda calceoliformis* Alkaline Herbaceous Vegetation (CEGL002040, G3G4)
- *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001587, G3G4)
- *Scolochloa festucacea* Herbaceous Vegetation (CEGL002260, G4G5)
- *Spartina pectinata* - *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001478, G3?)
- *Sporobolus airoides* Monotype Herbaceous Vegetation (CEGL001688, GUQ)
- *Sporobolus airoides* Northern Plains Herbaceous Vegetation (CEGL002274, GNR)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Stuckenia pectinata* - *Ruppia maritima* Herbaceous Vegetation (CEGL002004, G2?)
- *Stuckenia pectinata* - *Zannichellia palustris* Herbaceous Vegetation (CEGL002005, G3G4)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)
- *Typha* spp. Great Plains Herbaceous Vegetation (CEGL002389, G4G5)

Alliances:

- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Distichlis spicata* - (*Hordeum jubatum*) Temporarily Flooded Herbaceous Alliance (A.1341)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Puccinellia nuttalliana* Intermittently Flooded Herbaceous Alliance (A.1335)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Shrub Herbaceous Alliance (A.1535)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Scolochloa festucacea* Seasonally Flooded Herbaceous Alliance (A.1401)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Stuckenia pectinata* Permanently Flooded Herbaceous Alliance (A.1764)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

DISTRIBUTION

Range: This system can occur throughout the western Great Plains but is likely more prevalent in the south-central portions of the division. Its distribution extends as far west as central Montana and eastern Wyoming where it occurs in the matrix of Northwestern Great Plains Mixedgrass Prairie (CES303.674).

Divisions: 303:C

Nations: US

Subnations: CO, KS, MT, ND, NE, NM, OK, SD, TX, WY

Map Zones: 20:C, 25:?, 26:C, 27:C, 29:C, 30:C, 31:C, 33:C, 34:C, 35:?, 38:C, 39:?, 40:?

USFS Ecomap Regions: 315A:CC, 315B:CC, 315F:CC, 321A:CC, 331B:CC, 331C:CC, 331D:CP, 331E:CP, 331F:C?, 331G:CP, 331H:C?, 331I:CC, 331K:CC, 331L:CP, 331M:CP, 332E:CC, 332F:C?, M313B:CC

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C, 34:?

SOURCES

References: Comer et al. 2003, Hoagland 2000, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722989#references

Description Author: S. Menard and K. Kindscher, mod. M.S. Reid

Version: 29 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

WILLAMETTE VALLEY WET PRAIRIE (CES204.874)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saturated Soil; Lowland [Lowland]; Herbaceous; Extensive Wet Flat; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9221

CONCEPT

Summary: This system is largely restricted to the Willamette Valley of Oregon and adjacent Washington. It is nearly extirpated from the Puget Trough of Washington. These are high-nutrient wetlands that are temporarily to seasonally flooded. They are dominated primarily by graminoids, especially *Deschampsia caespitosa*, *Camassia quamash*, *Carex densa*, and *Carex unilateralis*, and to a lesser degree by forbs (e.g., *Isoetes nuttallii*) or shrubs (e.g., *Rosa nutkana*). Wet prairies historically covered large areas of the Willamette Valley where they were maintained by a combination of wetland soil hydrology and frequent burning. They have been reduced to tiny fragments of their former extent.

MEMBERSHIP

Associations:

- *Camassia quamash* Wet Prairie Herbaceous Vegetation (CEGL003341, G3)
- *Carex aperta* Herbaceous Vegetation (CEGL001801, G1?)
- *Carex densa* - *Deschampsia caespitosa* Herbaceous Vegetation [Provisional] (CEGL003455, G2)
- *Carex densa* - *Eleocharis palustris* Herbaceous Vegetation [Provisional] (CEGL003456, G3)
- *Deschampsia caespitosa* - *Danthonia californica* Herbaceous Vegetation (CEGL001604, G2)
- *Eleocharis palustris* - *Carex unilateralis* Herbaceous Vegetation (CEGL003411, G2)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Isoetes nuttallii* Herbaceous Vegetation (CEGL003343, G3)
- *Rosa nutkana* / *Deschampsia caespitosa* Shrubland [Provisional] (CEGL003344, G2)
- *Rosa nutkana* / *Oenanthe sarmentosa* Shrubland [Provisional] (CEGL003457, G1)

Alliances:

- *Camassia (cusickii, quamash)* Seasonally Flooded Herbaceous Alliance (A.2587)
- *Carex aperta* Saturated Herbaceous Alliance (A.1468)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Isoetes (bolanderi, tenella, occidentalis, nuttallii)* Permanently Flooded Herbaceous Alliance (A.1746)

DISTRIBUTION

Range: Restricted to the Willamette Valley of Oregon and adjacent Washington.

Divisions: 204:C

Nations: US

Subnations: OR, WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: 242A:CC, 242B:CC, M242A:??, M261A:CC, M261D:C?

TNC Ecoregions: 2:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722801#references

Description Author: C. Chappell

Version: 21 Nov 2003

Concept Author: C. Chappell

Stakeholders: West

ClassifResp: West

MIXED UPLAND AND WETLAND

1464 ACADIAN SUB-BOREAL SPRUCE BARRENS (CES201.561)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Sandplains/Glacial Outwash or Flats; Glaciated; Acidic Soil; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*

Non-Diagnostic Classifiers: Acidic Water; Lowland; Toeslope/Valley Bottom; Oligotrophic Soil; Mineral: W/ A-Horizon >10 cm; Udic; Unconsolidated; Long Disturbance Interval; F-Landscape/Medium Intensity; Needle-Leaved Tree; Broad-Leaved Deciduous Shrub; Broad-Leaved Evergreen Shrub

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2464; ESLF 9133; ESP 1464

CONCEPT

Summary: These barrens occur at the southeastern periphery of the boreal forest in northeastern North America. They form on sandplains and coarse outwash that often have undulating topography. Substrate microtopography can result in wetland pockets interspersed with upland areas. North of the range of most pine (except *Pinus banksiana*), *Picea mariana* tends to be the dominant tree. *Picea rubens* and red/black spruce hybrids are also common in the southern part of the range. Dwarf heath shrubs are extensive and diagnostic. Lichens, especially reindeer lichens, are often abundant in the ground layer. Vegetation physiognomy can vary within sites and can range from nearly closed forest to sparse trees over a dense dwarf heath understory. Fire is an important disturbance vector.

Classification Comments: This system is ecologically similar to open expressions of Boreal Jack Pine-Black Spruce Forest (CES103.022) of the upper Midwest and adjacent Canada but differs in lacking *Pinus banksiana* and in frequently having *Picea rubens* or its hybrids.

Similar Ecological Systems:

- Boreal Jack Pine-Black Spruce Forest (CES103.022)

MEMBERSHIP

Associations:

- *Picea mariana* - *Picea rubens* / *Rhododendron canadense* / *Cladina* spp. Woodland (CEGL006421, GNR)
- *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) - *Cladina rangiferina* Dwarf-shrubland (CEGL006426, GNR)

Alliances:

- *Picea mariana* Woodland Alliance (A.3504)
- *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) Dwarf-shrubland Alliance (A.1113)

DISTRIBUTION

Range: This system is found in far-northern New England and is more widely distributed in adjacent eastern Canada.

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: ME, NB, NH, QC, VT

Map Zones: 66:C

TNC Ecoregions: 48:P, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723043#references

Description Author: S.C. Gawler

Version: 29 Oct 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest
ClassifResp: East

1465 ACADIAN SUB-BOREAL SPRUCE FLAT (CES201.562)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Toeslope/Valley Bottom; Glaciated; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*

Non-Diagnostic Classifiers: Short (<5 yrs) Flooding Interval [Short interval, Spring Flooding]; Extensive Wet Flat; Isolated Wetland [Partially Isolated]; Mesotrophic Soil; Acidic Soil; Mineral: W/ A-Horizon >10 cm; Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2465; ESLF 9134; ESP 1465

CONCEPT

Summary: These spruce-fir forests are found in the colder regions of the northern Appalachians-Acadian region, in areas of imperfectly drained soils where they often form extensive flats along valley bottoms. The nutrient-poor acidic soils are typically saturated at snowmelt but are moderately well-drained for much of the growing season and may be reasonably dry at the soil surface. The mostly closed-canopy forests have *Picea rubens*, *Picea mariana*, and *Abies balsamea* as the dominant trees; other conifers are often present. Bryophytes are abundant in the ground layer; other layers are typically rather sparse. Many occurrences may be jurisdictional wetlands due to seasonal saturation, but the vegetation is primarily made up of upland or facultative species. The distribution in the Laurentian-Acadian Division is mostly Canadian.

Classification Comments: This might be considered as a component of Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565) but differs from that type *sensu stricto* in its hydrology (wetland vs. upland) and in that its range is somewhat more boreal. Alternatively, it shares some characteristics with Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574) but is more boreal in nature and appears to be typically not on consistently saturated soils. Information from Quebec and New Brunswick would be helpful in assessing its placement.

Similar Ecological Systems:

- Acadian Low-Elevation Spruce-Fir-Hardwood Forest (CES201.565)
- Laurentian-Acadian Swamp Systems (CES201.637)
- Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574)

MEMBERSHIP

Associations:

- *Picea mariana* - *Picea rubens* / *Pleurozium schreberi* Forest (CEGL006361, GNR)

Alliances:

- *Picea mariana* Forest Alliance (A.149)

DISTRIBUTION

Range: This system is found in the northernmost parts of New England, north and east into Canada.

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: ME, NB, NH, NY, QC, VT

Map Zones: 64:C, 66:C

TNC Ecoregions: 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723042#references

Description Author: S.C. Gawler

Version: 29 Oct 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East

ClassifResp: East

BOREAL ICE-SCOUR RIVERSHORE (CES103.589)

CLASSIFIERS

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Intermittent Flooding [Intermittent interval, Spring Flooding]; Intermittent Flooding [Intermittent interval, Summer Flooding]; Moderate (100-500 yrs) Persistence; Shrubland (Shrub-dominated); Herbaceous; Riverine / Alluvial; Glaciated; Very Short Disturbance Interval; Flood Scouring

Non-Diagnostic Classifiers: Mesotrophic Water; Saturated Soil; Lowland; Toeslope/Valley Bottom; Mesotrophic Soil; Circumneutral Soil; Acidic Soil; Mineral: W/ A-Horizon <10 cm; Udic

National Mapping Codes: ESLF 9332

CONCEPT

Summary: This riparian system occurs in the extreme northeastern and north-central U.S. and adjacent Canada. It develops along the shores of northern rivers, where early spring snowmelt and ice-scour exert a strong influence on the vegetation. The ice prevents floodplain forests from developing; the vegetation consists of shrublands, tall grasslands, graminoid-forb-dwarf shrub shoreline seeps, and rivershore outcrops. Characteristic shrubs include *Alnus incana* and *Alnus viridis ssp. crispa* (= *Alnus crispa*), *Myrica gale*, *Spiraea alba*, *Cornus sericea*, *Salix eriocephala* and many other *Salix* spp., and *Dasiphora fruticosa ssp. floribunda*. Characteristic herbaceous species vary with the setting; *Calamagrostis canadensis* is ubiquitous, and other herbs include *Symphyotrichum novi-belgii*, *Carex* spp. (including *Carex flava*, *Carex garberi*, *Carex viridula*), *Deschampsia caespitosa*, *Andropogon gerardii*, *Schizachyrium scoparium*, *Allium schoenoprasum*, *Triantha glutinosa*, *Spartina pectinata*, *Solidago uliginosa*, *Doellingeria umbellata* (= *Aster umbellatus*), *Agrostis scabra*, and many others. Soils in some areas remain saturated; other patches are well-drained for most of the growing season. The location and extent of shrub versus herb cover will vary in time and space according to how recent and severe the scour events have been. The continual weathering of glacial deposits in the river channel can produce relatively high pH conditions; this and periodic natural disturbance create conditions for many regionally rare plant species.

Classification Comments: Need to clarify the conceptual boundaries between this and the boreal rivershores in central and eastern Canada.

MEMBERSHIP

Associations:

- *Alnus incana* - *Cornus (amomum, sericea)* / *Clematis virginiana* Shrubland (CEGL006062, G4G5)
- *Calamagrostis canadensis* - *Doellingeria umbellata* - *Spartina pectinata* Herbaceous Vegetation (CEGL006427, GNR)
- *Campanula rotundifolia* - *Packera paupercula* - (*Aquilegia canadensis*) Sparse Vegetation (CEGL006532, GNR)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Prunus pumila var. depressa* / *Deschampsia caespitosa* Herbaceous Vegetation (CEGL006437, GNR)
- River Mudflats Sparse Vegetation (CEGL002314, GNR)
- *Triantha glutinosa* - *Carex garberi* Herbaceous Vegetation (CEGL006142, G3?)

Alliances:

- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Triantha glutinosa* - *Parnassia glauca* Saturated Herbaceous Alliance (A.1697)

DISTRIBUTION

Range: Far northern New England, extending into adjacent Canada and with scattered locations southward to central New England. Distribution west of New England is not well documented.

Divisions: 103:C; 201:C; 202:P

Nations: CA, US

Subnations: ME, NB, NH?, QC

Map Zones: 64:P, 66:C

TNC Ecoregions: 48:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723017#references

Description Author: S.C. Gawler
Version: 11 Apr 2007
Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest
ClassifResp: East

1151 CALIFORNIA CENTRAL VALLEY RIPARIAN WOODLAND AND SHRUBLAND (CES206.946)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Riparian Mosaic; Forest and Woodland (Treed); Mediterranean [Mediterranean Xeric-Oceanic]; Riverine / Alluvial; Deep Soil; Flood Scouring

Non-Diagnostic Classifiers: Floodplain; Fluvial; Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Herbaceous; Toeslope/Valley Bottom; Silt Soil Texture; Sand Soil Texture; Aquic; Udic; Very Short Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2151; ESLF 9101; ESP 1151

CONCEPT

Summary: This system occurs in the floodplains of small to mid-sized rivers of California's Central Valley. Alluvial soils and late winter/early spring flooding (usually every year) from snow melt typify this system. Communities are predominantly floodplain woodlands, but also include shrublands, wet meadows and gravel/s and flats. Important trees and shrubs include *Populus fremontii*, *Platanus racemosa*, *Quercus lobata*, *Salix gooddingii*, *Acer negundo*, *Cephalanthus occidentalis*, and *Vitis californica*. *Juglans nigra* hybrids and *Ailanthus altissima* are problem invasive trees. *Tamarix* spp. extend as far north as Shasta County. Herbaceous components can include *Carex barbarae*, *Artemisia douglasiana*, and various marsh species along riverbanks and backwater (*Schoenoplectus californicus* (= *Scirpus californicus*), *Typha* spp.). *Arundo donax* is another common invasive and introduced forage species that often invades degraded areas within the floodplains. Periodic flooding and associated sediment scour are necessary to maintain growth and reproduction of vegetation. Flooding regimes have been significantly altered in all but a few tributaries that support this system.

Related Concepts:

- Riparian Woodland (203) (Shiflet 1994) Broader

DISTRIBUTION

Range: Occurs in the floodplains of small to mid-sized rivers of California's Central Valley.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 3:P, 4:C, 5:C, 6:P, 13:P

USFS Ecomap Regions: 261B:??, 262A:CC, 263A:??, 322A:??, M261A:C?, M261B:C?, M261C:CC, M261F:CC

TNC Ecoregions: 13:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722735#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

1437 CENTRAL AND UPPER TEXAS COAST DUNE AND COASTAL GRASSLAND (CES203.465)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2437; ESLF 7150; ESP 1437

CONCEPT

Summary: This system consists of wetland and upland herbaceous and shrubland vegetation of barrier islands and near-coastal areas in the northern Gulf of Mexico along the upper Texas coast, at least to Galveston Bay. Plant communities of primary and secondary dunes, interdunal swales and adjacent mainland are included. Salt spray, saltwater overwash, and sand movement are important ecological forces.

Similar Ecological Systems:

- Central and South Texas Coastal Fringe Forest and Woodland (CES203.464)
- South Texas Sand Sheet Grassland (CES301.538)

MEMBERSHIP

Associations:

- *Panicum amarum* - *Paspalum monostachyum* Herbaceous Vegetation (CEGL004970, G3?)
- *Schizachyrium littorale* - *Paspalum monostachyum* Herbaceous Vegetation (CEGL002207, G3?)
- *Spartina patens* - *Fimbristylis (caroliniana, castanea)* - (*Panicum virgatum*) Herbaceous Vegetation (CEGL007836, G2G3)
- *Spartina patens* - *Panicum amarum* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004971, G2?)
- *Uniola paniculata* - (*Panicum amarum*) - *Croton punctatus* Herbaceous Vegetation (CEGL002218, G3?)

Alliances:

- *Paspalum monostachyum* - (*Panicum amarum*, *Schizachyrium littorale*) Herbaceous Alliance (A.1200)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Uniola paniculata* Temperate Herbaceous Alliance (A.1199)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central and South Texas Coastal Fringe Forest and Woodland (CES203.464)

DISTRIBUTION

Range: Northern Gulf of Mexico along the upper Texas coast.

Divisions: 203:C

Nations: US

Subnations: TX

Map Zones: 36:C, 37:?

USFS Ecomap Regions: 232E:CC, 255D:CC

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723121#references

Description Author: R. Evans and J. Teague

Version: 13 Jan 2003

Concept Author: R. Evans and J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL APPALACHIAN RIVER FLOODPLAIN (CES202.608)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Intermittent Flooding; Short (<5 yrs) Flooding Interval; Forest and Woodland (Treed); Toeslope/Valley Bottom; Riverine / Alluvial; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: 1-29-day hydroperiod; 30-180-day hydroperiod; Moderate (100-500 yrs) Persistence; Lowland; Temperate; Eutrophic Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Silt Soil Texture; Udic; Ustic; Unconsolidated; Short Disturbance Interval; Flood Scouring

National Mapping Codes: ESLF 9333

CONCEPT

Summary: This system encompasses floodplains of medium to large rivers in Atlantic drainages from southern New England to Virginia. This system can include a complex of wetland and upland vegetation on deep alluvial deposits and scoured vegetation on depositional bars and on bedrock where rivers cut through resistant geology. This complex includes floodplain forests in which *Acer saccharinum*, *Populus deltoides*, and *Platanus occidentalis* are characteristic, as well as herbaceous sloughs, shrub wetlands, riverside prairies and woodlands. Most areas are underwater each spring; microtopography determines how long the various habitats are inundated. Depositional and erosional features may both be present depending on the particular floodplain.

Classification Comments: This system is distinguished from related floodplain systems; northward, Laurentian-Acadian Floodplain Forest (CES201.587) is characterized by the lack or unimportance of *Platanus occidentalis* and *Betula nigra*, for example; and westward, North-Central Interior Floodplain (CES202.694) drains to the midwestern rivers rather than northeastern rivers. Determining the distinctions from South-Central Interior Large Floodplain (CES202.705), which overlaps the southern and western portions of this system, needs work.

Similar Ecological Systems:

- Central Appalachian Stream and Riparian (CES202.609)
- Laurentian-Acadian Floodplain Forest (CES201.587)
- North-Central Interior Floodplain (CES202.694)
- South-Central Interior Large Floodplain (CES202.705)

MEMBERSHIP

Associations:

- (*Hypericum prolificum*, *Leucothoe racemosa*) / *Schizachyrium scoparium* - *Solidago simplex* var. *racemosa* - *Ionactis linariifolius* Sparse Vegetation (CEGL006491, G2)
- *Acer (rubrum, saccharinum)* - *Fraxinus pennsylvanica* - *Ulmus americana* / *Boehmeria cylindrica* Forest (CEGL006548, G4)
- *Acer (rubrum, saccharinum)* - *Ulmus americana* Forest (CEGL006975, GNR)
- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer saccharinum* - (*Populus deltoides*) / *Matteuccia struthiopteris* - *Laportea canadensis* Forest (CEGL006147, GNR)
- *Acer saccharinum* - *Acer negundo* / *Ageratina altissima* - *Laportea canadensis* - (*Elymus virginicus*) Forest (CEGL006217, G4)
- *Acer saccharinum* - *Ulmus americana* / *Physocarpus opulifolius* Forest (CEGL006001, GNR)
- *Acer saccharinum* - *Ulmus americana* / *Physocarpus opulifolius* Forest (CEGL006042, GNR)
- *Acer saccharinum* - *Ulmus americana* Forest (CEGL002586, G4?)
- *Acer saccharinum* / *Onoclea sensibilis* - *Boehmeria cylindrica* Forest (CEGL006176, GNR)
- *Acer saccharum* - *Fraxinus americana* / *Carpinus caroliniana* / *Podophyllum peltatum* Forest (CEGL006459, G3?)
- *Acer saccharum* - *Fraxinus* spp. - *Tilia americana* / *Matteuccia struthiopteris* - *Ageratina altissima* Forest (CEGL006114, GNR)
- *Acer saccharum* - *Liriodendron tulipifera* / *Galium concinnum* - *Carex laxiculmis* Forest (CEGL006473, GNR)
- *Alnus incana* - *Viburnum recognitum* / *Calamagrostis canadensis* Shrubland [Provisional] (CEGL006546, GNR)
- *Alnus serrulata* - *Physocarpus opulifolius* Shrubland (CEGL006251, G5)
- *Alnus serrulata* Swamp Shrubland (CEGL005082, G4G5)
- *Andropogon gerardii* - *Panicum virgatum* - *Baptisia australis* Herbaceous Vegetation (CEGL006283, G2G3)
- *Betula nigra* - *Platanus occidentalis* / *Impatiens capensis* Forest (CEGL006184, GNR)
- *Betula nigra* - *Platanus occidentalis* Forest (CEGL002086, G5)
- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Herbaceous Vegetation (CEGL006536, G4G5)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Carex trichocarpa* Herbaceous Vegetation (CEGL006447, G3)
- *Carya cordiformis* - *Prunus serotina* / *Ageratina altissima* Forest (CEGL006445, GNR)
- *Cephalanthus occidentalis* - *Decodon verticillatus* Shrubland (CEGL006069, G4G5)

- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Herbaceous Vegetation (CEGL006483, G3)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Fraxinus americana* / *Andropogon gerardii* - *Sorghastrum nutans* - *Schizachyrium scoparium* - *Pycnanthemum tenuifolium* Herbaceous Vegetation (CEGL006478, G1)
- *Fraxinus pennsylvanica* - (*Juglans nigra*, *Platanus occidentalis*) Forest (CEGL006575, GNR)
- *Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014, G3G5)
- *Juglans nigra* / *Verbesina alternifolia* Forest (CEGL007879, GNA)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liriodendron tulipifera* - *Acer (rubrum, negundo)* - (*Platanus occidentalis*) / *Carpinus caroliniana* / *Polygonum virginianum* Forest (CEGL006492, G4)
- *Liriodendron tulipifera* - *Fraxinus* spp. / *Lindera benzoin* - *Viburnum prunifolium* / *Podophyllum peltatum* Forest (CEGL006314, GNR)
- *Liriodendron tulipifera* - *Pinus strobus* - (*Tsuga canadensis*) / *Carpinus caroliniana* / *Amphicarpaea bracteata* Forest (CEGL008405, G3)
- *Liriodendron tulipifera* - *Platanus occidentalis* - *Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Forest (CEGL006255, G3?)
- *Peltandra virginica* - *Polygonum amphibium* var. *emersum* - *Carex emoryi* - *Impatiens capensis* Herbaceous Vegetation (CEGL006244, G1)
- *Peltandra virginica* - *Saururus cernuus* - *Boehmeria cylindrica* / *Climacium americanum* Herbaceous Vegetation (CEGL007696, G2G3?)
- *Pinus virginiana* - *Juniperus virginiana* var. *virginiana* - *Quercus stellata* / *Amelanchier stolonifera* / *Danthonia spicata* / *Leucobryum glaucum* Woodland (CEGL008449, G2?)
- *Platanus occidentalis* - *Acer negundo* - *Juglans nigra* / *Asimina triloba* / *Mertensia virginica* Forest (CEGL004073, G4)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* Forest (CEGL006036, G4?)
- *Platanus occidentalis* - *Liquidambar styraciflua* / *Carpinus caroliniana* - *Asimina triloba* Forest (CEGL007340, G5)
- *Platanus occidentalis* / *Aesculus flava* Forest (CEGL006466, GNR)
- *Prunus pumila* / *Andropogon gerardii* - *Sorghastrum nutans* Herbaceous Vegetation (CEGL006518, GNR)
- *Quercus bicolor* - *Acer rubrum* / *Carpinus caroliniana* Forest (CEGL006386, GNR)
- *Quercus bicolor* - *Fraxinus pennsylvanica* - (*Platanus occidentalis*) / *Chasmanthium latifolium* - *Dichanthelium clandestinum* - *Zizia aurea* Woodland (CEGL006218, G1G2)
- *Quercus palustris* - *Acer rubrum* / *Carex grayi* - *Geum canadense* Forest (CEGL006185, GNR)
- *Quercus palustris* - *Quercus bicolor* / *Carex tribuloides* - *Carex radiata* - (*Carex squarrosa*) Forest (CEGL006497, G3G4)
- *Salix nigra* - *Betula nigra* / *Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional] (CEGL006463, GNR)
- *Salix sericea* Shrubland (CEGL006305, GNR)
- *Spiraea alba* Shrubland [Provisional] (CEGL006595, GNR)
- *Tilia americana* - *Acer saccharum* - *Acer nigrum* / *Laportea canadensis* Forest (CEGL006405, GNR)
- *Verbesina alternifolia* - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Herbaceous Vegetation (CEGL006480, GNR)

Alliances:

- *Acer (rubrum, saccharinum)* - *Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Eragrostis hypnoides* - *Lipocarpa micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Eupatorium* spp. - *Polygonum* spp. Temporarily Flooded Depositional Shore and Bar Herbaceous Alliance (A.3038)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Juglans nigra* Forest Alliance (A.1932)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)

- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Quercus bicolor* - *Acer rubrum* Temporarily Flooded Forest Alliance (A.3004)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus palustris* - *Acer rubrum* Temporarily Flooded Forest Alliance (A.301)
- *Salix sericea* Seasonally Flooded Shrubland Alliance (A.3028)
- *Schoenoplectus pungens* Semipermanently Flooded Wooded Herbaceous Alliance (A.3034)
- *Spiraea (alba, tomentosa)* - *Rubus* spp. Seasonally Flooded Shrubland Alliance (A.3022)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest Alliance (A.171)

DISTRIBUTION

Range: Southern New England west to Lake Erie and south to Virginia. The James River in Virginia marks the southern extent of this system.

Divisions: 201:C; 202:C

Nations: US

Subnations: CT, MA, MD, NH, NJ?, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C

TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723001#references

Description Author: S.C. Gawler, mod. J. Teague

Version: 01 Feb 2007

Concept Author: S.C. Gawler, mod. NCR Review Team

Stakeholders: East, Midwest, Southeast

ClassifResp: East

CENTRAL APPALACHIAN STREAM AND RIPARIAN (CES202.609)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Intermittent Flooding; Lowland; Riverine / Alluvial; Very Short Disturbance Interval; Flood Scouring

Non-Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence; Forest and Woodland (Treed);

Sideslope; Toeslope/Valley Bottom; Temperate; Mesotrophic Soil; Udic; Ustic

National Mapping Codes: ESLF 9331

CONCEPT

Summary: This riparian system ranges from southern New England to Virginia and West Virginia and occurs over a wide range of elevations. It develops on floodplains and shores along river channels that lack a broad flat floodplain due to steeper sideslopes, higher gradient, or both. It may include communities influenced by flooding, erosion, or groundwater seepage. The vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Betula nigra*, *Platanus occidentalis*, and *Acer negundo*. Open, flood-scoured rivershore prairies feature *Panicum virgatum* and *Andropogon gerardii*, and *Carex torta* is typical of wetter areas near the channel.

Classification Comments: This is a high-gradient system, unlike the low-gradient system described in Central Appalachian River Floodplain (CES202.608). To the south in the Appalachians and interior, this system is replaced by South-Central Interior Small Stream and Riparian (CES202.706).

Similar Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- Cumberland Riverscour (CES202.036)
- South-Central Interior Small Stream and Riparian (CES202.706)

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (CEGL006406, G4G5)
- *Acer rubrum* - *Fraxinus americana* - *Fraxinus nigra* - *Betula alleghaniensis* / *Veratrum viride* - *Carex bromoides* Forest (CEGL008416, G3)
- *Acer rubrum* - *Nyssa sylvatica* / *Ilex verticillata* - *Vaccinium fuscum* / *Osmunda cinnamomea* Forest (CEGL007853, G3G4)
- *Alnus serrulata* - *Physocarpus opulifolius* Shrubland (CEGL006251, G5)
- *Andropogon gerardii* - *Campanula rotundifolia* - *Solidago simplex* Sparse Vegetation (CEGL006284, G2)
- *Andropogon gerardii* - *Panicum virgatum* - *Baptisia australis* Herbaceous Vegetation (CEGL006283, G2G3)
- *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Herbaceous Vegetation (CEGL006536, G4G5)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Carex trichocarpa* Herbaceous Vegetation (CEGL006447, G3)
- *Deschampsia caespitosa* - *Carex viridula* Herbaceous Vegetation (CEGL006969, GNR)
- *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Herbaceous Vegetation (CEGL006483, G3)
- *Eupatorium serotinum* - *Polygonum (lapathifolium, punctatum, pennsylvanicum)* Herbaceous Vegetation (CEGL006481, GNR)
- *Hudsonia tomentosa* - *Paronychia argyrocoma* Dwarf-shrubland (CEGL006232, G1)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL006461, GNR)
- *Liriodendron tulipifera* - *Platanus occidentalis* - *Betula lenta* / *Lindera benzoin* / *Circaea lutetiana ssp. canadensis* Forest (CEGL006255, G3?)
- *Lysimachia ciliata* - *Apocynum cannabinum* Sparse Vegetation (CEGL006554, GNR)
- *Panicum virgatum* - *Andropogon gerardii* Gravel Wash Herbaceous Vegetation (CEGL006477, G2G3)
- *Pinus rigida* - *Hudsonia tomentosa* - *Pityopsis falcata* Sparse Vegetation (CEGL006391, GNR)
- *Pinus strobus* - *Betula populifolia* / *Comptonia peregrina* / *Schizachyrium scoparium* Woodland (CEGL006004, G2)
- *Platanus occidentalis* - *Acer saccharinum* - *Betula nigra* - *Fraxinus pennsylvanica* / *Boehmeria cylindrica* - *Carex emoryi* Woodland (CEGL006476, G2?)
- *Platanus occidentalis* - *Betula nigra* - *Salix (caroliniana, nigra)* Woodland (CEGL003896, G4G5)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Populus tremuloides* - *Betula populifolia* Forest (CEGL006560, GNR)
- *Rhododendron arborescens* / *Marshallia grandiflora* - *Triantha glutinosa* - *Platanthera flava var. herbiola* Herbaceous Vegetation (CEGL006598, G1)
- *Salix nigra* / *Phalaris arundinacea* - *Apocynum cannabinum* Temporarily Flooded Shrubland (CEGL006065, G4?)
- *Salix nigra* Temporarily Flooded Shrubland (CEGL003901, G4?)

- *Tsuga canadensis* - *Betula alleghaniensis* / *Veratrum viride* - *Carex scabrata* - *Oclemena acuminata* Forest (CEGL008533, G2)
- *Verbesina alternifolia* - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Herbaceous Vegetation (CEGL006480, GNR)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Saturated Forest Alliance (A.3035)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Eragrostis hypnoides* - *Lipocarpha micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Eupatorium* spp. - *Polygonum* spp. Temporarily Flooded Depositional Shore and Bar Herbaceous Alliance (A.3038)
- *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance (A.347)
- *Hudsonia tomentosa* Temporarily Flooded Dwarf-shrubland Alliance (A.1087)
- Inland Dune Sparsely Vegetated Alliance (A.1857)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Leersia oryzoides* - *Glyceria striata* Seasonally Flooded Herbaceous Alliance (A.1399)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Pinus strobus* - *Betula populifolia* Woodland Alliance (A.682)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Populus tremuloides* - *Betula papyrifera* Forest Alliance (A.269)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Triantha glutinosa* - *Parnassia glauca* Saturated Herbaceous Alliance (A.1697)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)

DISTRIBUTION

Range: This system ranges from southern New England west to Lake Erie and south to Virginia and West Virginia. The James River in Virginia marks its southern extent.

Divisions: 202:C

Nations: US

Subnations: CT, DE, MA, MD, NH, NJ?, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 60:C, 61:C, 62:C, 63:P, 64:P, 65:C

TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723000#references

Description Author: S.C. Gawler, mod. J. Teague

Version: 01 Feb 2007

Concept Author: S.C. Gawler, mod. NCR Review Team

Stakeholders: East, Midwest, Southeast
ClassifResp: East

1453 CENTRAL FLORIDA PINE FLATWOODS (CES203.382)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous; Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2453; ESLF 9122; ESP 1453

CONCEPT

Summary: This system is endemic to Florida, ranging in the north from approximately Levy and St. Johns counties (ca. 30 degrees N latitude) southward to approximately Hillsborough, Osceola and Polk counties. It was once an extensive system within its historic range. As currently conceived, this system includes both "scrubby flatwoods" that occur on well-drained soils and typical flatwoods that occur on more poorly drained soils. The vegetation is naturally dominated by either *Pinus palustris* or *Pinus elliottii* var. *elliottii*, and less frequently includes *Pinus serotina*. Examples vary in aspect from well-developed understory layers or scrub species to more herbaceous, savanna-like conditions. There is a dense ground cover of low shrubs, grasses, and herbs. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system includes at least two predominant expressions which could individually constitute distinct systems. Scrubby flatwoods are much more well-drained, uplands with characteristically shrubby understories, while flatwoods are much more poorly drained and savanna-like in aspect (Abrahamson et al. 1984).

Similar Ecological Systems:

- East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)--is closely related and found to the north.

DESCRIPTION

Vegetation: The southern limit of this system marks the approximate natural distribution limit for both *Pinus serotina* and *Pinus elliottii* var. *elliottii* (see Abrahamson and Hartnett 1990). The associations comprising this system are not well documented; more information is needed to describe additional communities that are believed to be present. The vegetation varies between examples of this system based on fire history, geographic location, and the soils on which it occurs. The most well-drained examples may be considered "scrubby flatwoods" that support a characteristic understory layer of xeromorphic adapted species, such as *Quercus geminata*, *Lyonia fruticosa*, *Lyonia ferruginea*, *Sideroxylon tenax* (= *Bumelia tenax*), and *Persea humilis*; *Quercus inopina* is especially diagnostic (Abrahamson et al. 1984). These conditions range to examples on more poorly drained soils that include scattered *Pinus elliottii* var. *elliottii* or *Pinus palustris* over *Serenoa repens* and other species such as *Panicum abscissum* and *Aristida beyrichiana*.

MEMBERSHIP

Associations:

- *Pinus elliottii* var. *densa* / *Quercus minima* / *Panicum abscissum* Woodland (CEGL003650, G2?)
- *Pinus elliottii* var. *elliottii* / *Serenoa repens* - *Ilex glabra* Woodland (CEGL003643, G4?)
- *Pinus palustris* - (*Pinus elliottii* var. *elliottii*) / *Quercus (chapmanii, myrtifolia)* - *Serenoa repens* / *Aristida beyrichiana* - *Chapmannia floridana* Woodland (CEGL007750, G2G3)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* - (*Serenoa repens*) Woodland (CEGL004791, G3G4)
- *Pinus serotina* / *Gordonia lasianthus* - *Persea palustris* Saturated Woodland (CEGL007996, G3?Q)
- *Pinus serotina* / *Ilex glabra* / *Aristida beyrichiana* Woodland (CEGL003795, G2G3)

Alliances:

- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)
- *Pinus serotina* Saturated Woodland Alliance (A.581)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Herbaceous Pondshore (CES203.890)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- Florida Longleaf Pine Sandhill (CES203.284)
- Southern Coastal Plain Hydric Hammock (CES203.501)

DISTRIBUTION

Range: Endemic to Florida, ranging in the north from approximately Levy and St. Johns counties southward to approximately Hillsborough and Polk counties.

Divisions: 203:C

Nations: US
Subnations: FL
Map Zones: 55:C, 56:C
USFS Ecomap Regions: 232D:CC, 232G:CC, 232K:CC
TNC Ecoregions: 55:C

SOURCES

References: Abrahamson and Hartnett 1990, Abrahamson et al. 1984, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723134#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1504 CHIHUAHUAN-SONORAN DESERT BOTTOMLAND AND SWALE GRASSLAND (CES302.746)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Swale; Toeslope/Valley Bottom; Depressional

Non-Diagnostic Classifiers: Clay Subsoil Texture; Intermittent Flooding [Intermittent interval, Summer Flooding]; Mesa; Plain; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Continental]; Temperate [Temperate Xeric]; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2504; ESLF 9411; ESP 1504

CONCEPT

Summary: This ecological system occurs in relatively small depressions or swales and along drainages throughout the northern and central Chihuahuan Desert and adjacent Sky Islands and Sonoran Desert, as well as limited areas of the southern Great Plains on broad mesas, plains and valley bottoms that receive runoff from adjacent areas. Occupying low topographic positions, these sites generally have deep, fine-textured soils that are neutral to slightly or moderately saline/alkaline. During summer rainfall events, ponding is common. Vegetation is typically dominated by *Sporobolus airoides*, *Sporobolus wrightii*, *Pleuraphis mutica* (tobosa swales), or other mesic graminoids such as *Pascopyrum smithii* or *Panicum obtusum*. With tobosa swales, sand-adapted species such as *Yucca elata* may grow at the swale's edge in the deep sandy alluvium that is deposited there from upland slopes. *Sporobolus airoides* and *Sporobolus wrightii* are more common in alkaline soils and along drainages. Other grass species may be present, but these mesic species are diagnostic. Scattered shrubs such as *Atriplex canescens*, *Prosopis glandulosa*, *Ericameria nauseosa*, *Fallugia paradoxa*, *Krascheninnikovia lanata*, or *Rhus microphylla* may be present.

Classification Comments: NRCS Ecological Site Description MLRA 42 SD-2 Bottomland Ecological Site (NRCS 2006) describes this system on the Jornada Experimental Range with State-and-Transition Model showing shifts in species composition with land use.

This bottomland/depressional wetland system can be similar to the upland Chihuahuan Loamy Plains Desert Grassland (CES302.061) but is restricted to moist depressions and intermittently flooded drainage terraces and adjacent flats. Alkali sacaton (*Sporobolus airoides*) is often associated with more alkaline (to gypsic), poorly drained areas and giant sacaton (*Sporobolus wrightii*) with less alkaline better drained areas. *Distichlis spicata*, *Allenrolfea occidentalis*, and *Suaeda* spp. are characteristic of more saline and alkaline sites.

Similar Ecological Systems:

- Chihuahuan Loamy Plains Desert Grassland (CES302.061)

Related Concepts:

- Alkali Sacaton - Tobosagrass (701) (Shiflet 1994) Broader
- Grama -Muhly - Threawn (713) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This ecological system occurs in relatively small depressions or swales and along drainages on broad mesas, plains and valley bottoms that receive runoff from adjacent areas. These sites occupy low topographic positions and generally have deep, fine-textured soils that are neutral to slightly or moderately saline/alkaline.

Vegetation: The vegetation of this grassland system is typically dominated by *Sporobolus airoides*, *Sporobolus wrightii*, *Pleuraphis mutica* (in tobosa swales), or other mesic graminoids such as *Pascopyrum smithii* or *Panicum obtusum*. In tobosa swales, sand-adapted species such as *Yucca elata* may grow at the swale's edge in the deep sandy alluvium that is deposited there from upland slopes. *Sporobolus airoides* and *Sporobolus wrightii* are more common in alkaline soils and along drainages. Other grass species may be present, but these mesic species are diagnostic. Scattered shrubs such as *Atriplex canescens*, *Prosopis glandulosa*, *Ericameria nauseosa*, *Fallugia paradoxa*, *Krascheninnikovia lanata*, or *Rhus microphylla* may be present. *Sporobolus airoides* is often associated with more alkaline (to gypsic), poorly drained areas and *Sporobolus wrightii* with less alkaline better drained areas. *Distichlis spicata*, *Allenrolfea occidentalis*, and *Suaeda* spp. are characteristic of more saline and alkaline sites.

MEMBERSHIP

Associations:

- *Panicum obtusum* - *Helianthus ciliaris* Herbaceous Vegetation (CEGL001574, G1)
- *Panicum obtusum* - *Panicum hirsutum* Herbaceous Vegetation (CEGL001576, GNRQ)
- *Pleuraphis mutica* - *Panicum obtusum* Herbaceous Vegetation (CEGL001639, G3)
- *Pleuraphis mutica* - *Scleropogon brevifolius* Herbaceous Vegetation (CEGL001640, G5)
- *Pleuraphis mutica* Monotype Herbaceous Vegetation (CEGL001637, G5?)
- *Sporobolus airoides* - *Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Sporobolus airoides* - *Scleropogon brevifolius* Herbaceous Vegetation (CEGL001692, G5)
- *Sporobolus airoides* Monotype Herbaceous Vegetation (CEGL001688, GUQ)

- *Sporobolus airoides* Sod Herbaceous Vegetation [Placeholder] (CEGL001791, GNR)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Sporobolus wrightii* - *Panicum hallii* Herbaceous Vegetation (CEGL001485, GNRQ)
- *Sporobolus wrightii* - *Panicum obtusum* Herbaceous Vegetation (CEGL001486, G2)

Alliances:

- *Panicum obtusum* Herbaceous Alliance (A.1238)
- *Pleuraphis mutica* Herbaceous Alliance (A.1249)
- *Pleuraphis mutica* Intermittently Flooded Herbaceous Alliance (A.1330)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)
- *Sporobolus airoides* Sod Herbaceous Alliance (A.1241)
- *Sporobolus wrightii* Herbaceous Alliance (A.1205)

DISTRIBUTION

Range: This system is found in the central and northern Chihuahuan Desert and adjacent Sky Islands and Sonoran Desert, as well as limited areas of the southern Great Plains.

Divisions: 302:C; 303:C

Nations: MX, US

Subnations: AZ, MXCH(MX), MXCO(MX), MXSO(MX), NM, TX

Map Zones: 14:C, 25:C, 26:P, 34:?, 35:?

USFS Ecomap Regions: 313C:PP, 315A:CC, 321A:CC, 322B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 22:C, 23:C, 24:C, 28:C

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, MacMahon and Wagner 1985, Muldavin et al. 1998a, Muldavin et al. 1998d, Muldavin et al. 2000b, NRCS 2006

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722926#references

Description Author: NatureServe Western Ecology Team

Version: 10 Apr 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

1435 EAST GULF COASTAL PLAIN DUNE AND COASTAL GRASSLAND (CES203.500)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2435; ESLF 7148; ESP 1435

CONCEPT

Summary: This system includes vegetation of coastal dunes along the northern Gulf of Mexico, including the northwestern panhandle of Florida, southern Alabama, and southeastern Mississippi. The vegetation consists largely of herbaceous and embedded shrublands on barrier islands and other near-coastal areas where salt spray, saltwater overwash, and sand movement are important ecological forces. This vegetation differs from that of other regions of the Gulf, and this region forms a natural unit with similar climate and substrate (Johnson 1997). There are a number of diagnostic and endemic plant species which characterize this system, including *Ceratiola ericoides*, *Chrysoma pauciflosculosa*, *Schizachyrium maritimum*, *Paronychia erecta*, and *Helianthemum arenicola* (Johnson and Barbour 1990).

Similar Ecological Systems:

- East Gulf Coastal Plain Maritime Forest (CES203.503)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Coastal Grassland (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- (*Iva imbricata*) / *Sporobolus virginicus* - *Spartina patens* - (*Paspalum distichum*, *Sesuvium portulacastrum*) Herbaceous Vegetation (CEGL007839, G3?)
- *Ceratiola ericoides* - (*Chrysoma pauciflosculosa*) / *Polygonella polygama* / *Cladonia leporina* Shrubland (CEGL003864, G2?)
- *Chrysoma pauciflosculosa* - *Paronychia erecta* Dwarf-shrubland (CEGL003947, G1G2)
- *Fuirena scirpoidea* - *Panicum tenerum* - *Dichanthelium wrightianum* - *Andropogon capillipes* Herbaceous Vegetation (CEGL004953, G2?)
- *Quercus myrtifolia* - *Quercus geminata* - *Ceratiola ericoides* - *Conradina canescens* Shrubland (CEGL003824, G2)
- *Schizachyrium maritimum* - (*Heterotheca subaxillaris*) Herbaceous Vegetation (CEGL004057, G2)
- *Spartina patens* - *Schizachyrium maritimum* - *Solidago sempervirens* Herbaceous Vegetation (CEGL008445, G3?)
- *Spartina patens* - *Setaria parviflora* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004257, G3)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Chrysoma pauciflosculosa* Dwarf-shrubland Alliance (A.1061)
- *Fuirena scirpoidea* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)
- *Schizachyrium maritimum* Herbaceous Alliance (A.1222)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)

DISTRIBUTION

Range: Coastal dunes along the northern Gulf of Mexico, including the northwestern panhandle of Florida, southern Alabama, and southeastern Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Johnson 1997, Johnson and Barbour 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723088#references

Description Author: R. Evans

Version: 06 Feb 2003
Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

1454 EAST GULF COASTAL PLAIN NEAR-COAST PINE FLATWOODS (CES203.375)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat; Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2454; ESLF 9123; ESP 1454

CONCEPT

Summary: This system of open forests or woodlands occupies broad, sandy flatlands in a relatively narrow band along the northern Gulf of Mexico coast east of the Mississippi River [see map in Peet and Allard (1993)]. This range corresponds roughly to Ecoregion 75a (EPA 2004). These areas, often called "flatwoods" or "flatlands," are subject to high fire-return intervals even though they are subject to seasonally high water tables. Overstory vegetation is characterized by *Pinus palustris* and to a lesser degree by *Pinus elliottii*. Understory conditions range from densely shrubby to open and herbaceous-dominated, based largely upon fire history. Fire is naturally frequent, with a fire-return time of from one to four years.

Classification Comments: There was some consideration of splitting out the slash pine flatwoods from this system due to presumed differences in both moisture status and fire history when compared with typical longleaf. There is considerable variation between wet and "non-wet" flatwoods implied in this system.

Similar Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)
- Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Intersecting
- Scrubby Flatwoods (FNAI 1990) Intersecting
- Wet Flatwoods (FNAI 1990) Intersecting

DESCRIPTION

Environment: This system occupies broad, sandy flatlands which are subject to high fire-return intervals even though they are subject to seasonally high water tables. These areas are often called "flatwoods" or "flatlands."

Vegetation: Overstory vegetation is characterized by *Pinus palustris* and to a lesser degree by *Pinus elliottii*. Some stands include *Pinus serotina*. Shrubs include *Quercus geminata*, *Quercus minima* - *Quercus pumila*, *Serenoa repens*, *Cyrilla racemiflora*, *Ilex coriacea*, *Ilex glabra*, *Ilex vomitoria*, and *Lyonia lucida*. Herbaceous species may include *Aristida beyrichiana*, *Ctenium aromaticum*, *Muhlenbergia expansa*, *Schizachyrium scoparium*, *Sporobolus floridanus*, *Carphephorus pseudoliatris*, *Sarracenia alata*, *Agalinis filicaulis*, *Polygala cymosa*, *Rhynchospora* spp., and *Helianthus radula*.

Dynamics: Fire is naturally frequent, with a fire-return time of from one to four years.

MEMBERSHIP

Associations:

- *Pinus (palustris, elliottii var. elliottii) / (Quercus geminata) / Serenoa repens / Aristida beyrichiana* Woodland (CEGL007714, G3?)
- *Pinus elliottii var. elliottii - Taxodium ascendens / Polygala cymosa - Rhynchospora* spp. Woodland (CEGL004556, G2?)
- *Pinus elliottii var. elliottii / Serenoa repens - Ilex glabra* Woodland (CEGL003643, G4?)
- *Pinus palustris - (Pinus elliottii var. elliottii) / Ctenium aromaticum - Carphephorus pseudoliatris - (Sarracenia alata)* Woodland (CEGL003645, G3?)
- *Pinus palustris - (Pinus elliottii var. elliottii) / Ilex coriacea - Cyrilla racemiflora* Woodland (CEGL003656, G3G4)
- *Pinus palustris - (Pinus elliottii var. elliottii) / Ilex vomitoria / Muhlenbergia expansa - Agalinis filicaulis* Woodland (CEGL004792, G1?)
- *Pinus palustris - Pinus serotina / Ilex glabra - Lyonia lucida - (Serenoa repens)* Woodland (CEGL004791, G3G4)
- *Pinus palustris / Quercus minima - Quercus pumila / Aristida beyrichiana* Woodland (CEGL003808, G3?)
- *Pinus palustris / Schizachyrium scoparium - Muhlenbergia expansa - Helianthus radula* Woodland (CEGL004956, G2?)
- *Pinus palustris / Serenoa repens - Ilex glabra* Woodland (CEGL003653, G2G3)
- *Pinus serotina / Sporobolus floridanus - Aristida beyrichiana* Woodland (CEGL003797, G2)

Alliances:

- *Pinus elliottii - Taxodium ascendens* Saturated Woodland Alliance (A.692)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris - Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)

- *Pinus serotina* Saturated Woodland Alliance (A.581)

DISTRIBUTION

Range: This system is conceived of as including wet and dry pine flatwoods of the near-coastal zone of the East Gulf Coastal Plain. For a definition of this range, see map in Peet and Allard (1993). It corresponds roughly to Ecoregion 75a (EPA 2004).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232D:CC, 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, EPA 2004, FNAI 1990, Griffith et al. 2001, Peet 2006, Peet and Allard 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723141#references

Description Author: R. Evans, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

1444 EASTERN BOREAL FLOODPLAIN (CES103.588)

CLASSIFIERS

Classification Status: Standard

Primary Division: Boreal (103)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval [Short interval, Spring Flooding]; Forest and Woodland (Treed); Riverine / Alluvial; Flood Scouring; *Picea* (*glauca*, *mariana*, *rubens*) - *Abies*

Non-Diagnostic Classifiers: Mesotrophic Water; Circumneutral Water; Acidic Water; Lowland; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Glaciated; Mesotrophic Soil; Oligotrophic Soil; Circumneutral Soil; Acidic Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Silt Soil Texture; Very Short Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2444; ESLF 9113; ESP 1444

CONCEPT

Summary: These southern boreal floodplains are found in the extreme northern portions of the eastern U.S., and believed to be more widespread in Canada. They consist of floodplains along medium-sized northern rivers, in areas not strongly influenced by ice-scour (i.e., depositional), where topography and process have resulted in a complex of upland and wetland alluvial vegetation. This complex includes floodplain forests dominated by northern trees such as *Populus balsamifera* and *Fraxinus nigra*, as well as herbaceous sloughs and shrub wetlands. (*Acer saccharinum* is uncommon or absent.) Most areas are underwater each spring; microtopography determines how long the various habitats are inundated. The distribution in Division 201 appears to be primarily Canadian, with incursions into northern Maine and northern Minnesota.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Abies balsamea* / *Viburnum nudum* var. *cassinoides* Floodplain Forest (CEGL006501, GNR)
- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Fraxinus nigra* - Mixed Hardwoods - Conifers / *Cornus sericea* / *Carex* spp. Forest (CEGL002105, G4)
- *Populus balsamifera* - *Fraxinus nigra* / *Matteuccia struthiopteris* Forest (CEGL006432, GNR)
- River Mudflats Sparse Vegetation (CEGL002314, GNR)

Alliances:

- *Acer* (*rubrum*, *saccharinum*) - *Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance (A.347)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

DISTRIBUTION

Range: This system is found primarily in Canada, with distribution extending into far-northern New England and the northern Great Lakes region.

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: ME, MI, MN, NB, NH, NY, ON, QC, VT

Map Zones: 40:?, 41:P, 50:P, 51:P, 63:P, 64:P, 66:C

USFS Ecomap Regions: 212J:CP, 212L:CP, 212M:CP, 212N:CP, 212R:CP, 212S:CP, 212T:CP, 212X:CP, 212Y:CP

TNC Ecoregions: 47:P, 48:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723018#references

Description Author: S.C. Gawler

Version: 09 Jan 2003

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: East

1411 GREAT LAKES WET-MESIC LAKEPLAIN PRAIRIE (CES202.027)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional [Lakeshore]; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2411; ESLF 7124; ESP 1411

CONCEPT

Summary: This system is found on the lakeplain near the southern central Great Lakes of the United States and Canada. Stands occur on level, sandy glacial outwash, sandy glacial lakeplains, and deposits of dune sand in silty/clayey glacial lakeplains. The soils are sands and sandy loams, loams with poor to moderate water-retaining capacity, typically occurring over less permeable silty clays. There is often temporary inundations after heavy rains or in the spring, followed by dry conditions throughout much of the remaining growing season. The vegetation of this community is dominated by tallgrass species typically 1-2 m high. Trees and shrubs are very rare. There is very little bare ground. *Andropogon gerardii*, *Calamagrostis canadensis*, *Carex* spp. (*Carex aquatilis*, *Carex bicknellii*, *Carex buxbaumii*, *Carex pellita* (= *Carex lanuginosa*)), *Panicum virgatum*, *Spartina pectinata*, *Schizachyrium scoparium*, and *Sorghastrum nutans* are the most abundant graminoid species. Many of the sites that this system formerly occupied are now urban and/or agricultural. Areas around Chicago and Detroit were likely in this system but are heavily converted now and few sites remain.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Calamagrostis canadensis* - *Pycnanthemum virginianum* - *Oligoneuron ohioense* Herbaceous Vegetation (CEGL005095, G2)
- *Andropogon gerardii* - *Sorghastrum nutans* - *Schizachyrium scoparium* - *Aletris farinosa* Herbaceous Vegetation (CEGL005096, G2)
- *Quercus alba* - *Quercus velutina* - *Quercus palustris* / *Carex pensylvanica* Woodland (CEGL005054, G2)
- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* Lakeplain Herbaceous Vegetation (CEGL005109, G2G3)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

DISTRIBUTION

Range: This system is found near the southern central Great Lakes of the United States and Canada, from southeastern Wisconsin and northeastern Illinois to southern Michigan and southwestern Ontario. This does not go farther east than northwestern Ohio (glacial Lake Maumee).

Divisions: 202:C

Nations: CA, US

Subnations: IL, IN, MI, OH, ON, WI

Map Zones: 41:?, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 222Ja:CCC, 222K:CC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 48:C

SOURCES

References: Chapman 1984, Chapman et al. 1989, Comer et al. 1995b, Comer et al. 2003, Faber-Langendoen and Maycock 1987, Faber-Langendoen and Maycock 1994

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722678#references

Description Author: K. Chapman, D. Faber-Langendoen, P. Comer, mod. S.C. Gawler

Version: 20 Jul 2007

Concept Author: K. Chapman, D. Faber-Langendoen, P. Comer

Stakeholders: Canada, Midwest

ClassifResp: Midwest

1466 GREAT LAKES WOODED DUNE AND SWALE (CES201.726)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: 30-180-day hydroperiod; Coastal Dune Mosaic; Forest and Woodland (Treed); Dune (Substrate); Glaciated; Sand Soil Texture

Non-Diagnostic Classifiers: Shallow (<15 cm) Water; Lowland [Lowland]; Shrubland (Shrub-dominated); Herbaceous; Temperate [Temperate Continental]; Depressional [Lakeshore]; Isolated Wetland [Partially Isolated]; Intermediate Disturbance Interval; W-Patch/High Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2466; ESLF 9135; ESP 1466

CONCEPT

Summary: This system is found in nearly 100 occurrences throughout the Great Lakes shorelines of the United States and Canada. It consists of a foredune, followed by a series of low to high dunes (uplands) and swales (wetlands). The system is often best developed where post-glacial streams entered an embayment and provide a dependable sand source. The combination of along-shore currents, waves, and winds form foredunes along the shoreline. The foredunes of most dune-and-swale complexes are commonly 1-2 m high, with *Ammophila breviligulata*, *Calamovilfa longifolia*, *Salix serissima*, *Salix cordata*, and *Populus balsamifera* most common. The swale immediately behind the foredune is influenced by short-term variation in lake levels and can be partially or occasionally completely filled by dune sands following major storm events. Species common to this first swale include *Juncus balticus*, *Juncus pelocarpus*, *Juncus nodosus*, *Eleocharis acicularis*, and *Schoenoplectus americanus* (= *Scirpus americanus*). Occasionally, such swales may contain lake-influenced, calcareous sands and may contain moderately alkaline indicators.

A low dune field with more advanced plant succession often follows the first open dunes and swales. *Pinus banksiana*, *Pinus strobus*, and *Pinus resinosa* often form a scattered overstory canopy, while *Juniperus communis*, *Juniperus horizontalis*, *Arctostaphylos uva-ursi*, and *Koeleria macrantha* form a scattered ground layer. Following the dune-field zone, both dunes and swales are typically forested. Moist swales are often forested, and soil organic material has often begun to accumulate. *Thuja occidentalis*, *Alnus incana*, *Salix* spp., and *Acer rubrum* dominate the partial overstory canopy and understory. In contrast to the dry or moist swales, wetter swales (where standing water is present through most of the year) may be dominated by Carices, such as *Carex aquatilis* and *Carex stricta*. Forested beach ridges, with soils of medium to coarse sand, tend to be dominated by species common to dry-mesic and mesic northern forest. Complexes located in embayments protected from prevailing winds tend to be formed entirely of low, water-lain beach ridges. As a result, even the beach ridges within these complexes support wetland vegetation.

Six major subtypes of Great Lakes Dune and Swale were described for Michigan, including the Lake Superior high dune type, the Lake Superior low dune type, the North Lake Michigan high dune type, Northern Lake Huron-Lake Michigan low dune type, the Southern Lake Huron type, and the Northern Great Lakes low dune type. These subtypes represent patterns of floristic variation resulting from latitude and sand dune/beach ridge characteristics that constrain floristic and structural attributes. High dune types may support predominantly upland vegetation, while low dune types may support predominantly wetland vegetation.

Classification Comments: Six major subtypes of Great Lakes Dune and Swale were described for Michigan, including the Lake Superior high dune type, the Lake Superior low dune type, the North Lake Michigan high dune type, Northern Lake Huron-Lake Michigan low dune type, the Southern Lake Huron type, and the Northern Great Lakes low dune type. These subtypes represent patterns of floristic variation resulting from latitude and sand dune/beach ridge characteristics that constrain floristic and structural attributes.

This system has rather strong variation between northern and southern Great Lakes examples (north and south of Bailey's 210-220 division line). Those occurring along the southern Lake Michigan shoreline of Indiana and Illinois have been altered significantly, but likely reflect a distinct ecological system type with oak woodland and savanna on beach ridges and wet prairie in swales.

Similar Ecological Systems:

- Great Lakes Dune (CES201.026)
- Northern Great Lakes Interdunal Wetland (CES201.034)--may not be a distinct system.

DESCRIPTION

Environment: The system consists of a foredune, followed by a series of low to high dunes (uplands) and swales (wetlands). The system is often best developed where post-glacial streams entered an embayment and provide a dependable sand source. The combination of along-shore currents, waves, and winds form foredunes along the shoreline. With gradual long-term drops in water level, combined with post-glacial uplifting of the earth's crust, these low dunes gradually rise above the direct influence of the lakes, and new foredunes replace them. Over several thousand years, a series of ridges and swales is created. For most complexes, the flow of surface streams and groundwater maintain the wet conditions in the swales. With time, plant succession has proceeded to the point where the beach ridges are now forested while the wet swales are either forested or open wetlands. Along the Lake Superior shoreline,

where post-glacial uplift is greatest, many of the complexes consist primarily of dry, forested swales. The dunes and swales differs depending on fetch and the amount of sediment available. The influence of Great Lakes water-level fluctuations is probably limited to the first few swales inland from the shoreline. For most of the complexes, the water occupying the swales comes from streams flowing from the adjacent uplands or from groundwater seepage.

Vegetation: The foredunes of most dune-and-swale complexes are commonly 1-2 m high, with *Ammophila breviligulata*, *Calamovilfa longifolia*, *Salix serissima*, *Salix cordata*, and *Populus balsamifera* most common. The swale immediately behind the foredune is influenced by short-term variation in lake levels and can be partially or occasionally completely filled by dune sands following major storm events. Species common to this first swale include *Juncus balticus*, *Juncus pelocarpus*, *Juncus nodosus*, *Eleocharis acicularis*, and *Schoenoplectus americanus* (= *Scirpus americanus*). Occasionally, such swales may contain lake-influenced, calcareous sands, and the shallow swale may contain moderately alkaline indicators, such as *Cladium mariscoides*, *Myrica gale*, *Dasiphora fruticosa ssp. floribunda* (= *Pentaphylloides floribunda*), and others.

A low dune field with more advanced plant succession often follows the first open dunes and swales. *Pinus banksiana*, *Pinus strobus*, and *Pinus resinosa* often form a scattered overstory canopy, while *Juniperus communis*, *Juniperus horizontalis*, *Arctostaphylos uva-ursi*, and *Koeleria macrantha* form a scattered ground layer.

Following the dune-field zone, both dunes and swales are typically forested. Moist swales are often forested, and soil organic material has often begun to accumulate. *Thuja occidentalis*, *Alnus incana*, *Salix* spp., and *Acer rubrum* dominate the partial overstory canopy and understory. In contrast to the dry or moist swales, wetter swales (where standing water is present through most of the year) may be dominated by Carices, such as *Carex aquatilis* and *Carex stricta*.

Forested beach ridges, with soils of medium to coarse sand, tend to be dominated by species common to dry-mesic and mesic northern forest. Soil moisture conditions appear to change dramatically with slight elevational changes and are reflected in the development of soil organic material and changing plant species. On higher, drier ridges, soils often have less than 3 cm of organic material. *Pinus resinosa*, *Pinus strobus*, and *Quercus rubra* are often codominant, while *Betula papyrifera*, *Populus grandidentata*, *Abies balsamea*, and *Acer rubrum* are subdominant or understory species. *Pteridium aquilinum*, *Gaylussacia baccata*, *Vaccinium myrtilloides*, *Cornus canadensis*, and *Gaultheria procumbens* occur in the shrub and ground layers.

Complexes located in embayments protected from prevailing winds tend to be formed entirely of low, water-lain beach ridges. As a result, even the beach ridges within these complexes support wetland vegetation.

Dynamics: Foredune and immediate back dune areas are influenced by active dune processes of wind-caused "blowouts" and subsequent restabilization. Forested beach ridges may support fire regimes characteristic of similar upland forest systems outside of these complexes. Due to lakeshore proximity, heavy winds and resultant windthrow are common in forested ridges. Great Lakes water-level fluctuations likely influence water levels in swales closest to the shoreline, if at all. The hydrology of interdunal swales is driven largely by lateral flow through the porous beach ridges. Older swales (farthest from current lakeshores) in larger complexes support peat-forming bogs.

MEMBERSHIP

Associations:

- *Ammophila breviligulata* - (*Schizachyrium scoparium*) Herbaceous Vegetation (CEGL005098, G3G5)
- *Chamaedaphne calyculata* - *Myrica gale* / *Carex lasiocarpa* Dwarf-shrubland (CEGL005228, G4G5)
- *Dasiphora fruticosa ssp. floribunda* / *Cladium mariscoides* - *Juncus balticus* - (*Rhynchospora capillacea*) Herbaceous Vegetation (CEGL005105, G3?)
- *Juniperus horizontalis* - *Arctostaphylos uva-ursi* - *Juniperus communis* Dune Dwarf-shrubland (CEGL005064, G3G4)
- *Pinus banksiana* - (*Pinus resinosa*) - *Pinus strobus* / *Juniperus horizontalis* Wooded Herbaceous Vegetation (CEGL005125, G2)
- *Pinus banksiana* - *Pinus resinosa* - *Pinus strobus* Dune Forest (CEGL002589, G3Q)
- *Populus deltoides* - (*Juniperus virginiana*) Dune Woodland (CEGL005119, G1G2)
- *Prunus pumila* - (*Ptelea trifoliata*) Dune Shrubland (CEGL005075, G2Q)
- *Thuja occidentalis* - (*Picea mariana*, *Abies balsamea*) / *Alnus incana* Forest (CEGL002456, G4)
- *Thuja occidentalis* - *Fraxinus nigra* Forest (CEGL005165, GNR)

Alliances:

- *Ammophila breviligulata* Herbaceous Alliance (A.1207)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Cladium mariscoides* Seasonally Flooded Herbaceous Alliance (A.1368)
- *Juniperus horizontalis* Dwarf-shrubland Alliance (A.1080)
- *Pinus banksiana* - (*Pinus resinosa*) Wooded Herbaceous Alliance (A.1499)
- *Pinus banksiana* Forest Alliance (A.116)
- *Populus deltoides* Woodland Alliance (A.1493)
- *Prunus pumila* Shrubland Alliance (A.912)
- *Thuja occidentalis* - *Acer rubrum* Saturated Forest Alliance (A.446)
- *Thuja occidentalis* Saturated Forest Alliance (A.200)

DISTRIBUTION

Range: This system occurs throughout the Great Lakes shorelines of the United States and Canada. In Pennsylvania, this is only on Presque Isle.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: IL, IN, MI, MN, NY, OH?, ON, PA, WI

Map Zones: 41:C, 49:C, 50:C, 51:C, 52:C, 62:C, 63:C, 64:C

USFS Ecomap Regions: 211Ee:PPP, 212Ha:CCC, 212Hf:CCC, 212Hl:CCC, 212J:CC, 212L:CC, 212Ra:CCC, 212Rc:CCC, 212Re:CCC, 212Sb:CCC, 212Sc:CCC, 212Sn:CCC, 212Sq:CCC, 212Te:CCC, 212Ya:CCC, 212Z:CC, 222Ib:CCP, 222Ie:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 48:C

SOURCES

References: Comer and Albert 1993, Comer et al. 2003, Lichter 1998, MNFI 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722946#references

Description Author: P. Comer and D. Albert

Version: 11 Apr 2007

Concept Author: P. Comer and D. Albert

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

1482 GREAT PLAINS PRAIRIE POTHOLE (CES303.661)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Lowland [Lowland]; Pothole; Herbaceous; Temperate [Temperate Continental]; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2482; ESLF 9203; ESP 1482

CONCEPT

Summary: The prairie pothole system is found primarily in the glaciated northern Great Plains of the United States and Canada, and is dominated by depressional wetlands formed by glaciers scraping the landscape during the Pleistocene era. This system is typified by several classes of wetlands distinguished by changes in topography, soils and hydrology. Many of the basins within this system are closed basins and receive irregular inputs of water from their surroundings (groundwater and precipitation), and export water as groundwater. Hydrology of the potholes is complex. Precipitation and runoff from snowmelt are often the principal water sources, with groundwater inflow secondary. Evapotranspiration is the major water loss, with seepage loss secondary. Most of the wetlands and lakes contain water that is alkaline (pH >7.4). The concentration of dissolved solids result in water that ranges from fresh to extremely saline. The flora and vegetation of this system are a function of the topography, water regime, and salinity. In addition, because of periodic droughts and wet periods, many wetlands within this system may undergo vegetation cycles. This system includes elements of emergent marshes and wet, sedge meadows that develop into a pattern of concentric rings. This system is responsible for a significant percentage of the annual production of many economically important waterfowl in North America and houses more than 50% of North American's migratory waterfowl, with several species reliant on this system for breeding and feeding. Much of the original extent of this system has been converted to agriculture, and only approximately 40-50% of the system remains undrained.

Classification Comments: More data from Canada is needed to really define this system completely.

DESCRIPTION

Environment: This system is dominated by closed basins, potholes, that receive irregular inputs of water from the surroundings and export water as groundwater. The climate for the range of this system is characterized by mid-continental temperature and precipitation extremes. Snowmelt in the spring typically fills many of the potholes in examples of this system. The region in the range of this system is distinguished by a thin mantle of glacial drift with overlying stratified sedimentary rocks of the Mesozoic and Cenozoic ages; these form a glacial landscape of end moraines, stagnation moraines, outwash plains and lakeplains. The glacial drift ranges 30 to 120 m thick and forms steep to slight local relief with fine-grained, silty to clayey soils. Limestone, sandstone, and shales predominant, and highly mineralized water can discharge from these rocks. The hydrology of this system is complex with salinity ranging from fresh to saline, and chemical characteristics varying seasonally and annually. Precipitation and snowmelt are the primary water sources with evapotranspiration being the source of major water loss.

Vegetation: The vegetation within this system is highly influenced by hydrology, salinity and dynamics. Potholes found within this system can vary in depth and duration, which will determine the local gradient of species. Likewise, plant species found within individual potholes of this system will be strongly influenced by periodic drought and wet periods. Deeper potholes with standing water throughout most of the year have a central zone of submersed aquatic vegetation. Potholes that dry during droughty times can have central zones dominated by either tall emergents or mid-height emergents depending on the depth of the marsh. Wet meadow species such as grasses, forbs and sedges can be found in potholes that are only flooded briefly in the spring. All of these types of potholes can be found within an example of this system. Grazing, draining, and mowing of this system can influence the distribution of these types of potholes and plant species within this system.

Dynamics: Flooding is the primary natural dynamic influencing this system. Snowmelt in the spring often floods this system and can cause the prominent potholes within the system to overflow. Greater than normal precipitation can flood out emergent vegetation and/or increase herbivory by animal species such as muskrats. This system can undergo periodic wet and droughty periods that can cause shifts in the vegetation. Vegetation zones are evident around the wet potholes throughout this system, and each zone responds to changing environmental conditions. Draining and conversion to agriculture can also significantly impact this system. Much of the original extent of this system has been converted to cropland, and many remaining examples are under pressure to be drained.

MEMBERSHIP

Associations:

- *Carex lasiocarpa* - *Carex oligosperma* / *Sphagnum* spp. Herbaceous Vegetation (CEGL002265, G3G4)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus maritimus* - *Schoenoplectus acutus* - (*Triglochin maritima*) Herbaceous Vegetation (CEGL002227, G3G5)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)

Alliances:

- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)

- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)

DISTRIBUTION

Range: This system can be found throughout the northern Great Plains ranging from central Iowa northeast to southern Saskatchewan and Alberta, and extending west into north-central Montana. It encompasses approximately 870,000 square km with approximately 80% of its range in southern Canada. It is also prevalent in North Dakota, South Dakota, and northern Minnesota.

Divisions: 205:C; 303:C

Nations: CA, US

Subnations: AB, IA?, MB, MN, MT, ND, SD, SK

Map Zones: 20:C, 29:C, 38:?, 39:C, 40:C, 41:C, 42:P

USFS Ecomap Regions: 251A:CC, 251B:CC, 331D:CC, 331E:CC, 331K:CC, 331L:CC, 331M:CC

TNC Ecoregions: 26:C, 34:C, 35:C, 66:P, 67:P

SOURCES

References: Comer et al. 2003, Johnson et al. 1987, Kantrud et al. 1989, Lesica 1989, Stewart and Kantrud 1972

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722997#references

Description Author: S. Menard

Version: 05 Mar 2003

Concept Author: S. Menard

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

1153 INTER-MOUNTAIN BASINS GREASEWOOD FLAT (CES304.780)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Alkaline Soil; Deep Soil; Xeromorphic Shrub

Non-Diagnostic Classifiers: Deep (>15 cm) Water; Alluvial flat; Alluvial plain; Alluvial terrace; Temperate [Temperate Continental]; Depressional; Isolated Wetland [Partially Isolated]; Saline Substrate Chemistry; *Sarcobatus vermiculatus*

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Evergreen shrubland

National Mapping Codes: EVT 2153; ESLF 9103; ESP 1153

CONCEPT

Summary: This ecological system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains and into central Montana. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*. Other shrubs that may be present to codominant in some occurrences include *Atriplex canescens*, *Atriplex confertifolia*, *Atriplex gardneri*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *tridentata*, *Artemisia cana* ssp. *cana*, or *Krascheninnikovia lanata*. Occurrences are often surrounded by mixed salt desert scrub or big sagebrush shrublands. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Sporobolus airoides*, *Pascopyrum smithii*, *Distichlis spicata* (where water remains ponded the longest), *Calamovilfa longifolia*, *Poa pratensis*, *Puccinellia nuttalliana*, or *Eleocharis palustris* herbaceous types.

Similar Ecological Systems:

- Inter-Mountain Basins Wash (CES304.781)

Related Concepts:

- Salt Desert Shrub (414) (Shiflet 1994) Broader
- Saltbush - Greasewood (501) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Atriplex confertifolia* - *Sarcobatus vermiculatus* Shrubland (CEGL001313, G5)
- *Distichlis spicata* - (*Scirpus nevadensis*) Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata* - *Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* - Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Ericameria nauseosa* / *Sporobolus airoides* Shrubland (CEGL002918, G3Q)
- *Leymus cinereus* - *Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Leymus cinereus* Bottomland Herbaceous Vegetation (CEGL001480, G1)
- *Leymus cinereus* Herbaceous Vegetation (CEGL001479, G2G3Q)
- *Puccinellia nuttalliana* Herbaceous Vegetation (CEGL001799, G3?)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Sarcobatus vermiculatus* - *Atriplex parryi* / *Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus* - *Psoralea polydenia* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus* / *Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus* / *Artemisia tridentata* Shrubland (CEGL001359, G4)
- *Sarcobatus vermiculatus* / *Atriplex confertifolia* - (*Picrothamnus desertorum*, *Suaeda moquinii*) Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus* / *Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus* / *Bouteloua gracilis* Shrubland (CEGL001361, G1Q)
- *Sarcobatus vermiculatus* / *Distichlis spicata* Shrubland (CEGL001363, G4)
- *Sarcobatus vermiculatus* / *Elymus elymoides* - *Pascopyrum smithii* Shrubland (CEGL001365, G2?)
- *Sarcobatus vermiculatus* / *Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus* / *Juncus balticus* Sparse Vegetation (CEGL002919, G3?)
- *Sarcobatus vermiculatus* / *Leymus cinereus* Shrubland (CEGL001366, G3)
- *Sarcobatus vermiculatus* / *Nitrophila occidentalis* - *Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrub Herbaceous Vegetation (CEGL001508, G4)

- *Sarcobatus vermiculatus* / *Pseudoroegneria spicata* Shrubland (CEGL001367, G3)
- *Sarcobatus vermiculatus* / *Sporobolus airoides* Shrubland (CEGL001368, G3?)
- *Sarcobatus vermiculatus* / *Suaeda moquinii* Shrubland (CEGL001370, GUQ)
- *Sarcobatus vermiculatus* Disturbed Shrubland (CEGL001357, G5)
- *Sporobolus airoides* - *Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)

Alliances:

- *Atriplex confertifolia* Shrubland Alliance (A.870)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Puccinellia nuttalliana* Intermittently Flooded Herbaceous Alliance (A.1335)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Intermittently Flooded Sparsely Vegetated Alliance (A.1877)
- *Sarcobatus vermiculatus* Shrubland Alliance (A.1041)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)

DISTRIBUTION

Range: This system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains.

Divisions: 303:C; 304:C

Nations: US

Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 6:P, 7:C, 8:C, 9:C, 10:?, 12:C, 13:C, 15:?, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 27:C, 28:C, 29:C, 30:P, 33:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:??, 322A:CC, 331B:CC, 331C:CP, 331D:CP, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:CP, 331L:C?, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:CC, M242C:??, M261D:CC, M261E:CP, M261G:CC, M313A:CC, M313B:CC, M331A:C?, M331B:CP, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CP, M331J:C?, M332A:C?, M332D:CP, M332E:C?, M332G:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C

SOURCES

References: Comer et al. 2003, Knight 1994, West 1983b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722892#references

Description Author: NatureServe Western Ecology Team

Version: 29 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West
ClassifResp: West

LAURENTIAN-ACADIAN FLOODPLAIN FOREST (CES201.587)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval [Short interval, Spring Flooding]; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Woody-Herbaceous; Herbaceous; Riverine / Alluvial; Flood Scouring

Non-Diagnostic Classifiers: Mesotrophic Water; Moderate (100-500 yrs) Persistence; Lowland; Toeslope/Valley Bottom; Glaciated; Eutrophic Soil; Mesotrophic Soil; Circumneutral Soil; Acidic Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Silt Soil Texture; Udic; Unconsolidated; Very Short Disturbance Interval; Broad-Leaved Deciduous Tree; Broad-Leaved Shrub; Graminoid

National Mapping Codes: ESLF 9328

CONCEPT

Summary: This system encompasses north-temperate floodplains in the northeastern and north-central U.S. and adjacent Canada at the northern end of the range of silver maple. They occur along medium to large rivers where topography and process have resulted in the development of a complex of upland and wetland temperate alluvial vegetation on generally flat topography. This complex includes floodplain forests, with *Acer saccharinum* characteristic, as well as herbaceous sloughs and shrub wetlands. In areas subject to more scour, sparse non-wetland vegetation may develop on sandbars or exposed rock. Most areas are underwater each spring; microtopography determines how long the various habitats are inundated. Associated trees include *Acer rubrum* and *Carpinus caroliniana*, the latter frequent but never abundant. On terraces or in more calcareous areas, *Acer saccharum* or *Quercus rubra* may be locally prominent, with *Betula alleghaniensis* and *Fraxinus* spp. *Salix nigra* is characteristic of the levees adjacent to the channel. Common shrubs include *Cornus amomum* and *Viburnum* spp. The herb layer in the forested portions often features abundant spring ephemerals, giving way to a fern-dominated understory in many areas by mid-summer. Non-forested wetlands associated with these systems include shrub-dominated and graminoid-herbaceous vegetation.

Classification Comments: These floodplains are similar to those to the south in the Central Interior, North-Central Interior Floodplain (CES202.694) and Appalachian Division, Central Appalachian River Floodplain (CES202.608) in having *Acer saccharinum* as a characteristic species; however, they are generally more depauperate and lack certain tree species that characterize central Appalachian floodplains such as *Platanus occidentalis*, *Betula nigra*, and *Quercus palustris*.

Similar Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- North-Central Interior Floodplain (CES202.694)

MEMBERSHIP

Associations:

- *Acer (rubrum, saccharinum) - Fraxinus pennsylvanica / Ilex verticillata / Osmunda regalis* Forest (CEGL006630, GNR)
- *Acer rubrum - Abies balsamea / Viburnum nudum var. cassinoides* Floodplain Forest (CEGL006501, GNR)
- *Acer rubrum - Prunus serotina / Cornus amomum* Forest (CEGL006503, GNR)
- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Forest (CEGL006147, GNR)
- *Acer saccharinum - Ulmus americana* Forest (CEGL002586, G4?)
- *Acer saccharinum / Onoclea sensibilis - Boehmeria cylindrica* Forest (CEGL006176, GNR)
- *Acer saccharum - Fraxinus* spp. - *Tilia americana / Matteuccia struthiopteris - Ageratina altissima* Forest (CEGL006114, GNR)
- *Acer saccharum / Ostrya virginiana / Brachyelytrum erectum* Forest (CEGL006504, GNR)
- *Alnus incana - Cornus (amomum, sericea) / Clematis virginiana* Shrubland (CEGL006062, G4G5)
- *Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Sparse Vegetation (CEGL006284, G2)
- *Calamagrostis canadensis - Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519, GNR)
- *Cephalanthus occidentalis - Decodon verticillatus* Shrubland (CEGL006069, G4G5)
- *Fraxinus pennsylvanica - Ulmus americana - (Acer negundo, Tilia americana)* Northern Forest (CEGL002089, G3G4)
- *Hudsonia tomentosa - Paronychia argyrocoma* Dwarf-shrubland (CEGL006232, G1)
- Igneous - Metamorphic Cobble - Gravel River Shore Sparse Vegetation (CEGL002304, G4G5)
- *Prunus pumila var. depressa / Deschampsia caespitosa* Herbaceous Vegetation (CEGL006437, GNR)
- River Mudflats Sparse Vegetation (CEGL002314, GNR)
- Sandstone Bedrock River Shore Sparse Vegetation (CEGL002302, GNR)
- *Spartina pectinata - Muhlenbergia richardsonis - Sporobolus heterolepis - Oligoneuron album - Euthamia graminifolia* Sparse Vegetation (CEGL005233, G1)
- *Vaccinium* spp. / *Danthonia spicata - Solidago puberula* Sparse Vegetation (CEGL006531, GNR)

Alliances:

- *Acer (rubrum, saccharinum) - Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Acer rubrum - Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)

- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Hudsonia tomentosa* Temporarily Flooded Dwarf-shrubland Alliance (A.1087)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- Open Pavement Sparsely Vegetated Alliance (A.1843)

DISTRIBUTION

Range: Central and northern New England and adjacent Canada west to the Great Lakes.

Divisions: 103:C; 201:C

Nations: CA, US

Subnations: MA?, ME, MI, MN, NB, NH, NY, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211A:CC, 211B:CC, 211C:CC, 211D:CC, 211E:CC, 212H:CC, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Q:CC, 212Ra:CCC, 212Rb:CCP, 212Rc:CCC, 212Rd:CCC, 212Re:CCC, 212Sb:CCP, 212Sc:CCP, 212Sn:CCC, 212Sq:CCP, 212Tb:CCP, 212Tc:CCC, 212Te:CCC, 212Xb:CCP, 212Xc:CCP, 212Xq:CCC, 212Ya:CCC, 212Z:CC, 222N:CC, 251A:CC, M211A:CC, M211B:CC, M211C:CC, M211D:CC

TNC Ecoregions: 47:C, 48:C, 61:C, 63:C, 64:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723019#references

Description Author: S.C. Gawler

Version: 05 Jun 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: East

MEDITERRANEAN CALIFORNIA FOOTHILL AND LOWER MONTANE RIPARIAN WOODLAND (CES206.944)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Riparian Mosaic; Forest and Woodland (Treed); Mediterranean [Mediterranean Xeric-Oceanic]; Riverine / Alluvial; Very Short Disturbance Interval; Flood Scouring

Non-Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Shallow Soil; Aquic; Udic; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9330

CONCEPT

Summary: This system is found throughout Mediterranean California within a broad elevation range from near sea level up to 300 m (900 feet) in the Coast Ranges and inland to 1500 m (4545 feet). This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. The variety of plant associations connected to this system reflects elevation, stream gradient, floodplain width, and flooding events. Dominant trees may include *Alnus rhombifolia*, *Acer negundo*, *Alnus rubra* (in Coast Ranges), *Populus fremontii*, *Salix laevigata*, *Salix gooddingii*, *Pseudotsuga menziesii*, *Platanus racemosa*, *Quercus agrifolia*, and *Acer macrophyllum* (in central and south coast). Dominant shrubs include *Salix exigua* and *Salix lasiolepis*. Exotic trees *Ailanthus altissima*, *Eucalyptus* spp., and herbs such as *Arundo donax* occur. These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance.

Classification Comments: It is unclear if riparian woodlands and shrublands occur in the upper montane and subalpine regions of the Sierras and possibly the Transverse Ranges, and if they do, if they are significantly different in composition to be distinguished as an ecological system. Some literature indicates that, if they do occur, the woodlands at least are not at all common. For now, there is no "subalpine-upper montane Sierran riparian" system described. Lower elevation (low montane and foothill) riparian systems on the east side of the Sierras are treated in Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045).

Related Concepts:

- Riparian Woodland (203) (Shiflet 1994) Broader

DISTRIBUTION

Range: This system is found throughout Mediterranean California within a broad elevation range from near sea level up to 300 m (900 feet) in the Coast Ranges and inland to 1500 m (4545 feet).

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), OR

Map Zones: 2:C, 3:C, 4:C, 5:C, 6:C, 7:C

USFS Ecomap Regions: 322A:PP, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M261F:CC, M261G:CC

TNC Ecoregions: 5:C, 12:C, 13:C, 14:C, 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722737#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

MEDITERRANEAN CALIFORNIA SERPENTINE FOOTHILL AND LOWER MONTANE RIPARIAN WOODLAND AND SEEP (CES206.945)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Intermittent Flooding; Short (<5 yrs) Flooding Interval; Serpentine; Mediterranean [Mediterranean Xeric-Oceanic]; Seepage-Fed Sloping; Riverine / Alluvial; Cupressus sargentii

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Aquic; Very Short Disturbance Interval; Flood Scouring

National Mapping Codes: ESLF 9325

CONCEPT

Summary: This ecological system is found mostly in the central and inner northern Coast Ranges of California and Sierra Nevada foothills. It includes springs, seeps, and perennial and intermittent streams in serpentine substrates (true serpentinite but also other related substrates). Characteristic species include *Salix breweri*, *Cupressus sargentii*, *Frangula californica ssp. tomentella* (= *Rhamnus tomentella*), *Umbellularia californica*, *Cirsium fontinale*, *Stachys albens*, *Solidago* spp., *Packera clevelandii* (= *Senecio clevelandii*), *Mimulus glaucescens*, *Mimulus guttatus*, *Aquilegia eximia*, and *Carex serratodens*. Riparian portions of this system are disturbance-driven and require limited flooding, scour and deposition for germination and maintenance.

Related Concepts:

- Port Orford-Cedar: 231 (Eyre 1980) Intersecting
- Riparian Woodland (203) (Shiflet 1994) Broader. Serpentine substrates are not specifically mentioned in Shiflet (1994) for this type, but they are likely included in SRM concept.

DISTRIBUTION

Range: This system occurs in the central and inner northern Coast Ranges of California and Oregon and Sierra Nevada foothills.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C, 6:C

USFS Ecomap Regions: M261A:CC, M261B:CP, M261C:CP, M261D:C?, M261F:C?

TNC Ecoregions: 5:C, 12:P, 14:C, 15:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722736#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 07 Oct 2005

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

NORTH-CENTRAL INTERIOR FLOODPLAIN (CES202.694)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Floodplain; Forest and Woodland (Treed); Herbaceous; Glaciated; Clay Soil Texture; Sand Soil Texture; Udic

National Mapping Codes: ESLF 9338

CONCEPT

Summary: This system is found along rivers across the glaciated Midwest. It occurs from river's edge across the floodplain or to where it meets a wet meadow system. It can have a variety of soil types found within the floodplain from very well-drained sandy substrates to very dense clays. It is this variety of substrates and flooding that creates the mix of vegetation that includes *Acer saccharinum*, *Populus deltoides*, willows, especially *Salix nigra* in the wettest areas, and *Fraxinus pennsylvanica*, *Ulmus americana*, and *Quercus macrocarpa* in more well-drained areas. Within this system are oxbows that may support *Nelumbo lutea* and *Typha latifolia*. Understory species are mixed, but include shrubs, such as *Cornus drummondii* and *Asimina triloba* (in Kansas), sedges and grasses, which sometimes help form savanna vegetation. Flooding is the primary dynamic process, but drought, grazing, and fire have all had historical influence on this system. Federal reservoirs have had a serious and negative effect on this system, along with agriculture that has converted much of this system to drained agricultural land.

Classification Comments: The distribution limit northward is considered to be the Laurentian region boundary. This system is distinguished from floodplain systems northeastward, Laurentian-Acadian Floodplain Forest (CES201.587), and eastward, Central Appalachian River Floodplain (CES202.608). *Celtis* and *Populus deltoides* are absent (or essentially so) from the Laurentian-Acadian type.

Similar Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- Laurentian-Acadian Floodplain Forest (CES201.587)

DESCRIPTION

Environment: This ecological system occurs in floodplains of medium to large rivers. It primarily is found on alluvial soils ranging from sandy to very dense clays.

Vegetation: The variety of soil properties associated with this system can create a mixture of vegetation. *Acer saccharinum* occurs on the wetter soils of floodplains in the eastern portion of this system, with *Populus deltoides* and willows, especially *Salix nigra*, occurring more in the western range of this system. *Fraxinus pennsylvanica*, *Ulmus americana*, and *Quercus macrocarpa* occur in more well-drained areas. Understory species can vary across the range of this system but can include shrubs such as *Cornus drummondii* and *Asimina triloba*, and sedge and grass species. Oxbows within this system may have species such as *Nelumbo lutea* and *Typha latifolia*.

Dynamics: This system is primarily controlled by moderate to frequent flooding. Grazing can also impact this system and can lead to decreased cover of many graminoid species in some areas.

MEMBERSHIP

Associations:

- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Acer saccharinum* - *Ulmus americana* Forest (CEGL002586, G4?)
- *Acer saccharum* - *Carya cordiformis* / *Asimina triloba* Floodplain Forest (CEGL005035, G2)
- *Betula nigra* - *Platanus occidentalis* Forest (CEGL002086, G5)
- *Brasenia schreberi* Herbaceous Vegetation (CEGL004527, G4?)
- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex pellita* - *Carex* spp. - *Schoenoplectus tabernaemontani* Fen Herbaceous Vegetation (CEGL002041, G1)
- *Carex* spp. - (*Carex pellita*, *Carex vulpinoidea*) Herbaceous Vegetation (CEGL005272, GNR)
- *Carya illinoensis* - *Celtis laevigata* Forest (CEGL002087, G4?)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) / *Symphoricarpos occidentalis* Forest (CEGL002088, G4?)
- *Fraxinus pennsylvanica* - *Celtis occidentalis* - *Tilia americana* - (*Quercus macrocarpa*) Forest (CEGL002081, G4?)
- *Fraxinus pennsylvanica* - *Celtis* spp. - *Quercus* spp. - *Platanus occidentalis* Bottomland Forest (CEGL002410, G3G4)
- *Fraxinus pennsylvanica* - *Ulmus americana* - (*Acer negundo*, *Tilia americana*) Northern Forest (CEGL002089, G3G4)

- *Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014, G3G5)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044, GNA)
- *Populus deltoides* - (*Salix nigra*) / *Spartina pectinata* - *Carex* spp. Woodland (CEGL002017, G1)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* - *Platanus occidentalis* Forest (CEGL002095, G1G2)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Quercus macrocarpa* - *Quercus bicolor* - *Carya laciniata* / *Leersia* spp. - *Cinna* spp. Forest (CEGL002098, G2G3)
- *Quercus macrocarpa* - *Quercus shumardii* - *Carya cordiformis* / *Chasmanthium latifolium* Forest (CEGL004544, G3?)
- River Mudflats Sparse Vegetation (CEGL002314, GNR)
- Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049, G4G5)
- *Sagittaria latifolia* - *Leersia oryzoides* Herbaceous Vegetation (CEGL005240, GNR)
- *Salix interior* Temporarily Flooded Shrubland (CEGL008562, G4G5)
- *Salix nigra* Forest (CEGL002103, G4)
- *Salix* spp. / *Andropogon gerardii* - *Sorghastrum nutans* Gravel Wash Herbaceous Vegetation (CEGL005175, G2Q)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233, G5)

Alliances:

- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Brasenia schreberi* Permanently Flooded Herbaceous Alliance (A.1742)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Carya illinoensis* - (*Celtis laevigata*) Temporarily Flooded Forest Alliance (A.282)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Temporarily Flooded Forest Alliance (A.308)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Quercus macrocarpa* - *Quercus bicolor* - (*Carya laciniata*) Temporarily Flooded Forest Alliance (A.293)
- *Sagittaria latifolia* Semipermanently Flooded Herbaceous Alliance (A.1675)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- Sand Flats Temporarily Flooded Sparsely Vegetated Alliance (A.1864)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found along medium and large river floodplains throughout the glaciated Midwest ranging from eastern Kansas and western Missouri to western Ohio and north along the Red River basin in Minnesota.

Divisions: 202:C; 205:C

Nations: US

Subnations: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI

Map Zones: 38:C, 39:C, 40:C, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 222H:CC, 222I:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222L:CC, 222M:CC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC, 223A:CC, 251B:CC, 251E:CC, 251F:CC, 251G:CC, 251H:CC, 255A:CC, 332B:CC, 332C:CC, 332D:CC, 332E:CC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:?, 48:?

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722965#references

Description Author: S. Menard and K. Kindscher

Version: 18 Jul 2006

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, Southeast

ClassifResp: Midwest

NORTHERN ATLANTIC COASTAL PLAIN CALCAREOUS RAVINE (CES203.069)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Ravine; Slope; Seepage-Fed Sloping; Calcareous

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: ESLF 4156

CONCEPT

Summary: This system occurs on dry to mesic ravine slopes and bottoms of the northern Atlantic Coastal Plain where erosion has exposed Tertiary-aged shell deposits or limesands. These calcium-bearing sediments produce soils that range from slightly acidic to circumneutral and moderately to very strongly calcareous. The fertile soils support a rich diversity of plant species that distinguishes this system from the more widespread dry-mesic, acidic (poor) ravines. This system includes upland forests and woodlands on slopes and low interfluvial and seepage wetlands found along the base of slopes. Species composition varies with the environmental setting. The communities of this system often contain species that are disjunct from their primary ranges in the mountains or Piedmont, such as *Actaea pachypoda*, *Caltha palustris*, *Pedicularis lanceolata*, *Solidago flexicaulis*, *Quercus muehlenbergii*, *Verbesina virginica* var. *virginica*, *Hexalectris spicata*, *Corallorrhiza wisteriana*, *Campanulastrum americanum*, *Celastrus scandens*, *Muhlenbergia sobolifera*, *Muhlenbergia tenuiflora*, *Sanicula marilandica*, and *Thalictrum revolutum*.

DESCRIPTION

Environment: This system is naturally rare and restricted to the calcium-rich, shell-containing formations exposed in ravines of downcutting streams along the northern Atlantic Coastal Plain of Virginia, Maryland, Delaware and New Jersey. It comprises mesic and dry uplands and seepage wetlands associated with these base-rich areas. Occurrences are typically linear or small patch and uncommon.

Vegetation: Forests of mesic slopes and low interfluvial areas are characterized by *Fagus grandifolia*, *Liriodendron tulipifera*, *Quercus alba*, *Carya cordiformis*, and *Quercus rubra* in the overstory. Other canopy dominants and associates may include *Quercus muehlenbergii*, *Fraxinus americana*, *Tilia americana*, and *Acer barbatum*. The understory is often dense and may include *Asimina triloba*, *Lindera benzoin*, *Viburnum prunifolium*, *Ulmus rubra*, *Ilex opaca*, *Magnolia tripetala*, and *Cercis canadensis* var. *canadensis*. The ground cover is lush though sometimes patchy and may include *Podophyllum peltatum*, *Arisaema triphyllum*, *Sanguinaria canadensis*, *Circaea lutetiana* ssp. *canadensis*, *Maianthemum racemosum* ssp. *racemosum*, *Cardamine concatenata*, and *Polystichum acrostichoides*. More locally abundant herbs include *Cystopteris protrusa*, *Deparia acrostichoides*, *Diplazium pycnocarpon*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Phegopteris hexagonoptera*, *Nemophila aphylla*, and *Actaea pachypoda*.

Drier, more southerly facing convex slopes are characterized by a more open canopy of *Quercus muehlenbergii*; common associates may include *Acer barbatum*, *Carya cordiformis*, *Fagus grandifolia*, *Fraxinus americana*, *Quercus alba*, *Quercus rubra*, and *Quercus prinus*. The understory may include *Juniperus virginiana* var. *virginiana*, *Cercis canadensis* var. *canadensis*, *Dirca palustris*, *Ilex opaca* var. *opaca*, *Sideroxylon lycioides*, and *Viburnum rufidulum*. The herb layer is usually patchy but contains a diversity of species, including *Aquilegia canadensis*, *Erigeron pulchellus* var. *pulchellus*, *Bromus pubescens*, *Dichanthelium boscii*, *Verbesina virginica* var. *virginica*, *Campanulastrum americanum*, *Smallanthus uvedalius*, *Silphium trifoliatum* var. *trifoliatum*, *Desmodium pauciflorum*, *Hexalectris spicata*, and *Piptochaetium avenaceum*.

Forested seepage wetlands are often found along stream bottoms and at the base of slopes. Braided streams and hummock-and-hollow microtopography are characteristic of the environmental setting. The tree canopy is characterized by *Fraxinus pennsylvanica*, *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa biflora*, and others. The shrub layer is comprised of *Lindera benzoin*, *Morella cerifera* (= *Myrica cerifera*), and *Cornus foemina*. Vines are abundant, especially *Decumaria barbara*. The herbaceous layer is characterized by *Caltha palustris*, *Carex bromoides*, *Packera aurea* (= *Senecio aureus*), *Scirpus lineatus*, *Thelypteris palustris*, *Pedicularis lanceolata*, *Carex tetanica*, *Liparis loeselii*, and *Carex granularis* on drier hummocks, and *Saururus cernuus*, *Bidens laevis*, *Pilea fontana*, *Glyceria striata*, and *Impatiens capensis* in wetter hollows and seepage rivulets.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Packera aurea* - *Carex bromoides* - *Pilea fontana* - *Bidens laevis* Forest (CEGL006413, G2)
- *Fagus grandifolia* - *Acer barbatum* - *Quercus muehlenbergii* / *Sanguinaria canadensis* Forest (CEGL007181, G2?)
- *Fagus grandifolia* - *Liriodendron tulipifera* - *Carya cordiformis* / *Lindera benzoin* / *Podophyllum peltatum* Forest (CEGL006055, G4?)
- *Quercus muehlenbergii* / *Cercis canadensis* / *Dichanthelium boscii* - *Bromus pubescens* - *Erigeron pulchellus* var. *pulchellus* - *Aquilegia canadensis* Forest (CEGL007748, G1)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Saturated Forest Alliance (A.3035)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.

DISTRIBUTION

Range: This system is known from the northern Atlantic Coastal Plain of Virginia and Maryland, possibly ranging north into Delaware and New Jersey.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, VA

Map Zones: 60:C

TNC Ecoregions: 57:C, 58:C

SOURCES

References: Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.798077#references

Description Author: G. Fleming and J. Teague

Version: 01 Feb 2007

Concept Author: NCR Review Team

Stakeholders: East, Southeast

ClassifResp: East

1436 NORTHERN ATLANTIC COASTAL PLAIN DUNE AND SWALE (CES203.264)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch, Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: North Atlantic Coastal Plain; Beach (Substrate); Graminoid; Coast

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2436; ESLF 7149; ESP 1436

CONCEPT

Summary: This system consists of vegetation of barrier islands and other coastal areas, ranging from northernmost North Carolina northward to southern Maine (where extensive sandy coastlines are replaced by rocky coasts). A range of plant communities may be present, but natural vegetation is predominately herbaceous, with *Ammophila breviligulata* diagnostic. Shrublands resulting from succession from grasslands may occur in limited areas. Both dune uplands and non-flooded wetland vegetation of interdunal swales are included in this system. Small patches of natural woodland may also be present in limited areas, especially in the northern range of this system. Dominant ecological processes are those associated with the maritime environment, including frequent salt spray, saltwater overwash, and sand movement.

Classification Comments: This system was separated from Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273) to parallel broad-scale biogeographic and climatic differences believed to be important in this environment. This system occupies the northern part of this broad transition which was labeled by Cowardin et al. (1979) as the Virginian Province, although the demarcated boundary differs somewhat from that used here. A useful vegetation indicator of this transition is the shift in herbaceous dominance on the dunes from *Uniola paniculata* in the south to *Ammophila breviligulata* in the north. Although the location of this shift itself is somewhat imprecise because of widespread planting of both species on artificially enhanced dunes, this boundary appears to be well approximated by Omernik Ecoregion 63g vs. 63d (EPA 2004). There is extensive south-to-north turnover of associations in TNC Ecoregion 58 with very little overlap southward. *Quercus virginiana* is only occasional in this system at its extreme southern end (southern Virginia) and should not be thought of as characteristic.

This system is distinguished from Northern Atlantic Coastal Plain Maritime Forest (CES203.302) by the lack of dominant woody vegetation. This distinction becomes blurred where dunes have been artificially enhanced and an unnatural succession to woody vegetation is occurring. The boundary at the northern end is the end of extensive sandy coastlines and the beginning of rocky coasts.

Southeastern Coastal Plain Interdunal Wetland (CES203.258) may occur with this system in northern North Carolina and southern Virginia. Where the ranges overlap, Southeastern Coastal Plain Interdunal Wetland (CES203.258) is distinguished from this system by the presence of standing water for a significant part of the growing season. This corresponds to a break between open-water and tall-graminoid marsh vegetation in the ponds and low-graminoid- or forb-dominated vegetation in the grasslands. North of Virginia, interdunal wetlands are smaller and more integrated into the dune systems and are included in this system.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895)
- Northern Atlantic Coastal Plain Maritime Forest (CES203.302)
- Northern Atlantic Coastal Plain Sandy Beach (CES203.301)--occurs between this system and the high tide line.
- Southeastern Coastal Plain Interdunal Wetland (CES203.258)
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)--occurs to the south.

DESCRIPTION

Environment: This system occurs on coastal strands and barrier islands, on sand dunes and sand flats. Strong salt spray is an important influence on vegetation in many parts. Overwash by sea water during storms is important on sand flats not protected by continuous dunes. On dunes, present or recent sand movement is an important factor. The combination of these factors prevents the dominance of woody vegetation. Sites may be either dry or saturated by freshwater from rainfall and the local water table. Areas connected to tidal influence are placed in other systems. Soils are sandy, with little organic matter and little or no horizon development. Soils may be excessively drained on the higher dunes. Soils are low in nutrient-holding capacity, but aerosol input of sea salt provides a continuous source of nutrients.

Vegetation: Vegetation consists of a set of grassland and herbaceous to shrubby associations. *Ammophila breviligulata* is the characteristic dominant on the youngest dunes and those most exposed to salt spray. Shrublands resulting from succession from grasslands may occur in limited areas, but they are generally not natural components of this system in the southern part of its range (M. Schafale pers. comm.). These communities tend to be low in plant species richness but have a characteristic set of forbs and occasional low shrubs associated with them. Wetter sand flats and dune swales may be dominated by a variety of herbs and sometimes have fairly high species richness.

Dynamics: The environment of this system is one of the most dynamic in existence for terrestrial vegetation. Reworking of sand by storms or by slower eolian processes may completely change the local environment in a short time, changing one association to

another. Many of these sites are fairly early in the process of primary succession on recent surfaces. Chronic salt spray is an ongoing stress. Overwash and extreme salt spray in storms are frequent disturbances. Vegetation interacts strongly with geologic processes; the presence of grass is an important factor in the development of new dunes. Alteration of dynamic processes, such as artificial enhancement of dunes by planting or sand fencing, can have drastic effects on this system, causing large areas to succeed to woody vegetation. Fire is probably not a major natural factor in this system, but may have been important locally. Most vegetation is too sparse to carry fire well.

MEMBERSHIP

Associations:

- (*Morella cerifera*) - *Panicum virgatum* - *Spartina patens* Herbaceous Vegetation (CEGL004129, G2G4)
- (*Morella pensylvanica*) / *Schizachyrium littorale* - *Aristida tuberculosa* Shrub Herbaceous Vegetation (CEGL006161, GNR)
- *Ammophila breviligulata* - *Lathyrus japonicus* Herbaceous Vegetation (CEGL006274, G4?)
- *Ammophila breviligulata* - *Panicum amarum* var. *amarum* Herbaceous Vegetation (CEGL004043, G2)
- *Bacopa monnieri* - *Eleocharis albida* Herbaceous Vegetation (CEGL006350, G1Q)
- *Cladium mariscoides* / *Vaccinium macrocarpon* - *Morella pensylvanica* Dwarf-shrubland (CEGL006141, G2G3)
- *Deschampsia flexuosa* Herbaceous Vegetation (CEGL006621, GNR)
- *Hudsonia tomentosa* - *Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL006143, G2G3)
- *Hudsonia tomentosa* / *Panicum amarum* var. *amarulum* Dwarf-shrubland (CEGL003950, G2G3)
- *Juncus (dichotomus, scirpoides)* - *Drosera intermedia* Herbaceous Vegetation (CEGL004111, G2G3)
- *Juniperus virginiana* var. *virginiana* / *Morella pensylvanica* Woodland (CEGL006212, G2)
- *Morella (pensylvanica, cerifera)* / *Schizachyrium littorale* - *Eupatorium hyssopifolium* Shrub Herbaceous Vegetation (CEGL004240, G2)
- *Morella cerifera* - *Vaccinium corymbosum* Shrubland (CEGL003906, G2G4)
- *Morella cerifera* / *Hydrocotyle verticillata* Shrubland (CEGL003840, G2G3)
- *Morella cerifera* / *Spartina patens* Shrubland (CEGL003839, G3G4)
- *Morella pensylvanica* - *Prunus maritima* Shrubland (CEGL006295, G4)
- *Morella pensylvanica* / *Diodia teres* Shrubland (CEGL003881, G2)
- *Morella pensylvanica* / *Schizachyrium littorale* - *Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067, G2)
- *Myrica gale* - *Morella pensylvanica* Saturated Shrubland (CEGL006339, GNR)
- *Pinus rigida* / *Hudsonia tomentosa* Woodland (CEGL006117, G2G3)
- *Pinus rigida* / *Vaccinium macrocarpon* Woodland (CEGL006127, GNR)
- *Pinus taeda* / *Hudsonia tomentosa* Woodland (CEGL006052, G1G2)
- *Prunus serotina* / *Morella cerifera* / *Smilax rotundifolia* Scrub Forest (CEGL006319, G1G2)
- *Salix nigra* Seasonally Flooded Forest (CEGL006348, G2G3)
- *Schoenoplectus pungens* - *Fimbristylis (castanea, caroliniana)* Herbaceous Vegetation (CEGL004117, G1G2)
- *Schoenoplectus pungens* var. *pungens* - *Juncus canadensis* Herbaceous Vegetation (CEGL006935, GNR)
- *Smilax glauca* - *Toxicodendron radicans* Vine-Shrubland (CEGL003886, G1G2)
- *Spartina patens* - *Eleocharis parvula* Herbaceous Vegetation (CEGL006342, GNR)
- *Spartina patens* - *Schoenoplectus pungens* - *Solidago sempervirens* Herbaceous Vegetation (CEGL004097, G2G3)
- *Spartina patens* - *Thinopyrum pycnanthum* Herbaceous Vegetation (CEGL006149, GNR)
- *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland (CEGL006371, G4)
- *Vitis rotundifolia* / *Triplasis purpurea* - *Panicum amarum* - *Schizachyrium littorale* Mid-Atlantic Coastal Meda±o Sparse Vegetation (CEGL004397, G1)

Alliances:

- *Ammophila breviligulata* Herbaceous Alliance (A.1207)
- *Bacopa monnieri* - *Eleocharis albida* Seasonally Flooded Herbaceous Alliance (A.1711)
- *Deschampsia flexuosa* Herbaceous Alliance (A.3039)
- *Fimbristylis castanea* - *Schoenoplectus pungens* Seasonally Flooded Herbaceous Alliance (A.1372)
- *Hudsonia tomentosa* Dwarf-shrubland Alliance (A.1062)
- *Juncus dichotomus* Seasonally Flooded Herbaceous Alliance (A.1427)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Morella (cerifera, pensylvanica)* - *Vaccinium formosum* Seasonally Flooded Shrubland Alliance (A.1010)
- *Morella cerifera* Saturated Shrubland Alliance (A.1906)
- *Morella pensylvanica* - (*Prunus maritima*) Shrubland Alliance (A.902)
- *Myrica gale* Saturated Shrubland Alliance (A.1022)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus taeda* Woodland Alliance (A.526)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Schizachyrium littorale* Shrub Herbaceous Alliance (A.1533)
- *Smilax* spp. - *Toxicodendron radicans* Vine-Shrubland Alliance (A.909)

- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Vaccinium formosum* - *Vaccinium fuscatum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)
- *Vaccinium macrocarpon* Saturated Dwarf-shrubland Alliance (A.1094)
- *Vitis rotundifolia* - *Parthenocissus quinquefolia* / *Triplasis purpurea* Unstabilized Dune Sparsely Vegetated Alliance (A.1858)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as a large-patch or linear system.

Size: Occurs in narrow to broad bands, extending along the length of coastal shores and barrier islands. Individual patches may cover a thousand or more acres. However, some of the best remnants are naturally small.

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895)
- Northern Atlantic Coastal Plain Maritime Forest (CES203.302)
- Northern Atlantic Coastal Plain Sandy Beach (CES203.301)

DISTRIBUTION

Range: This system ranges from northernmost North Carolina (EPA ecoregion 63d) and southeastern Virginia to southern Maine. The southern portion is a transition zone from around Kitty Hawk, North Carolina, to the Virginia-North Carolina border. The northern limit is Merrymeeting Bay, Maine.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NC, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 211Db:CCC, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221An:CCC, 232Ab:CCC, 232Hc:CCC, 232I:CC

TNC Ecoregions: 57:C, 58:C, 62:C, 63:C

SOURCES

References: Comer et al. 2003, Cowardin et al. 1979, Eastern Ecology Working Group n.d., EPA 2004, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723222#references

Description Author: R. Evans, mod.M. Pyne and S.C. Gawler

Version: 05 May 2008

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN STREAM AND RIVER (CES203.070)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Riverine / Alluvial

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Stream terrace (undifferentiated)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: ESLF 4157

CONCEPT

Summary: This ecological system is found throughout the northern Atlantic Coastal Plain, ranging from Virginia to New Jersey. Examples occur along low-gradient small streams and rivers. There may be little to moderate floodplain development. This system is influenced by overbank flooding, groundwater seepage and occasional beaver impoundments. The vegetation is a mosaic of forests, woodlands, shrublands, and herbaceous communities. Canopy composition and cover can vary within examples of this system, but typical tree species may include *Quercus palustris*, *Quercus phellos*, *Chamaecyparis thyoides*, *Acer rubrum*, *Fraxinus pennsylvanica*, *Nyssa sylvatica*, *Betula nigra*, *Liquidambar styraciflua*, and *Platanus occidentalis*. Shrubs and herbaceous layers can vary in richness and cover. Some characteristic shrubs may include *Alnus maritima*, *Carpinus caroliniana*, *Lindera benzoin*, and *Viburnum nudum*. Seepage forests dominated by *Acer rubrum* and *Magnolia virginiana* can often be found within this system, especially at the headwaters and terraces of streams. Where the channel is cutting through unconsolidated deposits of sand and clay, steep bluffs may form that can be important wildlife habitat.

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)

DESCRIPTION

Environment: This system occurs on small streams and rivers, and as a result, many of the depositional landforms may be poorly developed.

Dynamics: This system is influenced by periodic flooding and groundwater seepage.

MEMBERSHIP

Associations:

- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (CEGL006406, G4G5)
- *Acer rubrum* - *Fraxinus pennsylvanica* / *Saururus cernuus* Forest (CEGL006606, GNR)
- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia virginiana* / *Viburnum nudum var. nudum* / *Osmunda cinnamomea* - *Woodwardia areolata* Forest (CEGL006238, G3?)
- *Betula nigra* - *Platanus occidentalis* / *Impatiens capensis* Forest (CEGL006184, GNR)
- *Chamaecyparis thyoides* - *Acer rubrum* - *Magnolia virginiana* Forest (CEGL006078, GNR)
- *Chamaecyparis thyoides* / *Alnus maritima* Woodland (CEGL006307, GNR)
- *Chamaecyparis thyoides* / *Gaylussacia dumosa* / *Andropogon glomeratus var. glomeratus* Woodland (CEGL006262, G2G3)
- *Chamaecyparis thyoides* / *Ilex glabra* - *Rhododendron viscosum* Forest (CEGL006188, G3)
- *Chamaecyparis thyoides* / *Narthecium americanum* - *Sarracenia purpurea* - *Drosera filiformis* / *Sphagnum pulchrum* Woodland (CEGL006263, G2)
- *Cladium mariscoides* - *Panicum rigidulum var. pubescens* Herbaceous Vegetation (CEGL006270, G3)
- *Cornus amomum* - *Alnus serrulata* Shrubland (CEGL006414, GNR)
- *Decodon verticillatus* Semipermanently Flooded Shrubland (CEGL005089, GNR)
- *Eriocaulon aquaticum* - *Juncus pelocarpus* - *Drosera intermedia* Herbaceous Vegetation (CEGL006265, G3G4)
- Eroding Clay Bank Sparse Vegetation (CEGL002584, GNR)
- *Liquidambar styraciflua* - *Acer rubrum* - *Quercus phellos* / *Leucothoe racemosa* Forest (CEGL006110, G4G5)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Lindera benzoin* / *Arisaema triphyllum* Forest (CEGL004418, G4)
- *Muhlenbergia torreyana* - *Lobelia canbyi* - *Rhynchospora alba* Herbaceous Vegetation (CEGL006291, G2)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) / *Asimina triloba* Forest (CEGL006603, G3G4)
- *Quercus (phellos, palustris, michauxii)* - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)
- *Rhynchospora (alba, cephalantha)* - *Muhlenbergia uniflora* - *Lophiola aurea* Herbaceous Vegetation (CEGL006285, G2)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Saturated Forest Alliance (A.3035)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Chamaecyparis thyoides* - *Acer rubrum* Saturated Forest Alliance (A.448)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Chamaecyparis thyoides* Saturated Woodland Alliance (A.575)
- *Chamaecyparis thyoides* Seasonally Flooded Woodland Alliance (A.571)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Decodon verticillatus* Semipermanently Flooded Shrubland Alliance (A.1013)
- *Eleocharis* spp. - *Eriocaulon aquaticum* Semipermanently Flooded Herbaceous Alliance (A.1429)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Rhynchospora alba* Saturated Herbaceous Alliance (A.1461)
- Small Eroding Bluffs Sparsely Vegetated Alliance (A.1872)

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.

Size: Can be quite long but never very wide.

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

Adjacent Ecological System Comments: This list is incomplete; other systems are adjacent in different parts of the range.

DISTRIBUTION

Range: This system occurs on small streams and rivers, and as a result, many of the depositional landforms may be poorly developed. Riverside bluffs of unconsolidated sand and clay can be important micro-habitats.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, VA

Map Zones: 60:C

USFS Ecomap Regions: 232A:CC, 232H:CC

TNC Ecoregions: 57:C, 58:C, 62:C

SOURCES

References: Eastern Ecology Working Group n.d., Strakosch-Walz 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798071#references

Description Author: J. Teague, mod. S.C. Gawler

Version: 05 Feb 2009

Concept Author: NCR Review Team

Stakeholders: East, Southeast

ClassifResp: East

1168 NORTHERN ROCKY MOUNTAIN AVALANCHE CHUTE SHRUBLAND (CES306.801)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Avalanche chute; Very Short Disturbance Interval [Periodicity/Nonrandom Disturbance]; Avalanche

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Temperate [Temperate Continental]; Seepage-Fed Sloping [Mineral]; Forb

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Deciduous shrubland

National Mapping Codes: EVT 2168; ESLF 5327; ESP 1168

CONCEPT

Summary: This ecological system occurs in the mountains throughout the northern Rockies, from Wyoming north and west into British Columbia and Alberta. It is composed of a diverse mix of deciduous shrubs or trees, and conifers found on steep, frequently disturbed slopes in the mountains. Occurrences are found on the lower portions and runout zones of avalanche tracks, and slopes are generally steep, ranging from 15-60%. Aspects vary, but are more common where unstable or heavy snowpack conditions frequently occur. Sites are often mesic to wet because avalanche paths are often in stream gullies, and snow deposition can be heavy in the run-out zones. The vegetation consists of moderately dense, woody canopy characterized by dwarfed and damaged conifers and small, deciduous trees/shrubs. Characteristic species include *Abies lasiocarpa*, *Acer glabrum*, *Alnus viridis ssp. sinuata* or *Alnus incana*, *Populus balsamifera ssp. trichocarpa*, *Populus tremuloides*, or *Cornus sericea*. Other common woody plants include *Paxistima myrsinites*, *Sorbus scopulina*, and *Sorbus sitchensis*. The ground cover is moderately dense to dense forb-rich, with *Senecio triangularis*, *Castilleja* spp., *Athyrium filix-femina*, *Thalictrum occidentale*, *Urtica dioica*, *Erythronium grandiflorum*, *Myosotis asiatica* (= *Myosotis alpestris*), *Veratrum viride*, *Heracleum maximum* (= *Heracleum lanatum*), and *Xerophyllum tenax*. Mosses and ferns are often present.

MEMBERSHIP

Associations:

- *Abies lasiocarpa* - *Acer glabrum* Avalanche Chute Shrubland (CEGL000984, G5)
- *Acer glabrum* Avalanche Chute Shrubland (CEGL001061, G5)
- *Alnus* spp. Avalanche Chute Shrubland (CEGL001158, G5)
- *Alnus viridis ssp. sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland (CEGL001156, G4)
- *Alnus viridis ssp. sinuata* / Mesic Forbs Shrubland (CEGL002633, G3G4)
- *Populus balsamifera ssp. trichocarpa* / *Cornus sericea* Forest (CEGL000672, G3G4)
- *Populus tremuloides* / *Amelanchier alnifolia* Avalanche Chute Shrubland (CEGL005886, G3?)
- *Populus tremuloides* / *Cornus sericea* Forest (CEGL000582, G4)

Alliances:

- *Abies lasiocarpa* - *Acer glabrum* Shrubland Alliance (A.1052)
- *Acer glabrum* Shrubland Alliance (A.915)
- *Alnus (viridis ssp. sinuata, incana)* Temporarily Flooded Shrubland Alliance (A.965)
- *Alnus viridis ssp. sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

DISTRIBUTION

Range: This ecological system occurs in the mountains throughout the northern Rockies, from Wyoming north and west into British Columbia and Alberta. It is likely to occur in the Colorado Rockies, but no association from that area have been classified as "avalanche chute" communities.

Divisions: 306:C

Nations: CA, US

Subnations: AB, BC, CO, MT, OR, WA, WY

Map Zones: 9:C, 10:C, 12:?, 19:C, 21:P, 28:P

USFS Ecomap Regions: M242D:PP, M331A:CC, M331D:CC, M331E:CP, M331J:CC, M332B:PP, M332E:PP, M332F:PP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 7:C, 8:C, 9:C

SOURCES

References: Butler 1979, Butler 1985, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Malanson and Butler 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722872#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, West

ClassifResp: West

1009 NORTHWESTERN GREAT PLAINS ASPEN FOREST AND PARKLAND (CES303.681)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous; Boreal; Glaciated

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2009; ESLF 4146; ESP 1009

CONCEPT

Summary: This system ranges from the North Dakota/Manitoba border west to central Alberta and is considered part of the boreal-mixedgrass prairie grassland transition region. The climate in this region is mostly subhumid low boreal with short, warm summers and cold, long winters. Much of this region is covered with undulating to kettled glacial till. *Populus tremuloides* dominates this system. Common associates are *Betula papyrifera* and *Populus balsamifera* with an understory of mixedgrass species and tall shrubs. More poorly drained sites may contain willow (*Salix* spp.) and sedges (*Carex* spp.). Fire constitutes the most important dynamic in this system and prevents boreal conifer species such as *Picea glauca* and *Abies balsamea* from becoming too established in this system.

Classification Comments: This system can grade into Eastern Great Plains Tallgrass Aspen Parkland (CES205.688) to the east, which has a predominance of tallgrass species in the understory compared to the more mixedgrass species in this system. More data from Canada are needed to fully describe this system. In spring 2006, it was determined by Steve Cooper, Marion Reid and Gwen Kittel that this system does not occur in north-central Montana, mapzone 20. However, it does occur along the lower-elevation slopes of the Montana Front Range, in mapzone 19.

Similar Ecological Systems:

- Eastern Great Plains Tallgrass Aspen Parkland (CES205.688)
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Related Concepts:

- Aspen: 217 (Eyre 1980) Broader
- Fescue Grassland (613) (Shiflet 1994) Intersecting. *Festuca campestris* grasslands occur as small inclusions in this ecological system.

DESCRIPTION

Environment: Climate in the range of this system is mostly subhumid low boreal with short, warm summers and long, cold winters. Undulating to kettled glacial till predominates this region.

Vegetation: *Populus tremuloides* dominates this system. Common associates are *Populus balsamifera* and *Betula papyrifera* along with an understory of mixedgrass and tall-shrub species.

Dynamics: Fire is likely the most important natural dynamic allowing for a more open structure and preventing this system from containing more conifer species.

MEMBERSHIP

Associations:

- *Betula papyrifera* / *Corylus cornuta* Forest (CEGL002079, G2G3)
- *Betula papyrifera* / *Corylus cornuta* Woodland (CEGL002128, G2G3)
- *Festuca altaica* - (*Hesperostipa* spp., *Achnatherum* spp.) Herbaceous Vegetation (CEGL002436, GNR)
- *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629, G4)
- *Populus tremuloides* - *Populus balsamifera* / *Calamagrostis canadensis* Forest (CEGL002097, G3G4)
- *Populus tremuloides* / *Calamagrostis rubescens* Forest (CEGL000575, G5?)
- *Populus tremuloides* / *Prunus virginiana* Woodland (CEGL002130, G4G5)

Alliances:

- *Betula papyrifera* Forest Alliance (A.267)
- *Betula papyrifera* Woodland Alliance (A.603)
- *Festuca altaica* Herbaceous Alliance (A.1250)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Populus tremuloides* Woodland Alliance (A.610)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Eastern Great Plains Tallgrass Aspen Parkland (CES205.688)

Adjacent Ecological System Comments: This system can grade into Eastern Great Plains Tallgrass Aspen Parkland (CES205.688) to the east.

DISTRIBUTION

Range: This system is found in the boreal-grassland transition region from the North Dakota/Manitoba border west to central Alberta and south along the eastern slopes of the Front Range of Montana, where it occurs below lower treeline.

Divisions: 205:C; 303:C

Nations: CA, US

Subnations: AB, MB, MT, ND, SK

Map Zones: 19:C, 30:?, 40:P

USFS Ecomap Regions: 331D:CC, M333C:CC

TNC Ecoregions: 34:?, 66:C, 67:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Greenall 1995, Ricketts et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722978#references

Description Author: S. Menard

Version: 20 Apr 2006

Concept Author: S. Menard

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

NORTHWESTERN GREAT PLAINS RIPARIAN (CES303.677)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9326

CONCEPT

Summary: This system is found in the riparian areas of medium and small rivers and streams throughout the northwestern Great Plains. It is likely most common in the Northern Great Plains Steppe. This system occurs in the Upper Missouri and tributaries starting at the Niobrara, White, Cheyenne, Belle Fourche, Moreau, Grand, Heart, Little Missouri, Yellowstone, Powder, Tongue, Bighorn, Wind, Milk, Musselshell, Marias, and Teton rivers; and in Canada, the Southern Saskatchewan, Red Deer and Old Man rivers to where they extend into Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) or Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804). These are found on alluvial soils in highly variable landscape settings, from deep cut ravines to wide, braided streambeds. Hydrologically, these tend to be more flashy with less developed floodplain than on larger rivers, and typically dry down completely for some portion of the year. Dominant vegetation shares much with generally drier portions of larger floodplain systems downstream, but overall abundance of vegetation is generally lower. Communities within this system range from riparian forests and shrublands to gravel/sand flats. Dominant species include *Populus deltoides*, *Populus balsamifera ssp. trichocarpa*, *Salix spp.*, *Artemisia cana ssp. cana*, and *Pascopyrum smithii*. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. Another factor is that groundwater depletion and lack of fire have created additional species changes.

Classification Comments: This system needs to be more clearly delineated from Northwestern Great Plains Floodplain (CES303.676). The component plant association list is incomplete. All the riparian/floodplain/alluvial systems of the Great Plains region need to be revisited for naming conventions, along with better definitions of conceptual boundaries. There is much apparent overlap in their concepts and distribution, and the names add to the confusion. In particular, the difference between "riparian" and "floodplain" usage in the names needs revisiting and possible changing. These systems include Northwestern Great Plains Floodplain (CES303.676), Northwestern Great Plains Riparian (CES303.677), Western Great Plains Floodplain (CES303.678), and Western Great Plains Riparian (CES303.956).

Related Concepts:

- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. Most *Artemisia cana ssp. cana* shrublands occur on stream terraces.

MEMBERSHIP

Associations:

- *Artemisia cana* / *Pascopyrum smithii* Shrubland (CEGL001072, G4)
- *Pascopyrum smithii* - (*Elymus trachycaulus*) Clay Pan Herbaceous Vegetation (CEGL002239, GNR)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Cornus sericea* Forest (CEGL000657, G2G3)
- *Populus deltoides* / *Symphoricarpos occidentalis* Woodland (CEGL000660, G2G3)

Alliances:

- *Artemisia cana* Temporarily Flooded Shrubland Alliance (A.843)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)

DISTRIBUTION

Range: This system occurs throughout the northwestern Great Plains, north of the North Platte River basin in eastern Wyoming. It is found in eastern Wyoming and eastern Montana along the upper Missouri, Yellowstone, Powder, Tongue, Bighorn, Wind, Milk, Musselshell, Marias, and Teton rivers; in northern Nebraska and the Dakotas on the Niobrara, upper Missouri, White, Cheyenne, Belle Fourche, Moreau, Grand, Heart, Little Missouri rivers; and in Canada the Southern Saskatchewan, Red Deer and Old Man rivers.

Divisions: 205:P; 303:C

Nations: CA, US

Subnations: AB, MB, MT, ND, NE, SD, SK, WY

Map Zones: 20:C, 22:P, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:CC, 331F:CP, 331G:CC, 331K:CC, 331L:CC, 331M:C?, 331N:CC, 342A:CC, 342F:CC, M334A:CC

TNC Ecoregions: 10:C, 26:C, 34:C, 66:P, 67:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722981#references

Description Author: NatureServe Western Ecology Team

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

OZARK-OUACHITA RIPARIAN (CES202.703)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Ozark/Ouachita

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Stream terrace (undifferentiated)

National Mapping Codes: ESLF 9337

CONCEPT

Summary: This system is found along streams and small rivers within the Ozark and Ouachita regions. In contrast to larger floodplain systems, this system has little to no floodplain development and often contains cobble bars and steep banks. It is traditionally higher gradient than larger floodplains and experiences periodic, strong flooding. It is often characterized by a cobble bar with forest immediately adjacent with little to no marsh development. Canopy cover can vary within examples of this system, but typical tree species include *Liquidambar styraciflua*, *Platanus occidentalis*, *Betula nigra*, *Acer* spp., and *Quercus* spp. The richness of the herbaceous layer can vary significantly, ranging from species-rich to species-poor. Likewise, the shrub layer can vary considerably, but typical species may include *Lindera benzoin*, *Alnus serrulata*, and *Hamamelis vernalis*. Small seeps and fens can often be found within this system, especially at the headwaters and terraces of streams. These areas are typically dominated by primarily wetland obligate species of sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species such as *Impatiens capensis*. Flooding and scouring strongly influence this system and prevent the floodplain development found on larger rivers.

Classification Comments: A separate Ozark-Ouachita fen/seep system (CES202.052) has also been developed.

Similar Ecological Systems:

- South-Central Interior Small Stream and Riparian (CES202.706)

DESCRIPTION

Environment: This system has little to no floodplain development and often contains cobble bars and steep banks. It is often characterized by a cobble bar with forest immediately adjacent with little to no marsh development.

Vegetation: Typical tree species in examples of this system include *Liquidambar styraciflua*, *Platanus occidentalis*, *Betula nigra*, maples species (*Acer* spp.), and oaks (*Quercus* spp.). The richness of the herbaceous layer can vary significantly, ranging from species-rich to species-poor. Likewise, the shrub layer can vary considerably, but typical species may include *Lindera benzoin*, *Alnus serrulata*, and *Hamamelis vernalis*.

Dynamics: Flooding and scouring strongly influence this system and prevent the floodplain development found on larger rivers. It is traditionally higher gradient than larger floodplains and experiences periodic, strong flooding.

MEMBERSHIP

Associations:

- (*Carex interior*, *Carex lurida*) - *Carex leptalea* - *Parnassia grandifolia* - *Rhynchospora capillacea* Herbaceous Vegetation (CEGL002404, G2G3)
- *Acer (saccharum, barbatum)* - *Quercus rubra* - *Carya cordiformis* / *Asimina triloba* Forest (CEGL002060, G3)
- *Alnus serrulata* - *Amorpha fruticosa* Shrubland (CEGL007807, G3?)
- *Betula nigra* - *Platanus occidentalis* Forest (CEGL002086, G5)
- *Carex crinita* - *Osmunda* spp. / *Physocarpus opulifolius* Seep Herbaceous Vegetation (CEGL002392, G2)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Herbaceous Vegetation (CEGL002263, G2G3)
- *Carex interior* - *Carex lurida* - *Andropogon gerardii* - *Parnassia grandifolia* Herbaceous Vegetation (CEGL002416, G1G2)
- *Hamamelis vernalis* - *Cornus obliqua* - *Hypericum prolificum* Shrubland (CEGL003898, G3)
- *Juniperus virginiana* var. *virginiana* - *Leptopus phyllanthoides* - (*Quercus nigra*, *Ilex vomitoria*) Shrubland (CEGL003942, G2Q)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liquidambar styraciflua* - (*Quercus alba*, *Acer saccharum*) / *Carpinus caroliniana* / *Lindera benzoin* Forest (CEGL007826, G3G4)
- *Panicum virgatum* - *Calamovilfa arcuata* Herbaceous Vegetation (CEGL007838, G2?)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Salix nigra* Temporarily Flooded Shrubland (CEGL003901, G4?)
- *Taxodium distichum* - *Platanus occidentalis* Ouachita Foothills Forest (CEGL007377, G2Q)
- *Zizaniopsis miliacea* Rocky Riverbed Herbaceous Vegetation (CEGL004140, G2?)

Alliances:

- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)

- *Hamamelis vernalis* Temporarily Flooded Shrubland Alliance (A.944)
- *Juniperus virginiana* - *Leptopus phyllanthoides* Intermittently Flooded Shrubland Alliance (A.1053)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Panicum virgatum* Temporarily Flooded Herbaceous Alliance (A.1343)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Taxodium distichum* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.298)
- *Zizaniopsis miliacea* Seasonally Flooded Temperate Herbaceous Alliance (A.1395)

DISTRIBUTION

Range: This system is found within the Ozarks and the Ouachita Mountains of Missouri, Arkansas and Oklahoma.

Divisions: 202:C

Nations: US

Subnations: AR, MO, OK

Map Zones: 32:C, 44:C

TNC Ecoregions: 38:C, 39:C

SOURCES

References: Comer et al. 2003, Nelson 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722957#references

Description Author: S. Menard

Version: 26 Jan 2006

Concept Author: S. Menard

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

SONORAN FAN PALM OASIS (CES302.759)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Seepage-Fed Sloping; Palm or Sabal

Non-Diagnostic Classifiers: Lowland [Foothill]; Lowland [Lowland]; Isolated Wetland [Partially Isolated]; Udic

National Mapping Codes: ESLF 9327

CONCEPT

Summary: This ecological system occurs on highly localized, spring-fed depressions along canyon waterways and tectonic faultlines below 900 m in elevation in the Sonoran and Mojave deserts. Permanent subsurface water is required to maintain *Washingtonia filifera*, a relict species. Salinity is low in the root zone, but increases near the surface where evaporation leaves salt accumulations. These oases woodlands are distinctively dominated by *Washingtonia filifera* with variable understory conditions. Other trees that may be present include *Platanus racemosa*, *Quercus chrysolepis*, *Populus fremontii*, and *Fraxinus velutina*. A subcanopy of *Salix lasiolepis*, *Salix gooddingii*, *Salix exigua*, or *Prosopis glandulosa* is often present. Reproduction of *Washingtonia filifera* is limited by water supply, surface salinity, rainfall, and fire. Fan palms are fire-tolerant, while the understory species are not, and fires open up the understory allowing palm seedlings to establish. Removal of the understory also decreases competition for water. There are currently 24 known occurrences in Arizona, Nevada, and California.

MEMBERSHIP

Associations:

- *Washingtonia filifera* Woodland (CEGL000001, G3?)

Alliances:

- *Washingtonia filifera* Seasonally Flooded Woodland Alliance (A.485)

DISTRIBUTION

Range: Below 900 m in elevation in the Sonoran and Mojave deserts.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXSO(MX), NV

Map Zones: 4:C, 13:C

USFS Ecomap Regions: 322A:CC, 322B:CC, 322C:CC

TNC Ecoregions: 17:C, 23:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Sawyer and Keeler-Wolf 1995, Szaro 1989, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722913#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, West

ClassifResp: West

1446 SOUTH FLORIDA PINE FLATWOODS (CES411.381)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Needle-Leaved Tree

Non-Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2446; ESLF 9115; ESP 1446

CONCEPT

Summary: This system is endemic to Florida, ranging from approximately Lee, Desoto, Highlands, and Okeechobee counties southward. It was once an extensive system within its historic range. The vegetation is naturally dominated by *Pinus elliottii* var. *densa*, being largely outside the natural range of *Pinus serotina*, *Pinus elliottii* var. *elliottii*, and *Pinus palustris*. In natural condition, examples are generally open with a variety of low shrub and grass species forming a dense ground cover. Frequent, low-intensity fire was the dominant natural ecological force, but most areas have undergone long periods of fire suppression resulting in greater dominance of shrubs and saw palmetto, as well as denser canopies of slash pine (Huffman and Judd 1998, Noel et al. 1998).

Classification Comments: No associations have currently been described in the USNVC for this system. More information is needed. The floristic composition of this system overlaps Florida Dry Prairie (CES203.380); the primary difference lies in taller and denser shrub cover (especially of *Serenoa repens*) (Huffman and Judd 1998). There is considerable variation between wet and "non-wet" flatwoods implied in this system.

Similar Ecological Systems:

- Florida Dry Prairie (CES203.380)
- South Florida Pine Rockland (CES411.367)--is also dominated almost exclusively by *Pinus elliottii* var. *densa* in the canopy, but occurs on limestone and has a richer, diverse mix of tropical and temperate species in the understory.

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Intersecting
- Pine Forest (Duever et al. 1986) Finer
- Scrubby Flatwoods (FNAI 1990) Intersecting
- Wet Flatwoods (FNAI 1990) Intersecting

DESCRIPTION

Vegetation: According to Huffman and Judd (1998) examples of this system have generally open canopies composed of *Pinus elliottii* var. *densa* and, more rarely, *Pinus palustris*. *Serenoa repens*, *Lyonia lucida*, *Lyonia fruticosa*, *Ilex glabra*, *Vaccinium darrowii*, *Vaccinium myrsinites*, and *Quercus minima* are common shrubs. Grasses are typically abundant, including *Aristida beyrichiana* and *Schizachyrium scoparium* var. *stoloniferum*; most other grass and herbaceous species found are in common with Florida Dry Prairie (CES203.380).

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: This system is found in southern Florida, extending north to mid-peninsula.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

USFS Ecomap Regions: 232D:CC, 232G:CC, 411A:CC

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Comer et al. 2003, Huffman and Judd 1998, McPherson 1986, Noel et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723135#references

Description Author: R. Evans and C. Nordman

Version: 17 Jan 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1443 SOUTH TEXAS DUNE AND COASTAL GRASSLAND (CES301.460)

CLASSIFIERS

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2443; ESLF 7156; ESP 1443

CONCEPT

Summary: This ecological system includes non-tidal maritime grasslands occurring on barrier islands and mainland areas near the coast of southern Texas, from Matagorda Island and Padre Island south along the northern Gulf of Mexico. This includes grasslands of primary and secondary dunes, interdune swales, barrier flats, and the mainland. Some examples of this system naturally occurred as an open matrix of midgrass species within native mesquite - acacia shrublands dominated by *Prosopis glandulosa*, *Acacia farnesiana*, and *Acacia rigidula* but have become shrub-dominated due to the lack of fire. In many areas this system has been virtually eliminated due to conversion to tame pasture, cropland, or due to lack of burning.

MEMBERSHIP

Associations:

- *Acacia rigidula* Shrubland (CEGL003874, G4G5)
- *Spartina patens* - *Fimbristylis (caroliniana, castanea)* - (*Panicum virgatum*) Herbaceous Vegetation (CEGL007836, G2G3)
- *Uniola paniculata* - (*Panicum amarum*) - *Croton punctatus* Herbaceous Vegetation (CEGL002218, G3?)

Alliances:

- *Acacia rigidula* - *Leucophyllum frutescens* - *Acacia berlandieri* Shrubland Alliance (A.1909)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Uniola paniculata* Temperate Herbaceous Alliance (A.1199)

DISTRIBUTION

Range: This system ranges from Matagorda Island south along the northern Gulf of Mexico.

Divisions: 301:C

Nations: US

Subnations: TX

Map Zones: 36:C

USFS Ecomap Regions: 255D:CC, 315E:??

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723126#references

Description Author: J. Teague

Version: 04 Feb 2009

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH-CENTRAL INTERIOR LARGE FLOODPLAIN (CES202.705)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Floodplain; Forest and Woodland (Treed); Herbaceous

National Mapping Codes: ESLF 9334

CONCEPT

Summary: This floodplain system is found in the Interior Highlands as far west as eastern Oklahoma, as well as throughout the Interior Low Plateau, Cumberlands, Southern Ridge and Valley, and Western Allegheny Plateau, and lower elevations of the Southern Blue Ridge. Examples occur along large rivers or streams where topography and alluvial processes have resulted in a well-developed floodplain. A single occurrence may extend from river's edge across the outermost extent of the floodplain or to where it meets a wet meadow or upland system. Many examples of this system will contain well-drained levees, terraces and stabilized bars, and some will include herbaceous sloughs and shrub wetlands resulting, in part, from beaver activity. A variety of soil types may be found within the floodplain from very well-drained sandy substrates to very dense clays. It is this variety of substrates in combination with different flooding regimes that creates the mix of vegetation. Most areas, except for the montane alluvial forests, are inundated at some point each spring; microtopography determines how long the various habitats are inundated. Although vegetation is quite variable in this broadly defined system, examples may include *Acer saccharinum*, *Platanus occidentalis*, *Liquidambar styraciflua*, and *Quercus* spp. Understory species are mixed, but include shrubs, such as *Cephalanthus occidentalis* and *Arundinaria gigantea* ssp. *gigantea*, and sedges (*Carex* spp.). This system likely floods at least once annually and can be altered by occasional severe floods. Impoundments and conversion to agriculture can also impact this system.

Classification Comments: Montane alluvial forests may be difficult to place within this system because they share traits with both this system and Southern and Central Appalachian Cove Forest (CES202.373), at least in the southern Appalachians. This split from Central Appalachian River Floodplain (CES202.608) may appear somewhat arbitrary but is based on the freshwater systems classification, using roughly the Mid-Continental Divide. This means that Ecoregions 50 and 51 are included in this system, whereas Ecoregions 52 and 59 are considered part of Central Appalachian River Floodplain (CES202.608) (except for a small part of southernmost Ecoregion 59 in West Virginia that drains to the Ohio River). This system grades into Western Great Plains Floodplain (CES303.678) in the Crosstimbers region of east-central Oklahoma as eastern cottonwood (*Populus deltoides*) and willows (*Salix* spp.) become more dominant.

Similar Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- South-Central Interior Small Stream and Riparian (CES202.706)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)
- Western Great Plains Floodplain (CES303.678)

Related Concepts:

- Bottomland Hardwood Forest (Evans 1991) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Slough (Evans 1991) Intersecting
- Riparian Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: This system inhabits broad floodplains along large creeks and rivers that are usually inundated for at least part of each year.

Vegetation: Vegetation varies quite widely, encompassing shrubby and herbaceous communities, as well as forested communities with a wide array of canopy types. Examples may include *Acer saccharinum*, *Platanus occidentalis*, *Liquidambar styraciflua*, and *Quercus* spp. Understory species are mixed but include shrubs, such as *Cephalanthus occidentalis* and *Arundinaria gigantea* ssp. *gigantea*, and sedges (*Carex* spp.).

Dynamics: Flooding dynamics are an important factor in the development and maintenance of this system.

MEMBERSHIP

Associations:

- (*Diospyros virginiana*, *Platanus occidentalis*) / *Eupatorium serotinum* - *Diodia virginiana* Herbaceous Vegetation (CEGL003910, GNA)
- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer rubrum* var. *trilobum* - *Fraxinus pennsylvanica* / *Carex crinita* - *Peltandra virginica* Forest (CEGL004420, G1)
- *Acer saccharinum* - *Betula nigra* / *Cephalanthus occidentalis* Forest (CEGL007810, G3Q)
- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Acer saccharinum* - *Ulmus americana* Forest (CEGL002586, G4?)
- *Acer saccharum* - *Carya cordiformis* / *Asimina triloba* Floodplain Forest (CEGL005035, G2)
- *Alnus serrulata* - *Xanthorhiza simplicissima* Shrubland (CEGL003895, G3G4)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Betula nigra* - *Platanus occidentalis* Forest (CEGL002086, G5)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Fraxinus pennsylvanica* - *Ulmus crassifolia* - *Celtis laevigata* Forest (CEGL004618, GNR)
- *Hypericum densiflorum* - *Alnus serrulata* / *Tripsacum dactyloides* Shrubland (CEGL008495, G1G2)
- *Juglans nigra* / *Verbesina alternifolia* Forest (CEGL007879, GNA)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* - (*Platanus occidentalis*) / *Carpinus caroliniana* - *Halesia tetraptera* / *Amphicarpaea bracteata* Forest (CEGL007880, G3G4)
- *Liquidambar styraciflua* - *Quercus michauxii* - *Carya laciniosa* / *Fagus grandifolia* - (*Aesculus flava*) Forest (CEGL007702, G2G3Q)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Osmunda regalis* var. *spectabilis* Seepage Scour Herbaceous Vegetation (CEGL008404, G3?)
- *Platanus occidentalis* - *Acer saccharinum* - *Juglans nigra* - *Ulmus rubra* Forest (CEGL007334, G4)
- *Platanus occidentalis* - *Betula nigra* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Arundinaria gigantea* Temporarily Flooded Forest (CEGL007999, G3?)
- *Platanus occidentalis* - *Betula nigra* / *Cornus amomum* / (*Andropogon gerardii*, *Chasmanthium latifolium*) Woodland (CEGL003725, GNR)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Quercus imbricaria* Forest (CEGL007339, G2Q)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* / *Carpinus caroliniana* / *Verbesina alternifolia* Forest (CEGL006458, GNR)
- *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula (alleghaniensis, lenta)* / *Alnus serrulata* - *Leucothoe fontanesiana* Forest (CEGL004691, G2?)
- *Platanus occidentalis* / *Aesculus flava* Forest (CEGL006466, GNR)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Quercus (rubra, velutina, alba)* / *Carpinus caroliniana* - (*Halesia tetraptera*) / *Maianthemum racemosum* Forest (CEGL006462, GNR)
- *Quercus michauxii* - *Quercus shumardii* - *Liquidambar styraciflua* / *Arundinaria gigantea* Forest (CEGL002099, G3G4)
- *Quercus nigra* - *Quercus (alba, phellos)* Forest (CEGL004979, G3?)
- *Quercus palustris* - (*Fraxinus nigra*) / *Lindera benzoin* / *Carex bromoides* Forest (CEGL007399, GNR)
- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus phellos* - (*Quercus lyrata*) / *Carex* spp. - *Leersia* spp. Forest (CEGL002102, G3G4Q)
- *Quercus stellata* - *Quercus marilandica* - *Quercus falcata* / *Schizachyrium scoparium* Sand Woodland (CEGL002417, G2)
- *Quercus stellata* / (*Danthonia spicata*, *Croton willdenowii*) Woodland (CEGL005057, G1)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* Forest (CEGL002103, G4)
- *Salix nigra* Large River Floodplain Forest (CEGL007410, G3G5)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- Tennessee Valley Impoundment Mudflat Sparse Vegetation (CEGL004049, GNA)
- *Tsuga canadensis* - *Quercus rubra* - (*Platanus occidentalis*, *Betula nigra*) / *Rhododendron maximum* / *Anemone quinquefolia* Forest [Provisional] (CEGL006620, GNR)
- *Verbesina alternifolia* - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Herbaceous Vegetation (CEGL006480, GNR)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)

- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Eupatorium serotinum* - *Diodia virginiana* Artificial Drawdown Temporarily Flooded Herbaceous Alliance (A.2017)
- *Eupatorium* spp. - *Polygonum* spp. Temporarily Flooded Depositional Shore and Bar Herbaceous Alliance (A.3038)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Juglans nigra* Forest Alliance (A.1932)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Osmunda (cinnamomea, regalis)* Saturated Herbaceous Alliance (A.1692)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest Alliance (A.171)

SPATIAL CHARACTERISTICS

Size: Examples can range in size from very small (<1 acre) to hundreds of acres in larger floodplain areas.

DISTRIBUTION

Range: This system ranges from the Ozarks, Arkansas River Valley, and Interior Low Plateau to the Southern Blue Ridge and north into the Western Allegheny Plateau.

Divisions: 202:C; 205:C

Nations: US

Subnations: AL, AR, GA, IL, IN, KY, MO, NC, OH, OK, PA, SC?, TN, VA, WV

Map Zones: 32:P, 37:P, 38:?, 43:C, 44:C, 47:C, 48:C, 49:C, 53:C, 57:C, 61:C, 62:C

TNC Ecoregions: 32:P, 37:C, 38:C, 39:C, 44:C, 49:C, 50:C, 51:C, 59:C

SOURCES

References: Comer et al. 2003, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722955#references

Description Author: S. Menard, M. Pyne, R. Evans, R. White

Version: 17 Jan 2006

Concept Author: S. Menard, M. Pyne, R. Evans, R. White

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

SOUTH-CENTRAL INTERIOR SMALL STREAM AND RIPARIAN (CES202.706)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Stream terrace (undifferentiated)

National Mapping Codes: ESLF 9335

CONCEPT

Summary: This system is found throughout the Interior Low Plateau, Southern Ridge and Valley, Western Allegheny Plateau, lower elevations of the Southern Blue Ridge, and parts of the Cumberlands. Examples occur along small streams and floodplains with low to moderately high gradients. There may be little to moderate floodplain development. Flooding and scouring both influence this system, and the nature of the landscape prevents the kind of floodplain development found on larger rivers. This system may contain cobble bars with adjacent wooded vegetation and rarely have any marsh development, except through occasional beaver impoundments. The vegetation is a mosaic of forests, woodlands, shrublands, and herbaceous communities. Canopy cover can vary within examples of this system, but typical tree species may include *Platanus occidentalis*, *Acer rubrum* var. *trilobum*, *Betula nigra*, *Liquidambar styraciflua*, and *Quercus* spp. Shrubs and herbaceous layers can vary in richness and cover. Some characteristic shrubs may include *Hypericum densiflorum*, *Salix* spp., and *Alnus* spp. Small seeps dominated by sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species can often be found within this system, especially at the headwaters and terraces of streams.

Classification Comments: This system is closely related to Central Appalachian Stream and Riparian (CES202.609) but has been distinguished based on the precepts of the Freshwater Systems classification. This system has been divided from Central Appalachian Riparian roughly by the Mid-Continental Divide. This means that Ecoregions 50 and 51 are included in this system, whereas Ecoregions 52 and 59 are considered part of Central Appalachian Riparian (except for a small part of southernmost Ecoregion 59 in West Virginia that drains to the Ohio River). In contrast to floodplain systems, this system has little to no floodplain development. In comparison with South-Central Interior Large Floodplain (CES202.705), this system typically has somewhat higher gradients, is sometimes rocky, and may experience flash floods. Stands from somewhat larger rivers have been placed here if the river lacks substantial floodplain development (e.g., the New River of West Virginia and the Ocoee Gorge of Tennessee).

Similar Ecological Systems:

- Central Appalachian Stream and Riparian (CES202.609)
- Cumberland Riverscour (CES202.036)--is essentially a more extreme and local variant of this broader concept, found in the major rivers of the Cumberland Plateau and related areas of Tennessee, Kentucky, and adjacent states.
- Ozark-Ouachita Riparian (CES202.703)--is the Ozark-Ouachita equivalent of this system.
- South-Central Interior Large Floodplain (CES202.705)

Related Concepts:

- Alluvial Forest (Evans 1991) Intersecting
- Bottomland Hardwood Forest (Evans 1991) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Slough (Evans 1991) Intersecting
- Gravel/Cobble Bar (Evans 1991) Finer
- Riparian Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: Found along fairly high-energy streams and rivers with steep banks, this system is subject to frequent flooding and can be subject to scouring depending upon the substrate.

Vegetation: There is wide variation in vegetation depending upon the frequency of the flooding cycle (more frequent flooding creates a better environment for forbs and shrubs, less frequent may create a better environment for the establishment of trees). Typical tree species may include *Platanus occidentalis*, *Acer rubrum* var. *trilobum*, *Betula nigra*, *Liquidambar styraciflua*, and *Quercus* spp. Shrubs and herbaceous layers can vary in richness and cover. Some characteristic shrubs may include *Hypericum densiflorum*, *Salix* spp., and *Alnus* spp. Small seeps dominated by sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species can often be found within this system, especially at the headwaters and terraces of streams.

Dynamics: Flooding and seed propagule dispersal caused by flooding events are the two most important processes affecting this system. The two processes vary widely depending upon size of stream, upstream land use and topography, presence or absence of invasive exotics that may displace native community types, etc.

MEMBERSHIP

Associations:

- (*Salix* spp.) / *Andropogon gerardii* - *Panicum virgatum* - *Salvia azurea* Cahaba Riverwash Herbaceous Vegetation (CEGL004149, G1)
- *Acer negundo* - (*Platanus occidentalis*, *Populus deltoides*) Forest (CEGL004690, G4)
- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest (CEGL007443, G3?)
- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425, G2G3)
- *Alnus serrulata* - *Xanthorhiza simplicissima* Shrubland (CEGL003895, G3G4)
- *Alnus serrulata* Interior Shrubland (CEGL003894, G4?)
- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Alnus serrulata* Southeastern Seasonally Flooded Shrubland (CEGL008474, G4)
- *Andropogon gerardii* - *Panicum virgatum* - *Baptisia australis* Herbaceous Vegetation (CEGL006283, G2G3)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Betula nigra* - *Platanus occidentalis* Forest (CEGL002086, G5)
- *Carex crinita* - *Osmunda* spp. / *Physocarpus opulifolius* Seep Herbaceous Vegetation (CEGL002392, G2)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Herbaceous Vegetation (CEGL002263, G2G3)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Herbaceous Vegetation (CEGL006483, G3)
- *Fagus grandifolia* - *Quercus alba* / *Kalmia latifolia* - *Rhododendron canescens* - *Symplocos tinctoria* Forest (CEGL008551, G3?)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Hymenocallis coronaria* - *Justicia americana* Herbaceous Vegetation (CEGL004285, G1)
- *Juncus effusus* - *Chelone glabra* - *Scirpus* spp. Southern Blue Ridge Beaver Pond Herbaceous Vegetation (CEGL008433, G4?)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* - (*Platanus occidentalis*) / *Carpinus caroliniana* - *Halesia tetraptera* / *Amphicarpaea bracteata* Forest (CEGL007880, G3G4)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Orontium aquaticum* Permanently Flooded Herbaceous Vegetation (CEGL008480, G3G4)
- *Osmunda regalis* var. *spectabilis* Seepage Scour Herbaceous Vegetation (CEGL008404, G3?)
- *Peltandra virginica* - *Saururus cernuus* - *Boehmeria cylindrica* / *Climacium americanum* Herbaceous Vegetation (CEGL007696, G2G3?)
- *Pinus taeda* - *Liriodendron tulipifera* / *Lindera benzoin* / *Carex crinita* Forest (CEGL007546, GNA)
- *Pinus virginiana* - *Juniperus virginiana* var. *virginiana* - *Quercus stellata* / *Amelanchier stolonifera* / *Danthonia spicata* / *Leucobryum glaucum* Woodland (CEGL008449, G2?)
- *Platanus occidentalis* - *Betula nigra* - *Salix (caroliniana, nigra)* Woodland (CEGL003896, G4G5)
- *Platanus occidentalis* - *Betula nigra* / *Cornus amomum* / (*Andropogon gerardii*, *Chasmanthium latifolium*) Woodland (CEGL003725, GNR)
- *Platanus occidentalis* - *Celtis laevigata* - *Liriodendron tulipifera* / *Lindera benzoin* - *Arundinaria gigantea* / *Amphicarpaea bracteata* Forest (CEGL008429, G4?)
- *Platanus occidentalis* - *Liquidambar styraciflua* / *Carpinus caroliniana* - *Asimina triloba* Forest (CEGL007340, G5)
- *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula (alleghaniensis, lenta)* / *Alnus serrulata* - *Leucothoe fontanesiana* Forest (CEGL004691, G2?)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Polygonum (hydropiperoides, punctatum)* - *Leersia* spp. Herbaceous Vegetation (CEGL004290, G4?)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation (CEGL004725, G4?)
- *Quercus (alba, coccinea, falcata, velutina)* / *Kalmia latifolia* Temporarily Flooded Forest (CEGL004098, G4?)
- *Quercus alba* - (*Liriodendron tulipifera*, *Liquidambar styraciflua*) / *Calycanthus floridus* / *Athyrium filix-femina* Forest (CEGL008428, G3G4)
- *Quercus alba* - *Carya (alba, ovata)* - *Liriodendron tulipifera* - (*Quercus phellos*) / *Cornus florida* Forest (CEGL007709, G4)
- *Salix caroliniana* Temporarily Flooded Forest (CEGL007373, G4)
- *Salix nigra* - *Betula nigra* / *Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional] (CEGL006463, GNR)
- *Salix nigra* - *Platanus occidentalis* Forest (CEGL004626, G5)
- *Schizachyrium scoparium* - *Andropogon ternarius* - *Liatris microcephala* - (*Pityopsis ruthii*) Herbaceous Vegetation (CEGL008455, G2)
- *Schizachyrium scoparium* - *Schoenoplectus americanus* - *Juncus marginatus* - *Eupatorium serotinum* Herbaceous Vegetation (CEGL008496, G2)
- *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510, G2G3)

- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest (CEGL007143, G3)
- *Verbesina alternifolia* - *Elymus riparius* - *Solidago gigantea* - (*Teucrium canadense*) Herbaceous Vegetation (CEGL006480, GNR)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Vine-Shrubland (CEGL004620, GNA)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Eragrostis hypnoides* - *Lipocarpa micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Eupatorium* spp. - *Polygonum* spp. Temporarily Flooded Depositional Shore and Bar Herbaceous Alliance (A.3038)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Orontium aquaticum* - (*Schoenoplectus subterminalis*) Permanently Flooded Herbaceous Alliance (A.1931)
- *Osmunda* (*cinnamomea*, *regalis*) Saturated Herbaceous Alliance (A.1692)
- *Pinus taeda* - *Liriodendron tulipifera* Temporarily Flooded Forest Alliance (A.434)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Salix caroliniana* Temporarily Flooded Forest Alliance (A.296)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Schizachyrium scoparium* Temporarily Flooded Herbaceous Alliance (A.1346)
- *Schoenoplectus pungens* Semipermanently Flooded Wooded Herbaceous Alliance (A.3034)
- *Spartanium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest Alliance (A.171)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Seasonally Flooded Vine-Shrubland Alliance (A.993)

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.

Size: Can be quite long but never very wide.

DISTRIBUTION

Range: This system ranges from the Interior Low Plateau to the Southern Blue Ridge and north into the Western Allegheny Plateau and portions of the Cumberlands. There would be limited and peripheral presence in the Upper East Gulf Coastal Plain.

Divisions: 202:C; 203:C

Nations: US

Subnations: AL, GA, IL, IN, KY, NC, OH, PA, SC, TN, VA, WV

Map Zones: 46:P, 47:C, 48:C, 49:C, 53:C, 57:C, 61:C, 62:C

TNC Ecoregions: 43:C, 44:C, 49:C, 50:C, 51:C, 59:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722954#references

Description Author: S. Menard, M. Pyne, R. Evans, R. White, D. Faber-Langendoen, mod. S.C. Gawler

Version: 05 Jun 2008

Stakeholders: East, Midwest, Southeast

Concept Author: S. Menard, M. Pyne, R. Evans, R. White, D. Faber-Langendoen

ClassifResp: Midwest

TAMAULIPAN CALICHE GRASSLAND (CES301.989)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Caliche Layer; Lowland [Lowland]; Plain; Herbaceous; Tropical/Subtropical [Tropical Xeric]; Alkaline Soil; Calcareous; Very Shallow Soil; Sand Soil Texture

Non-Diagnostic Classifiers: Toeslope/Valley Bottom; Oligotrophic Soil

National Mapping Codes: ESLF 9410

CONCEPT

Summary: This ecological system is restricted to the Loreto Plain in Tamaulipas, Mexico. It occurs on shallow sandy loam soils with a caliche hardpan subhorizon. These small-patch grasslands are less than 40 ha in area and are dominated by perennial grasses often with sparse low shrubs within a mosaic of thornscrub. Dominant grasses may include *Aristida purpurea*, *Bouteloua hirsuta*, *Bouteloua radicata*, *Cenchrus spinifex*, *Paspalum setaceum*, and *Tridens muticus*. Perennial forbs may be abundant such as *Boerhavia coccinea*, *Chamaecrista flexuosa*, *Heliotropium confertifolium*, or *Rhynchosia americana*. Low shrubs are *Calliandra conferta* and *Krameria ramosissima*.

DISTRIBUTION

Range: Restricted to the Loreto Plain in Tamaulipas, Mexico.

Divisions: 301:C

Nations: MX, US?

Subnations: MXTM(MX), TX?

Map Zones: 36:C

TNC Ecoregions: 30:C, 31:C

SOURCES

References: Comer et al. 2003, Johnston 1963

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722716#references

Description Author: NatureServe Western Ecology Team

Version: 21 Mar 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast

ClassifResp: Southeast

1434 TEXAS-LOUISIANA COASTAL PRAIRIE (CES203.550)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Deep Soil; Graminoid

Non-Diagnostic Classifiers: Extensive Wet Flat; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2434; ESLF 7147; ESP 1434

CONCEPT

Summary: This system encompasses non-saline tallgrass prairie vegetation ranging along the coast of Louisiana and Texas. This vegetation is found on Vertisols and Alfisols which developed over Pleistocene terraces flanking the Gulf Coast. It is often characterized by a ridge-and-swale or mound-and-intermound microtopography and encompasses both upland and wetland plant communities. Upland dominants include *Schizachyrium scoparium*, *Paspalum plicatulum*, *Sorghastrum nutans*, and *Andropogon gerardii*. Wetland dominants in undisturbed occurrences include *Panicum virgatum* and *Tripsacum dactyloides*; disturbed occurrences may be dominated by *Andropogon glomeratus*. Some estimates state that 99% of coastal prairie has been lost through conversion to other uses and environmental degradation due to the interruption of important ecological processes, such as fire, needed to maintain this system. In the absence of regular fire, this system will be invaded by woody shrubs and trees.

Similar Ecological Systems:

- Texas-Louisiana Coastal Prairie Pondshore (CES203.541)

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* - *Schizachyrium scoparium* - *Schizachyrium tenerum* - *Helianthus mollis* Herbaceous Vegetation (CEGL007938, G1)
- *Andropogon glomeratus* var. *pumilus* Herbaceous Vegetation (CEGL004099, GNA)
- *Baccharis halimifolia* Successional Shrubland (CEGL004657, GNA)
- *Euthamia leptocephala* - *Helianthus angustifolius* - *Boltonia asteroides* - *Spartina patens* Herbaceous Vegetation (CEGL007936, G1)
- *Muhlenbergia capillaris* Herbaceous Vegetation (CEGL004607, G1G2)
- *Panicum virgatum* - *Tripsacum dactyloides* - (*Panicum hemitomom*) Herbaceous Vegetation (CEGL007937, G1)
- *Schizachyrium scoparium* - *Paspalum plicatulum* - *Sorghastrum nutans* - *Dichanthelium oligosanthes* - *Paspalum setaceum* - *Symphytichum pratense* Alfisol Herbaceous Vegetation (CEGL002208, G1)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Paspalum plicatulum* - *Carex microdonta* - *Neptunia lutea* Vertisol Herbaceous Vegetation (CEGL004519, G1)
- *Schizachyrium scoparium* - *Triplasis purpurea* - *Eriogonum multiflorum* - *Liatris elegans* var. *carizzana* Herbaceous Vegetation (CEGL008483, G1)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon glomeratus* Temporarily Flooded Herbaceous Alliance (A.1338)
- *Baccharis halimifolia* Saturated Shrubland Alliance (A.1015)
- *Muhlenbergia capillaris* Herbaceous Alliance (A.1216)
- *Panicum virgatum* - *Tripsacum dactyloides* Herbaceous Alliance (A.1194)
- *Schizachyrium scoparium* - *Paspalum plicatulum* Herbaceous Alliance (A.1197)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191)

Adjacent Ecological System Comments: In Louisiana, this system grades coastward into marshes of the chenier plain and inland into West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191). In Texas this system generally grades coastward into a saline prairie or salt marsh system and inland into West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.191), or oak woodland vegetation. Degraded examples are often dominated by the invasive exotic *Triadica sebifera*. Relatively undisturbed natural depressions (potholes) occurring within the upland matrix units of this system are included in Texas-Louisiana Coastal Prairie Pondshore (CES203.541).

DISTRIBUTION

Range: Along the coast of Louisiana and Texas

Divisions: 203:C
Nations: US
Subnations: LA, TX
Map Zones: 36:C, 37:C
USFS Ecomap Regions: 232E:CC, 255D:CC
TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723052#references

Description Author: J. Teague

Version: 06 Feb 2003

Concept Author: J. Teague

Stakeholders: Southeast

ClassifResp: Southeast

1458 WEST GULF COASTAL PLAIN PINE-HARDWOOD FLATWOODS (CES203.278)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Pimple mounds; Forest and Woodland (Treed); Extensive Wet Flat; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2458; ESLF 9127; ESP 1458

CONCEPT

Summary: This ecological system represents predominantly mesic to dry flatwoods of limited areas of inland portions of the West Gulf Coastal Plain. These areas are usually found on Pleistocene high terraces that are located above current floodplains. Hydrology is controlled by local rainfall events and not overbank flooding. Soils are fine-textured, and hardpans may be present in the subsurface. The limited permeability of these soils contributes to shallowly perched water tables during portions of the year when precipitation is greatest and evapotranspiration is lowest. Soil moisture fluctuates widely throughout the growing season, from saturated to very dry, a condition sometimes referred to elsewhere as xerohydric. Saturation occurs not from overbank flooding but typically whenever precipitation events occur. Local topography is a complex of ridges and swales, often in close proximity to one another. Ridges tend to be much drier than swales, which may hold water for varying periods of time. Within both ridges and swales, there is vegetation variability relating to soil texture and moisture and disturbance history. The driest ridges support *Pinus taeda* and *Quercus stellata*; more mesic ridges have *Pinus taeda* with *Quercus alba* and species such as *Symplocos tinctoria* and *Viburnum dentatum*. Fire may have been an important natural process in some examples of this system (T. Foti pers. comm.).

Classification Comments: Embedded swales tend to support hardwood forests or swamps, often heavily oak-dominated with species tolerant of some inundation, such as *Quercus phellos* and *Quercus laurifolia*, with sparse coverage of wetland herbs such as *Carex glaucescens*. Some swales support unusual pockets of *Fraxinus caroliniana* and *Crataegus* spp. These latter vegetation types are linked to West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548). In Arkansas (at least), this system is most closely affiliated with these Soil Associations: "Adaton-Felker-Gore" (MUID=AR035); "Wrightsville-Acadia-Louin" (MUID=AR036); "Amy-Pheba-Savannah" (MUID=038); "Amy-Pheba-Guyton" (MUID=AR040); "Smithdale-Savannah-Sacul" (MUID=AR041); "Sacul-Savannah-Sawyer" (MUID=AR042); "Calloway-Henry-Grenada" (MUID=AR044); "Wrightsville-Kolin-Gore" (MUID=AR063); "Bussy-Tillou-Guyton" (MUID=AR069). Apparently, this system occurs within the historic range of longleaf pine [see USFS ecomap attributions]. Within this range, more information is needed to identify the toposequence between longleaf pine-dominated flatwoods/savannas/uplands and hardwood/loblolly-dominated flatwoods. The distribution of this system in the South Central Plains Flatwoods and Southern Tertiary Uplands (EPA 35e and f) needs to be better defined.

Similar Ecological Systems:

- West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)

DESCRIPTION

Environment: Areas occupied by this system are usually found on nonriverine, Pleistocene high terraces. Soils are fine-textured and hardpans may be present in the subsurface. The limited permeability of these soils contributes to shallowly perched water tables during portions of the year when precipitation is greatest and evapotranspiration is lowest. Soil moisture fluctuates widely throughout the growing season, from saturated to very dry, a condition sometimes referred to elsewhere as xerohydric. Saturation occurs not from overbank flooding but typically whenever precipitation events occur. Local topography is a complex of ridges and swales, often in close proximity to one another. Ridges tend to be much drier than swales, which may hold water for varying periods of time.

Vegetation: There is vegetation variability between and among ridges and swales, as well as within them, relating to soil texture and moisture and disturbance history. The driest ridges support *Pinus taeda* and *Quercus stellata*; more mesic ridges have *Pinus taeda* with *Quercus alba* and understory species such as *Symplocos tinctoria* and *Viburnum dentatum*. Embedded swales (which are, in effect, smaller interfingered examples of West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)) tend to support hardwood forests or swamps, often heavily oak-dominated with species tolerant of some inundation, such as *Quercus phellos* and *Quercus laurifolia*, with sparse coverage of wetland herbs, such as *Carex glaucescens*. Some swales support unusual pockets of *Fraxinus caroliniana* and *Crataegus* spp.

Dynamics: The difference in the dynamics between this system and the "wet" hardwood flatwoods of the region, i.e., West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548), is the different structure: the wetter type occurs as a closed forest, the dry/mesic (xero-hydric) one as a more open forest or woodland (with an open canopy, a full herbaceous expression, and few shrubs). The fire regime is different as well: the xero-hydric type is short-interval, low-intensity, low-severity versus medium- to long-interval, low-intensity, high-severity for the wet one (D. Zollner pers. comm. 2006).

MEMBERSHIP

Associations:

- *Panicum hemitomon* - *Ludwigia sphaerocarpa* Herbaceous Vegetation (CEGL008478, G1)
- *Pinus taeda* - *Quercus alba* - (*Fagus grandifolia*) / *Ilex opaca* / *Smilax pumila* - *Mitchella repens* Forest (CEGL007525, G3G4)
- *Pinus taeda* - *Quercus stellata* / *Crataegus* spp. Woodland (CEGL002112, G2G3?)
- *Quercus alba* - *Carya alba* / *Symplocos tinctoria* / *Mitchella repens* Forest (CEGL007980, G3?)
- *Quercus stellata* - *Pinus taeda* Flatwoods Depression Forest (CEGL008587, G2G3)

Alliances:

- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Pinus (echinata, taeda)* - *Quercus (stellata, marilandica, falcata)* Woodland Alliance (A.2011)
- *Pinus taeda* - *Quercus (alba, falcata, stellata)* Forest Alliance (A.404)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus stellata* - *Pinus taeda* Depression Seasonally Flooded Forest Alliance (A.2014)

SPATIAL CHARACTERISTICS

Spatial Summary: This system forms a matrix in the Arkansas Coastal Plain in terraces along the lower Ouachita River (D. Zollner pers. comm. 2006). This dry (to mesic) pine-hardwood system is a matrix one, the wetter type (CES203.548) is a small- to large-patch system (D. Zollner pers comm. 2006).

Adjacent Ecological Systems:

- Red River Large Floodplain Forest (CES203.065)
- West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)

DISTRIBUTION

Range: This system is found in the inland portions of the West Gulf Coastal Plain, on nonriverine, Pleistocene high terraces.

Divisions: 203:C

Nations: US

Subnations: AR, LA, OK, TX

Map Zones: 37:C, 44:C

USFS Ecomap Regions: 231E:CC, 232F:CC, 234E:??

TNC Ecoregions: 32:C, 40:C, 41:C

SOURCES

References: Comer et al. 2003, Foti pers. comm., Hoagland pers. comm., Singhurst pers. comm., Zollner pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723208#references

Description Author: R. Evans, mod. M. Pyne and J. Teague

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

WESTERN GREAT PLAINS RIPARIAN (CES303.956)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Riparian Mosaic; Woody-Herbaceous; Riverine / Alluvial; Very Short Disturbance Interval; Flood Scouring

Non-Diagnostic Classifiers: Intermittent Flooding; Short (<5 yrs) Flooding Interval; Floodplain; Fluvial; Lowland [Lowland]; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Alluvial fan; Toeslope/Valley Bottom; Arroyo; Temperate [Temperate Xeric]; Broad-Leaved Deciduous Tree; Broad-Leaved Deciduous Shrub; Evergreen Sclerophyllous Shrub; Graminoid

National Mapping Codes: ESLF 9329

CONCEPT

Summary: This ecological system is found in the riparian areas of medium and small rivers and streams throughout the western Great Plains. It is likely most common in the Shortgrass Prairie and Northern Great Plains Steppe but extends west as far as the Rio Grande in New Mexico and into the Wyoming Basins in the north. Major rivers include the North and South Platte, portions of the Arkansas, Cimarron, Canadian and upper Pecos rivers and tributaries to where they extend into Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821). It is found on alluvial soils in highly variable landscape settings, from deep cut ravines to wide, braided streambeds. Hydrologically, these sites tend to be more flashy with less developed floodplains than on larger rivers that are classified as floodplain systems, and may dry down completely for some portion of the year. Water sources for this riparian system are largely snowmelt near the Rocky Mountains, but it will respond to summer rains. This system includes numerous smaller prairie rivers and streams that are often groundwater-fed, such as the Arikaree River, a tributary of the Republican River. Dominant vegetation shares much with generally drier portions of larger floodplain systems downstream, but overall abundance of vegetation is generally lower. Communities within this system range from riparian forests and shrublands to gravel/sand flats. Dominant species include *Populus deltoides*, *Salix* spp., *Artemisia cana* ssp. *cana*, *Pascopyrum smithii*, *Panicum virgatum*, *Panicum obtusum*, *Sporobolus cryptandrus*, and *Schizachyrium scoparium*. On the North Platte in southeastern Wyoming, *Fraxinus pennsylvanica* may be present to dominant. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. *Tamarix* spp., *Elaeagnus angustifolia*, and less desirable grasses and forbs can invade degraded examples up through central Colorado. Groundwater depletion and lack of fire have resulted in additional species changes.

Classification Comments: All the riparian/floodplain/alluvial systems of the Great Plains region need to be revisited for naming conventions, along with better definitions of conceptual boundaries. There is much apparent overlap in their concepts and distribution, and the names add to the confusion. In particular, the difference between "riparian" and "floodplain" usage in the names needs revisiting and possible changing. These systems include Northwestern Great Plains Floodplain (CES303.676), Northwestern Great Plains Riparian (CES303.677), Western Great Plains Floodplain (CES303.678), and Western Great Plains Riparian (CES303.956).

Related Concepts:

- Cottonwood - Willow: 235 (Eyre 1980) Broader

DESCRIPTION

Dynamics: Hydrologically, these sites tend to be more flashy with less developed floodplains than on larger rivers that are classified as floodplain systems, and may dry down completely for some portion of the year. Water sources for this riparian system are largely snowmelt near the Rocky Mountains, but it will respond to summer rains. This system includes numerous smaller prairie rivers and streams that are often groundwater-fed, such as the Arikaree River, a tributary of the Republican River.

MEMBERSHIP

Associations:

- *Artemisia cana* / *Pascopyrum smithii* Shrubland (CEGL001072, G4)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* / *Panicum virgatum* - *Schizachyrium scoparium* Woodland (CEGL001454, G2)
- Riverine Gravel Flats Great Plains Sparse Vegetation (CEGL005223, GNR)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)

Alliances:

- *Artemisia cana* Temporarily Flooded Shrubland Alliance (A.843)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Canyon (CES303.658)

DISTRIBUTION

Ecological Systems / LANDFIRE Biophysical Settings for location: US States AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI or WY ; Excluding Aggregates

Range: This system is found in riparian areas of medium and small rivers and streams throughout the western Great Plains. It is likely most common in the Central Shortgrass Prairie and Southern Shortgrass Prairie, but extends west as far as the Rio Grande in New Mexico and into the Wyoming Basins. This system occurs on the North Platte, South Platte, Cache La Poudre, Arkansas, Purgatoire, middle Rio Grande, the upper reaches of the Cimarron, Canadian, and Pecos rivers, and smaller prairie rivers and streams, such as the Arikaree and Republican rivers.

Divisions: 303:C; 304:P

Nations: US

Subnations: CO, MT, NM, TX?, WY

Map Zones: 24:P, 25:C, 26:P, 27:C, 28:C, 33:C, 34:C, 35:?

USFS Ecomap Regions: 313B:PP, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 331B:CC, 331C:CC, 331E:CP, 331H:CC, 331I:CC, 331J:CC, 342A:PP, 342F:PP, M313A:C?, M313B:CC, M331B:CC, M331F:CC, M331G:CP, M331I:CC

TNC Ecoregions: 10:P, 26:C, 27:C, 28:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722725#references

Description Author: P. Comer, G. Kittel, K. Schulz

Version: 23 Jan 2008

Concept Author: P. Comer, G. Kittel

Stakeholders: Canada, Midwest, Southeast, West

ClassifResp: West

1385 WESTERN GREAT PLAINS WOODED DRAW AND RAVINE (CES303.680)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Ravine; G-Patch/Medium Intensity; Draw

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2385; ESLF 4328; ESP 1385

CONCEPT

Summary: This ecological system is typically found associated with permanent or ephemeral streams and may occur on steep northern slopes or within canyon bottoms that do not experience periodic flooding, although soil moisture and topography allow greater than normal moisture conditions compared to the surrounding areas. Occurrences can be either tree-dominated or predominantly shrubland. *Fraxinus* spp. with *Ulmus rubra* or *Ulmus americana* typically dominate this system, although in some areas of the western Great Plains steppe province, *Juniperus scopulorum* can dominate the canopy. *Populus tremuloides*, *Betula papyrifera*, or *Acer negundo* are commonly present in portions of the northwestern Great Plains, for example in areas of central and eastern Montana. In south-central portions of the Great Plains, *Quercus macrocarpa* can also be present. Component shrubs can include *Cornus sericea*, *Crataegus douglasii*, *Crataegus chrysocarpa*, *Crataegus succulenta*, *Elaeagnus commutata*, *Prunus virginiana*, *Rhus* spp., *Rosa woodsii*, *Shepherdia argentea*, *Symphoricarpos occidentalis*, or *Viburnum lentago*. Common grasses can include *Calamagrostis stricta*, *Carex* spp., *Pascopyrum smithii*, *Piptatherum micranthum*, *Pseudoroegneria spicata*, or *Schizachyrium scoparium*. This system was often subjected to heavy grazing and trampling by both domestic animals and wildlife and can be heavily degraded in some areas. In addition, exotic species such as *Ulmus pumila* and *Elaeagnus angustifolia* can invade these systems.

Classification Comments: More information from the broader division and from the Rocky Mountain division will be needed to determine if those areas dominated by ash and elm should be separated from areas dominated by *Juniperus scopulorum*. Those areas dominated by *Juniperus* are typically found in the Badlands and the western portions of North Dakota and Nebraska, and should probably be described based on data from the Great Plains Steppe or Rocky Mountain division. However, *Juniperus* can occur in stands with elm and ash in Nebraska and North Dakota.

Related Concepts:

- Bur Oak: 236 (Eyre 1980) Intersecting
- Rocky Mountain Juniper: 220 (Eyre 1980) Intersecting

DESCRIPTION

Environment: This system is associated with permanent or ephemeral streams. It also can occur on steep northern slopes or within canyon bottoms that do not experience periodic flooding. Soils are primarily wet to mesic, and more dissected topography allows for greater than normal moisture conditions. This system is most often associated with smaller rivers and/or temporary streams.

Vegetation: Species composition can vary across the range of this system. *Fraxinus* spp. and *Ulmus* spp. typically dominate this system. In some western areas of the Great Plains Division, *Juniperus* spp. can dominate, and in the south-central portion of the division, *Quercus macrocarpa* can also be important. Exotic species, such as *Ulmus pumila* and *Elaeagnus angustifolia*, can be present in degraded examples of this system.

Dynamics: Fire can influence this system; however, grazing is the most prevalent dynamic process influencing this system. Overgrazing can heavily degrade this system and allow for the invasion of exotic species.

MEMBERSHIP

Associations:

- *Betula papyrifera* / *Corylus cornuta* Forest (CEGL002079, G2G3)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Cornus drummondii* - (*Rhus glabra*, *Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Cornus drummondii* - *Amorpha fruticosa* - *Cornus sericea* Shrubland (CEGL005220, G4?)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Crataegus douglasii* - (*Crataegus chrysocarpa*) Shrubland (CEGL001093, G2Q)
- *Crataegus succulenta* Shrubland [Provisional] (CEGL001097, G3G4Q)
- *Elaeagnus commutata* / *Pascopyrum smithii* Shrubland (CEGL001099, G3?)
- *Elaeagnus commutata* Shrubland (CEGL001098, G2Q)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) / *Symphoricarpos occidentalis* Forest (CEGL002088, G4?)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Prunus virginiana* Woodland (CEGL000643, G2G3)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Symphoricarpos occidentalis* Forest (CEGL002082, G3G5)
- *Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014, G3G5)
- *Fraxinus pennsylvanica* / *Prunus virginiana* Forest (CEGL000642, G3?)

- *Juniperus scopulorum* / *Cornus sericea* Woodland (CEGL000746, G4)
- *Juniperus scopulorum* / *Piptatherum micranthum* Woodland (CEGL000747, G3G4)
- *Juniperus scopulorum* / *Pseudoroegneria spicata* Woodland (CEGL000748, G4)
- *Juniperus scopulorum* / *Schizachyrium scoparium* Woodland (CEGL000750, G2)
- *Juniperus scopulorum* Woodland (CEGL003550, GNR)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Pascopyrum smithii* Woodland (CEGL002680, G3)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Carex pellita* Woodland (CEGL002649, G2)
- *Populus deltoides* / *Symphoricarpos occidentalis* Woodland (CEGL000660, G2G3)
- *Prunus virginiana* - (*Prunus americana*) Shrubland (CEGL001108, G4Q)
- *Quercus macrocarpa* / *Prunus virginiana* - *Symphoricarpos occidentalis* Woodland (CEGL002138, G3G4)
- *Rosa woodsii* Shrubland (CEGL001126, G5)
- *Shepherdia argentea* Shrubland (CEGL001128, G3G4)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)

Alliances:

- *Betula papyrifera* Forest Alliance (A.267)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Crataegus (douglasii, succulenta)* Temporarily Flooded Shrubland Alliance (A.954)
- *Elaeagnus commutata* Shrubland Alliance (A.918)
- *Elaeagnus commutata* Temporarily Flooded Shrubland Alliance (A.956)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Forest Alliance (A.259)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Temporarily Flooded Forest Alliance (A.308)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Woodland Alliance (A.629)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Juniperus scopulorum* Temporarily Flooded Woodland Alliance (A.563)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Prunus virginiana* Shrubland Alliance (A.919)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Rosa woodsii* Temporarily Flooded Shrubland Alliance (A.959)
- *Shepherdia argentea* Temporarily Flooded Shrubland Alliance (A.960)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)

DISTRIBUTION

Range: This system is found throughout more northern portions of the Western Great Plains Division. In Wyoming, it occurs in the northeastern foothills of the Bighorns and across far-northeastern Wyoming into the northern fringes of the Black Hills.

Divisions: 205:P; 303:C

Nations: US

Subnations: CO, KS, MT, ND, NE, OK, SD, TX, WY

Map Zones: 20:C, 27:P, 28:P, 29:C, 30:C, 31:C, 33:C, 34:C, 35:?, 38:C, 39:C, 40:C, 43:C

USFS Ecomap Regions: 331D:CP, 331E:CP, 331F:C?, 331G:CP, 331H:C?, 331K:CC, 331L:CC, 331M:CP, 331N:C?, M331B:??, M331I:??, M334A:PP

TNC Ecoregions: 26:C, 27:C, 28:P, 33:C, 34:C, 37:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722979#references

Description Author: S. Menard and K. Kindscher, mod. M.S. Reid

Version: 23 Jan 2008

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

SPARSELY VEGETATED

ACADIAN-NORTH ATLANTIC ROCKY COAST (CES201.573)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Rocks and Derived Substrates of the Immediate Coast

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Long (>500 yrs) Persistence; Lowland; Glaciated; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Consolidated; Unconsolidated; W-Landscape/Medium Intensity

National Mapping Codes: ESLF 3189

CONCEPT

Summary: This system encompasses non-forested uplands along the immediate Atlantic Coast, from north of Cape Cod to the Canadian Maritimes. It is often a narrow zone between the high tide line and the upland forest; this zone becomes wider with increasing maritime influence. The substrate is rock, sometimes with a shallow soil layer, and tree growth is prevented by extreme exposure to wind, salt spray, and fog. Slope varies from flat rock to cliffs. Cover is patchy shrubs, dwarf-shrubs and sparse vascular vegetation, sometimes with a few stunted trees. Many coastal islands have graminoid-shrub areas that were maintained by sheep grazing and now persist even after grazing has ceased.

MEMBERSHIP

Associations:

- *Cakile edentula* ssp. *edentula* - *Mertensia maritima* Sparse Vegetation (CEGL006106, GNR)
- *Morella pensylvanica* - *Empetrum nigrum* Dwarf-shrubland (CEGL006510, GNR)
- *Prunus serotina* - *Rhus typhina* Scrub Forest (CEGL006399, GNR)
- *Solidago sempervirens* - (*Rhodiola rosea*) - *Juniperus horizontalis* Sparse Vegetation (CEGL006529, GNR)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)
- *Empetrum nigrum* Dwarf-shrubland Alliance (A.1078)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)

DISTRIBUTION

Range: Primary range is Maine eastward into the Canadian Maritimes, with peripheral occurrences southward along the New England rocky coast.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: CT?, MA, ME, NB, NH

Map Zones: 65:C, 66:C

TNC Ecoregions: 62:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723032#references

Description Author: S.C. Gawler

Version: 05 Oct 2004

Concept Author: S.C. Gawler

Stakeholders: Canada, East

ClassifResp: East

CENTRAL ATLANTIC COASTAL PLAIN SANDY BEACH (CES203.064)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Beach (Substrate); Coast

National Mapping Codes: ESLF 3162

CONCEPT

Summary: This system includes ocean beaches along the Mid-Atlantic coast ranging from approximately Bodie Island, North Carolina, to approximately Myrtle Beach, South Carolina, a range which is largely represented by Omernik Level IV Ecoregion 63g (EPA 2004). Examples of this system generally include the outermost zone of coastal vegetation extending seaward from foredunes on barrier islands and also limited wash-over flats behind breached foredunes. Substrates consist of unconsolidated sand and shell sediments that are constantly shifting. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by waves and are prone to major impact from storm surges and hurricane events. Under normal conditions constant salt spray and rainwater maintain generally moist conditions. Dynamic disturbance regimes largely limit vegetation to pioneering, salt-tolerant, succulent annuals.

Classification Comments: To the north this system is replaced by Northern Atlantic Coastal Plain Sandy Beach (CES203.301) and to the south by Southern Atlantic Coastal Plain Sea Island Beach (CES203.383). This system provides habitat for the threatened plant seabeach amaranth (*Amaranthus pumilus*).

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Sandy Beach (CES203.301)

DESCRIPTION

Environment: Examples of this system generally extend seaward from foredunes on barrier islands and also limited wash-over flats behind breached foredunes. Substrates consist of unconsolidated sand and shell sediments that are constantly shifting.

Dynamics: Extensive construction of high, artificial dunes along the Atlantic Coast has reduced the extent of these habitats by increasing oceanside beach erosion and eliminating the disturbance regime that creates and maintains overwash flats.

MEMBERSHIP

Associations:

- *Cakile edentula* ssp. *edentula* - *Chamaesyce polygonifolia* Sparse Vegetation (CEGL004400, G4G5)
- *Sesuvium portulacastrum* - *Atriplex* spp. - *Suaeda* spp. Sparse Vegetation (CEGL004406, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)
- *Sesuvium* spp. - *Atriplex* spp. - *Suaeda* spp. Tidal Sparsely Vegetated Alliance (A.1868)

DISTRIBUTION

Range: This system ranges along the Mid-Atlantic coast ranging from approximately Bodie Island, North Carolina, to approximately Myrtle Beach, South Carolina, a range which is largely represented by Omernik Level IV Ecoregion 63g (EPA 2004), but extends southward into the coastal portion of 63h in Horry County, South Carolina.

Divisions: 203:C

Nations: US

Subnations: NC, SC

Map Zones: 58:C

USFS Ecomap Regions: 232I:CC

TNC Ecoregions: 57:C

SOURCES

References: EPA 2004, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.730725#references

Description Author: R.E. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL CALIFORNIA COAST RANGES CLIFF AND CANYON (CES206.903)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Canyon Mosaic; Cliff (Substrate); Talus (Substrate); Mediterranean [Mediterranean Xeric-Oceanic]; Canyon

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Forest and Woodland (Treed);

Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Xeric; Landslide; Cliff (Landform)

National Mapping Codes: ESLF 3169

CONCEPT

Summary: Found from foothill and montane elevations of California's Coast Ranges, these are barren and sparsely vegetated areas (<10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock. This system also includes unstable scree and talus slopes typically occurring below cliff faces. Scattered vegetation may include *Pseudotsuga menziesii*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, and *Pinus jeffreyi*. There may be shrubs including species of *Arctostaphylos* or *Ceanothus*. Soil development is limited as is herbaceous cover.

DISTRIBUTION

Range: Found from foothill and montane elevations of California's Coast Ranges.

Divisions: 206:C

Nations: US

Subnations: CA

Map Zones: 3:C, 4:C

USFS Ecomap Regions: 262A:PP, M261B:CC, M261C:CC

TNC Ecoregions: 14:C, 15:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722778#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

CENTRAL INTERIOR ACIDIC CLIFF AND TALUS (CES202.689)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Talus (Landform); Acidic Soil; Cliff (Landform)

National Mapping Codes: ESLF 3149

CONCEPT

Summary: This system is found primarily in the Interior Highlands, including the Ozarks, Ouachita, and Interior Low Plateau ecoregions, extending marginally north and west along the Missouri and Mississippi rivers. Sandstone outcrops and talus ranging from moist to dry typify this system. It is typically sparsely vegetated; however, on moister sites with more soil development, several fern species and sedges (*Carex* spp.) can establish. Wind and water erosion are the major dynamic processes influencing this system.

Classification Comments: In Kentucky, this system covers the sandstone cliffs of the Shawnee Hills (Interior Low Plateau). In Illinois, one exemplary example is the "Garden of the Gods" in the Shawnee National Forest.

Similar Ecological Systems:

- North-Central Appalachian Acidic Cliff and Talus (CES202.601)

Related Concepts:

- Dry Sandstone Cliff (Evans 1991) Intersecting
- Moist Sandstone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: Sandstone outcrops and talus ranging from moist to dry typify this system.

Vegetation: This system is typically sparsely vegetated; however, on moister sites with more soil development, several fern species and sedges (*Carex* spp.) can establish. Some taxa that could be present include *Ribes cynosbati*, *Deschampsia flexuosa*, *Dryopteris marginalis*, and *Dennstaedtia punctilobula*, as well as *Carex interior*, *Carex lurida*, *Carex leptalea*, *Parnassia grandifolia*, *Rhynchospora capillacea*, *Osmunda cinnamomea*, *Rhynchospora capitellata*, *Heuchera parviflora* var. *puberula*, and *Xyris jupicai* on wetter sites.

Dynamics: Wind and water erosion are the major dynamic processes influencing this system.

MEMBERSHIP

Associations:

- (*Carex interior*, *Carex lurida*) - *Carex leptalea* - *Parnassia grandifolia* - *Rhynchospora capillacea* Herbaceous Vegetation (CEGL002404, G2G3)
- (*Hydrangea arborescens*, *Ribes cynosbati*) / *Deschampsia flexuosa* - *Dryopteris marginalis* - *Dennstaedtia punctilobula* Shrubland (CEGL007820, G2?)
- Chert Ozark Dry Cliff Sparse Vegetation (CEGL002285, G3?)
- Chert Ozark Moist Cliff Sparse Vegetation (CEGL002288, G2G3)
- Igneous Ozark Dry Cliff Sparse Vegetation (CEGL002286, G4)
- Igneous Ozark Moist Cliff Sparse Vegetation (CEGL002289, G4Q)
- Igneous Ozark Talus Sparse Vegetation (CEGL005203, G4)
- *Osmunda cinnamomea* - *Rhynchospora capitellata* - *Heuchera parviflora* var. *puberula* - *Xyris jupicai* Herbaceous Vegetation (CEGL007837, G1Q)
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045, G4G5)
- Sandstone Interior Highlands Talus Sparse Vegetation (CEGL002309, G4G5)
- Sandstone Midwest Moist Cliff Sparse Vegetation (CEGL002287, G4G5)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)

DISTRIBUTION

Range: This system is found primarily in the Interior Highlands, including the Ozark, Ouachita, and Interior Low Plateau ecoregions. It extends marginally into the Central Tallgrass Prairie Ecoregion along the Missouri and Mississippi rivers.

Divisions: 202:C

Nations: US

Subnations: AR, IA?, IL, IN, KY, MO, TN

Map Zones: 43:P, 44:C, 47:C, 48:C, 49:C, 53:C
TNC Ecoregions: 36:C, 38:C, 39:C, 44:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722970#references

Description Author: S. Menard, T. Foti, R. Evans, mod. M. Pyne

Version: 17 Apr 2006

Concept Author: S. Menard, T. Foti, R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

CENTRAL INTERIOR CALCAREOUS CLIFF AND TALUS (CES202.690)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

National Mapping Codes: ESLF 3148

CONCEPT

Summary: This system is found primarily in non-Appalachian portions of the Central Interior Division. It ranges from the Ouachitas east to the Cumberlands and north into the Western Allegheny Plateau and Lake states. Limestone and dolomite outcrops and talus distinguish this system. Examples range from moist to dry and from sparsely to moderately well-vegetated. Woodland species such as *Thuja occidentalis* can establish along the ridgetops. Understory species can range from grassland species, such as *Andropogon gerardii* on drier slopes, to more mesic species in areas with higher moisture and more soil development. Wind and water erosion along with fire are the primary natural dynamics influencing this system. Some associations included here are rocky openings in forest stands, sometimes with moisture present from groundwater seepage. Also included are wet and dry cliffs. The flora of these wetter examples may include (across the broad range of the system) *Aconitum noveboracense*, *Adiantum capillus-veneris*, *Adoxa moschatellina*, *Aquilegia canadensis*, *Asplenium rhizophyllum*, *Boehmeria cylindrica*, *Chrysosplenium iowense*, *Cystopteris bulbifera*, *Cystopteris bulbifera*, *Dichanthelium depauperatum*, *Heuchera americana*, *Heuchera americana* var. *hirsuticaulis*, *Heuchera villosa* var. *arkansana*, *Hydrangea arborescens*, *Impatiens pallida*, *Lobelia siphilitica*, *Toxicodendron radicans*, and *Woodsia obtusa*.

Classification Comments: Similar examples in the driftless region of Minnesota, Wisconsin, Iowa and Illinois should be considered part of Paleozoic Plateau Bluff and Talus (CES202.704).

Similar Ecological Systems:

- North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)
- Paleozoic Plateau Bluff and Talus (CES202.704)
- Southern Interior Calcareous Cliff (CES202.356)--includes circumneutral cliff and talus communities from southern Virginia south.
- Southern Interior Sinkhole Wall (CES202.357)

Related Concepts:

- Dry Limestone Cliff (Evans 1991) Finer
- Moist Limestone Cliff (Evans 1991) Finer

DESCRIPTION

Environment: Limestone and dolomite outcrops and talus distinguish this system.

Vegetation: Examples range from moist to dry and from sparsely to moderately well-vegetated. Woodland species such as *Thuja occidentalis* can establish along the ridgetops. Understory species can range from grassland species, such as *Andropogon gerardii* on drier slopes, to more mesic species in areas with higher moisture and more soil development. The flora of some moister examples (e.g., rocky openings in forest stands, with moisture present from groundwater seepage as well as wet cliffs) includes (across the broad range of the system) *Aconitum noveboracense*, *Adiantum capillus-veneris*, *Adoxa moschatellina*, *Aquilegia canadensis*, *Asplenium rhizophyllum*, *Boehmeria cylindrica*, *Chrysosplenium iowense*, *Cystopteris bulbifera*, *Cystopteris bulbifera*, *Dichanthelium depauperatum*, *Heuchera americana*, *Heuchera americana* var. *hirsuticaulis*, *Heuchera villosa* var. *arkansana*, *Hydrangea arborescens*, *Impatiens pallida*, *Lobelia siphilitica*, *Toxicodendron radicans*, and *Woodsia obtusa*.

Dynamics: Wind and water erosion along with fire are the primary natural dynamics influencing this system.

MEMBERSHIP

Associations:

- (*Hydrangea arborescens*, *Toxicodendron radicans*) / *Heuchera americana* - (*Dichanthelium depauperatum*, *Woodsia obtusa*) Shrubland (CEGL004395, G3?)
- *Acer saccharum* - *Tilia americana* - *Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland (CEGL005058, G3G5)
- *Adiantum capillus-veneris* - *Boehmeria cylindrica* - *Lobelia siphilitica* Herbaceous Vegetation (CEGL004728, G2G3)
- *Andropogon gerardii* - *Chasmanthium latifolium* - *Amsonia tabernaemontana* var. *salicifolia* Herbaceous Vegetation (CEGL004739, G2G3)
- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Ozark Sparse Vegetation [Provisional] (CEGL008486, GNR)
- *Hydrangea arborescens* / *Heuchera* (*americana* var. *hirsuticaulis*, *villosa* var. *arkansana*) - *Aquilegia canadensis* Shrubland (CEGL007819, G3?)
- *Hydrangea arborescens* / *Impatiens* (*capensis*, *pallida*) - *Heuchera villosa* Shrubland (CEGL004708, G3)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* - (*Chrysosplenium iowense*, *Aconitum noveboracense*) Herbaceous Vegetation (CEGL002387, G2)
- Limestone - Dolostone Midwest Dry Cliff Sparse Vegetation (CEGL002291, G4G5)

- Limestone - Dolostone Midwest Moist Cliff Sparse Vegetation (CEGL002292, G4G5)
- Limestone - Dolostone Talus Sparse Vegetation (CEGL002308, G4G5)
- *Quercus muehlenbergii* - (*Juniperus virginiana* var. *virginiana*) Unglaciated Bluff Woodland (CEGL004267, G2G3)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Bedrock Bluff Herbaceous Vegetation (CEGL002245, G3G4)
- *Schizachyrium scoparium* - *Sporobolus compositus* var. *compositus* - *Rudbeckia fulgida* var. *fulgida* Wooded Herbaceous Vegetation (CEGL004078, G2)
- Small Eroding Bluffs Midwestern Sparse Vegetation (CEGL002315, GNR)
- *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596, G2G3)
- *Thuja occidentalis* Cliff Woodland (CEGL002451, G3)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Sparsely Vegetated Alliance (A.1834)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* Herbaceous Alliance (A.1598)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Quercus muehlenbergii* Woodland Alliance (A.621)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- Small Eroding Bluffs Sparsely Vegetated Alliance (A.1872)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

DISTRIBUTION

Range: This system is found primarily in non-Appalachian portions of the Central Interior Division.

Divisions: 201:?: 202:C; 205:P

Nations: US

Subnations: AR, IA, IL, IN, KY?, MI, MN, MO, NY, OH, OK, PA, TN, WI

Map Zones: 41:?, 42:P, 43:P, 44:C, 47:C, 48:C, 49:P, 50:C, 51:C, 52:C, 53:C, 61:C, 62:C, 63:C, 64:C

USFS Ecomap Regions: 222M:CC

TNC Ecoregions: 36:C, 38:C, 39:C, 44:C, 45:C, 46:C, 47:?, 48:C, 49:C

SOURCES

References: Comer et al. 2003, Vanderhorst pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722969#references

Description Author: S. Menard, mod. J. Drake and M. Pyne

Version: 01 Feb 2007

Concept Author: S. Menard

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

COLORADO PLATEAU MIXED BEDROCK CANYON AND TABLELAND (CES304.765)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate [Temperate Xeric]; Alkaline Soil; Aridic

Non-Diagnostic Classifiers: Moss/Lichen (Nonvascular); Cliff (Substrate); Talus (Substrate)

National Mapping Codes: ESLF 3183

CONCEPT

Summary: The distribution of this ecological system is centered on the Colorado Plateau where it is comprised of barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. Some eroding shale layers similar to Inter-Mountain Basins Shale Badland (CES304.789) may be interbedded between the harder rocks. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common species includes *Pinus edulis*, *Pinus ponderosa*, *Juniperus* spp., *Cercocarpus intricatus*, and other short-shrub and herbaceous species, utilizing moisture from cracks and pockets where soil accumulates.

Classification Comments: Geographically restricted and distinct from the related, but broader Inter-Mountain Basins Cliff and Canyon (CES304.779). Shale areas are not as extensive as in shale badlands.

Similar Ecological Systems:

- Colorado Plateau Pinyon-Juniper Shrubland (CES304.766)
- Inter-Mountain Basins Cliff and Canyon (CES304.779)

Related Concepts:

- Littleleaf Mountain-Mahogany (417) (Shiflet 1994) Intersecting
- Pinyon - Juniper: 239 (Eyre 1980) Intersecting

DESCRIPTION

Environment: This system includes limestone escarpments and plateaus occurring in a relatively narrow band of unvegetated or sparsely vegetated badlands formed by the red beds of the Claron (Wasatch) Formation along the eastern edge of the Pausaugunt Plateau (Bryce Canyon) and the western edge of the Markagunt Plateau (Cedar Breaks National Monument) (Graybosch and Buchanan 1983). It includes areas of which often 90% of the exposed surface consists of barren rock. It forms, or includes, areas of fixed bedrock forming the vertical or near-vertical parts on the plateau faces. The rocks forming such areas are predominantly limestone-capped plateaus. These areas are highly erodible and form the basic scenic structure of Bryce Canyon and Cedar Breaks national parks. The area is generally too steep to allow any significant soil development. Scattered plants obtain a precarious foothold in the crevices of the rocks. Knolls may form at the base of the cliffs.

This ecological system also includes sandstone and shale escarpments, which form, or include, areas of fixed bedrock forming the vertical or near-vertical parts of canyon walls and plateau faces. The scenic cliffs of the East Tavaputs area, e.g., the Book Cliffs, are excellent examples of this. The rocks forming such areas are predominantly sandstone and shale with some limestone and marlstone. These areas are unstable and rocks are frequently rolling down onto the talus slopes below (often forming Inter-Mountain Basins Shale Badland (CES304.789)). The area is generally too steep to allow any significant soil development. Scattered plants obtain a precarious foothold in the crevices of the rocks. Knolls may form at the base of the cliffs. The larger drainages (e.g., East Fork Parachute Creek) plunge several hundred feet at this escarpment, which creates scenic and lush hanging gardens. Many of these escarpments are over 1000 feet in height and provide excellent habitat for cliff-nesting birds such as peregrine falcons and golden eagles.

The Claron limestone, a Tertiary deposit, is divisible into Red Eocene beds and White Oligocene beds, which differ somewhat in presence or absence of pigmentation in the form of iron and manganese oxides, and in amounts of sand and conglomerates in the limestone (Graybosch and Buchanan 1983). The Claron Formation is characterized by a rapid rate of erosion, largely a function of creep resulting from winter freeze-thaw activity and wash away by summer thunderstorm runoff (Graybosch and Buchanan 1983). Freeze-thaw cycles are most pronounced on south-facing slopes. Soil development is limited. Infiltration rates are low and runoff high.

Vegetation: For the most part, this system is sparsely vegetated. Small patches of scattered trees and shrubs may occur. These small vegetated patches are usually dominated by conifer trees and may include *Abies concolor*, *Juniperus scopulorum*, *Picea pungens*, *Pinus flexilis*, *Pinus longaeva*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. If a shrub layer exists, it may include *Acer glabrum*, *Amelanchier utahensis*, *Arctostaphylos patula*, *Ceanothus martinii*, *Cercocarpus montanus*, *Cercocarpus intricatus*, *Juniperus communis*, *Mahonia repens*, *Purshia tridentata*, *Ribes cereum*, and *Gutierrezia sarothrae*. Grasses and forbs, if present, may include *Astragalus kentrophyta*, *Cirsium arizonicum*, *Clematis columbiana*, *Leymus salinus*, *Eriogonum panguicense*, *Achnatherum hymenoides*, and *Linum kingii*.

This ecological system is noted for its high rate of endemic species of forbs, especially in Bryce Canyon. Nine of the eleven endemic species occur in the *Pinus longaeva* community, three are found in the *Pinus ponderosa* - *Arctostaphylos patula* plant association, and two occur in the mixed conifer type. Species that occur only in the *Pinus longaeva* type have the narrowest geographic distributions, although *Eriogonum panguicense* var. *panguicense* is an exception (Graybosch and Buchanan 1983). Within Bryce Canyon, most of these endemics are restricted to the Claron Formation (Graybosch and Buchanan 1983). The majority of endemic species found in southern Utah are restricted to substrates derived from a specific geologic formation (Welsh 1979). Welsh notes that most of these taxa are found in areas of exposed parent material. The distribution of endemic species in Utah is not a random one; fine-textured substrates support more species than coarser ones, and desert and foothill vegetation is richer in endemic species than montane communities (Welsh 1979).

Dynamics: This ecological system has a naturally high rate of erosion. Fires are infrequent and not an important ecological process.

MEMBERSHIP

Associations:

- *Acer negundo* / *Rhus trilobata* Woodland (CEGL002750, GNR)
- *Artemisia bigelovii* - *Ephedra* (*viridis*, *torreyana*) Talus Shrubland (CEGL003755, GNR)
- *Atriplex canescens* - (*Ephedra viridis*) / (*Muhlenbergia porteri*) Sandstone Sparse Vegetation [Provisional] (CEGL002927, GNR)
- *Atriplex canescens* - *Ephedra viridis* Talus Shrubland (CEGL001287, G4)
- *Celtis laevigata* var. *reticulata* Slickrock Canyon Woodland [Provisional] (CEGL002359, GNR)
- *Cercocarpus intricatus* Montane Shrubland (CEGL002587, GNR)
- *Cercocarpus intricatus* Slickrock Sparse Vegetation (CEGL002977, GNR)
- *Cercocarpus montanus* Rock Pavement Sparse Vegetation (CEGL002978, GNR)
- *Chrysothamnus viscidiflorus* Talus Shrubland (CEGL002347, GNR)
- *Coleogyne ramosissima* Sparse Shrubland (CEGL003834, GNR)
- *Ephedra torreyana* - (*Atriplex canescens*, *Atriplex confertifolia*) Sparse Vegetation (CEGL005801, GNR)
- *Ephedra torreyana* - (*Atriplex* spp.) / Nonvascular Gypsum Sparse Vegetation (CEGL002349, GNR)
- *Ephedra torreyana* - *Artemisia bigelovii* Sparse Vegetation (CEGL002350, GNR)
- *Ephedra torreyana* Sparse Vegetation (CEGL002353, GNR)
- *Fendlera rupicola* Talus Shrubland (CEGL002765, GNR)
- *Fraxinus anomala* - *Rhus trilobata* Talus Shrubland (CEGL003963, GNR)
- *Juniperus osteosperma* - (*Pinus edulis*) / *Coleogyne ramosissima* - *Purshia stansburiana* - *Quercus havardii* var. *tuckeri* Wooded Shrubland (CEGL003774, GNR)
- *Juniperus osteosperma* / *Artemisia nova* / Rock Woodland (CEGL000729, G5)
- *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Pinus edulis* - *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000779, G3)
- *Pinus edulis* - *Juniperus osteosperma* / *Ephedra viridis* Woodland (CEGL002370, G3)
- *Pinus edulis* - *Juniperus osteosperma* / *Petradoria pumila* Woodland (CEGL002332, GNR)
- *Pinus ponderosa* / Sparse Understory Woodland [Provisional] (CEGL002384, GNR)
- *Pinus ponderosa* Slickrock Sparse Vegetation (CEGL002972, GNR)
- *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666, G3?)
- *Rhus trilobata* - *Ephedra* (*viridis*, *torreyana*) Talus Shrubland (CEGL003776, GNR)

Alliances:

- *Acer negundo* Temporarily Flooded Woodland Alliance (A.642)
- *Artemisia bigelovii* Shrubland Alliance (A.1103)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Celtis laevigata* var. *reticulata* Woodland Alliance (A.632)
- *Cercocarpus intricatus* Shrubland Alliance (A.2659)
- *Cercocarpus intricatus* Sparsely Vegetated Alliance (A.2543)
- *Cercocarpus montanus* Sparsely Vegetated Alliance (A.2544)
- *Chrysothamnus viscidiflorus* Shrubland Alliance (A.2651)
- *Coleogyne ramosissima* Shrubland Alliance (A.874)
- *Ephedra torreyana* Sparsely Vegetated Alliance (A.2571)
- *Fendlera rupicola* Shrubland Alliance (A.2656)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus edulis* - *Juniperus osteosperma* Wooded Shrubland Alliance (A.2649)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Rhus trilobata* Shrubland Alliance (A.3569)
- Sandstone Sparsely Vegetated Alliance (A.2568)
- Wooded Bedrock Sparsely Vegetated Alliance (A.2546)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Inter-Mountain Basins Shale Badland (CES304.789)

Adjacent Ecological System Comments: Some eroding shale layers similar to Inter-Mountain Basins Shale Badland (CES304.789) may be interbedded between the harder rocks.

DISTRIBUTION

Range: Colorado Plateau.

Divisions: 304:C

Nations: US

Subnations: AZ, CO, NM, UT, WY

Map Zones: 13:C, 14:P, 15:C, 16:C, 17:C, 22:P, 23:C, 24:C, 25:P, 27:?, 28:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315H:CC, 321A:CC, 322A:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, M313A:CC, M313B:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M341B:CC, M341C:CC

TNC Ecoregions: 18:C, 19:C, 20:?

SOURCES

References: Comer et al. 2003, Graybosch and Buchanan 1983, LaMarche and Mooney 1972, Shute and West 1978, Thorne Ecological Institute 1973a, Welsh 1979, Welsh and Chatterly 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722907#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

COLUMBIA PLATEAU ASH AND TUFF BADLAND (CES304.081)

CLASSIFIERS

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Badlands; Alkaline Soil; Silt Soil Texture; Clay Soil Texture

National Mapping Codes: ESLF 3174

CONCEPT

Summary: This ecological system of the Columbia Plateau region is composed of barren and sparsely vegetated substrates (<10% plant cover) typically derived from highly eroded volcanic ash and tuff. Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs and forbs. Characteristic species include *Grayia spinosa*, *Artemisia tridentata*, *Salvia dorrii*, *Achnatherum* sp., *Eriogonum* sp., *Sarcobatus vermiculatus*, *Purshia tridentata*, and *Atriplex confertifolia*. Characteristic forbs are short-lived annuals, including *Cleome*, *Mentzelia*, *Camissonia*, and *Mimulus* species, although these habitats often support endemic perennial forbs.

Classification Comments: Associations assigned to this system are not well-classified, but as many support G1 and G2 plant taxa, they are well sampled.

Similar Ecological Systems:

- Inter-Mountain Basins Shale Badland (CES304.789)

MEMBERSHIP

Associations:

- *Achnatherum hymenoides* Shale Barren Herbaceous Vegetation (CEGL001651, G2)
- *Artemisia tridentata* ssp. *wyomingensis* - *Atriplex confertifolia* Shrubland (CEGL001040, G3G5)
- *Salvia dorrii* / *Pseudoroegneria spicata* Dwarf-shrubland (CEGL001453, G4)

Alliances:

- *Achnatherum hymenoides* Herbaceous Alliance (A.1262)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Salvia dorrii* Dwarf-shrubland Alliance (A.1129)

DISTRIBUTION

Range: This system is found on the Columbia Plateau of southern Idaho west into southern Oregon, northern Nevada, and extreme northeastern California.

Divisions: 304:C

Nations: US

Subnations: CA, ID, NV, OR, WA?

Map Zones: 7:P, 8:C, 9:C, 10:P, 12:P, 18:C

USFS Ecomap Regions: 342B:CC, 342C:CC, 342D:CC, M331A:??

TNC Ecoregions: 4:P, 6:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.740139#references

Description Author: J. Kagan

Version: 08 Sep 2004

Concept Author: J. Kagan

Stakeholders: West

ClassifResp: West

CUMBERLAND ACIDIC CLIFF AND ROCKHOUSE (CES202.309)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Acidic Soil

National Mapping Codes: ESLF 3119

CONCEPT

Summary: This sandstone cliff system is found in the Cumberland Plateau and Mountain regions of the southeastern United States. Examples are extremely steep or vertical rock faces exposed along bluffs often associated with rivers. Aspect is variable but best developed south and west. Plants are infrequent due to the lack of crevices capable of accumulating soil, the highly acidic nature of the bedrock, and the frequent weathering and erosion of the substrate. Lichen cover may be extensive in places, especially on the more exposed portions. These cliffs are also prone to harsh climatic conditions; frequent disturbances include drought stress and wind and storm damage. As a result, examples are characterized by sparse herbaceous cover and few, if any, trees. Vegetation consists of scattered individuals of *Asplenium montanum*, *Silene rotundifolia*, and other species rooted in crevices and erosion pockets. In some parts of its range, this system is the primary or sole habitat for rare endemic species, such as *Minuartia cumberlandensis* and *Ageratina luciae-brauniae*. This system includes a mosaic of cavelike features (often called "rockhouses") and associated sandstone box canyons in the western Appalachian foothills regions of Kentucky, Alabama, West Virginia, and possibly southeastern Ohio. Where present, the rockhouses are a prominent and diagnostic feature of the system.

Classification Comments: It is unclear whether or not this system should range into the Interior Low Plateau. Also debatable is whether or not wet and dry cliffs should be included as well as the number of different physical settings possible. See also Southern Appalachian Montane Cliff and Talus (CES202.330).

Similar Ecological Systems:

- North-Central Appalachian Acidic Cliff and Talus (CES202.601)
- Southern Appalachian Montane Cliff and Talus (CES202.330)

Related Concepts:

- Dry Sandstone Cliff (Evans 1991) Intersecting
- Moist Sandstone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: The rockhouses are the most unique and diagnostic feature of the system. These unusual geologic features are created by spray and rock-cracking from seasonal flowing waterfalls at the heads of canyons amidst thick layers of sandstone from the Pennsylvanian geologic period. The ceiling of the rockhouse may be 50 m tall, and they can be as much as 100 m deep (A. Weakley pers. comm. 2006). They require sufficient flowing water and freezing and thawing to weather the thick beds of sandstone. These conditions seem to be restricted to the western margin of the Appalachian Plateau.

Vegetation: Examples of this system usually include a vegetational mosaic that includes hemlock bluffs, sandstone cliffs, or overhangs near the base of a cliff (often with a sandy area beneath the overhang which is shaded and protected from direct rainfall, as well as gladelike vegetation at the horizontal portion of the cliffs). The rockhouses in the southern parts of the range are habitats for rare vascular plant species such as *Minuartia cumberlandensis* and *Ageratina luciae-brauniae* and sometimes support populations of rare nonvascular plants as well.

MEMBERSHIP

Associations:

- *Asplenium montanum* - *Heuchera parviflora* var. *parviflora* - *Silene rotundifolia* Sparse Vegetation (CEGL004392, G3G4)
- *Heuchera parviflora* var. *parviflora* - *Trichomanes boschianum* - *Thalictrum mirabile* - (*Ageratina luciae-brauniae*, *Solidago albopilosa*) Herbaceous Vegetation (CEGL004301, G2)
- *Osmunda cinnamomea* - *Rhynchospora capitellata* - *Thalictrum mirabile* Cumberland Seepage Cliff Herbaceous Vegetation (CEGL008432, G1G2Q)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Schizachyrium scoparium* - *Danthonia sericea* - *Liatris microcephala* - (*Eurybia surculosa*) Wooded Herbaceous Vegetation (CEGL004061, G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Pinus virginiana* Forest Alliance (A.131)
- *Vittaria appalachiana* - *Heuchera parviflora* Saturated Herbaceous Alliance (A.1696)

DISTRIBUTION

Range: This system occurs in a limited area of the Cumberland Plateau of northern Alabama, northwestern Georgia, eastern Kentucky, eastern Tennessee, West Virginia, and possibly southwestern Virginia. It may occur in southeastern Ohio (Rockhouse 349) and in western Pennsylvania.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, OH?, PA?, TN, VA?, WV

Map Zones: 46:C, 47:C, 48:C, 53:C, 57:C, 62:?

TNC Ecoregions: 50:C

SOURCES

References: Comer et al. 2003, Weakley pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723185#references

Description Author: R. Evans, mod. M. Pyne and S.C. Gawler

Version: 05 May 2008

Concept Author: R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN DRY CHALK BLUFF (CES203.492)

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Barren**Spatial Scale & Pattern:** Linear**Required Classifiers:** Natural/Semi-natural; Unvegetated (<10% vasc.); Upland**Diagnostic Classifiers:** Cliff (Substrate)**National Mapping Codes:** ESLF 3117**CONCEPT****Summary:** The system is endemic to the Black Belt region of Alabama and Mississippi. Examples are relatively sheer surfaces of exposed chalk generally devoid of vegetation. In most cases these bluffs extend directly to the edge of rivers or streams.**MEMBERSHIP****Associations:**

- *Adiantum capillus-veneris* Cahaba River Bluff Herbaceous Vegetation (CEGL007796, G2G3)

Alliances:

- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)

DISTRIBUTION**Range:** Endemic to the Black Belt region of Alabama and Mississippi.**Divisions:** 203:C**Nations:** US**Subnations:** AL, MS**Map Zones:** 46:C**USFS Ecomap Regions:** 231B:CC**TNC Ecoregions:** 43:C**SOURCES****References:** Comer et al. 2003, Gunn 1985, Morris et al. 1993**Full References:**See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723094#references**Description Author:** A. Schotz and R. Evans**Version:** 06 Feb 2003**Concept Author:** A. Schotz and R. Evans**Stakeholders:** Southeast**ClassifResp:** Southeast

EDWARDS PLATEAU CARBONATE GLADE AND BARRENS (CES303.655)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Moss/Lichen (Nonvascular); Sedimentary Rock; Limestone; Very Shallow Soil

National Mapping Codes: ESLF 3141

CONCEPT

Summary: This system occurs on thin soils over massive hard-bedded limestone formations in the Edwards Plateau of Texas. This is a sparsely vegetated system, but species such as *Sedum* spp. can form bands of glades that alternate with areas of woodlands and forests. Some of the depressions hold moisture for longer periods than the surrounding landscape, providing for the establishment of a diversity of spring-blooming annuals. Some characteristic plants include *Lesquerella gordonii*, *Lesquerella ovalifolia*, *Schizachyrium scoparium*, *Sedum nuttallianum*, *Sporobolus vaginiflorus* (var. *ozarkanus* and var. *vaginiflorus*), and *Sedum pulchellum*.

Classification Comments: Further field investigation is needed to better develop the association-level information for this system.

DESCRIPTION

Environment: These glades and barrens are found in xeric sites on limestone rock substrates.

Vegetation: The sparse cover of vegetation is usually limited to cracks or depressions in the limestone bedrock where soil has developed and accumulated. Some of the depressions hold moisture for longer periods than the surrounding landscape, providing for the establishment of a diversity of spring annuals. Some characteristic plants include *Lesquerella gordonii*, *Lesquerella ovalifolia*, *Schizachyrium scoparium*, *Sedum nuttallianum*, *Sporobolus vaginiflorus* (var. *ozarkanus* and var. *vaginiflorus*), and *Sedum pulchellum*.

Dynamics: Processes controlling this system are unclear; however, erosion likely plays a major role. Erosion may be exacerbated in some situations by removal of biomass through overgrazing. Erosion mediates the occurrence of this system through its effects on soil depth. As is true for all the systems, there is a gradient from moister representatives of this system in the east to drier representatives in the west.

MEMBERSHIP

Associations:

- *Lesquerella (gordonii, ovalifolia) - Schizachyrium scoparium* Herbaceous Vegetation (CEGL004917, G2G3)
- *Sedum nuttallianum - Sporobolus vaginiflorus (var. ozarkanus, var. vaginiflorus) - Sedum pulchellum* Herbaceous Vegetation (CEGL004729, G3)

Alliances:

- *Lesquerella (gordonii, ovalifolia)* Herbaceous Alliance (A.1619)
- *Sedum pulchellum* Saturated Herbaceous Alliance (A.1820)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Edwards Plateau Cliff (CES303.653)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)

DISTRIBUTION

Range: This system occurs throughout the Edwards Plateau of Texas.

Divisions: 303:C

Nations: US

Subnations: TX

Map Zones: 35:C

TNC Ecoregions: 29:C

SOURCES

References: Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791381#references

Description Author: J. Teague

Version: 23 Jan 2008
Concept Author: L. Elliott and J. Teague

Stakeholders: Midwest, Southeast, West
ClassifResp: Southeast

EDWARDS PLATEAU CLIFF (CES303.653)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Moss/Lichen (Nonvascular); Sedimentary Rock; Limestone; Cliff (Landform)

National Mapping Codes: ESLF 3127

CONCEPT

Summary: This system occurs on limestone cliff faces and lower slopes of boxed canyons of the Edwards Plateau. It usually occurs as narrow, sometimes long bands in areas where moisture is consistently more available than on adjacent slopes. Conspicuous components of occurrences of this system in seepage areas include *Adiantum capillus-veneris* along the seep and *Thelypteris ovata* var. *lindheimeri* on nearby moist habitats. Communities dominated by *Buddleja racemosa*, *Ungnadia speciosa*, and *Toxicodendron radicans* ssp. *eximium* occur on exposures of the Edwards Plateau Formation (or geologically similar formations) of the southern Edwards Plateau. Geology is clearly the controlling process of this system, along with moisture associated with the crevices in the underlying limestone bedrock. One factor controlling the composition of communities of this system is the amount of overstory shading the sites. This system occurs throughout the Edwards Plateau and west Texas. In the Lampasas Cutplain, this system is sparsely vegetated, and in the eastern plateau and Balcones Canyonlands, it is locally dominated by *Buddleja racemosa*, *Philadelphus* spp., *Syrax*, and *Perityle* spp. It is dominated in the western plateau by *Perityle* spp., *Penstemon baccharifolius*, and *Heterotheca* spp. and is associated with rivers and streams. The cliffs serve as refugia for palatable species.

Classification Comments: Further field investigation is needed to better develop the association-level information for this system.

Similar Ecological Systems:

- Edwards Plateau Mesic Canyon (CES303.038)
- North American Warm Desert Bedrock Cliff and Outcrop (CES302.745)

DESCRIPTION

Environment: This system occurs on steep limestone cliff faces.

MEMBERSHIP

Associations:

- *Adiantum capillus-veneris* - (*Thelypteris ovata* var. *lindheimeri*, *Thelypteris kunthii*) Herbaceous Vegetation (CEGL004514, G2)
- *Buddleja racemosa* - *Ungnadia speciosa* / *Aquilegia canadensis* - *Aristolochia serpentaria* Shrubland (CEGL004531, G2?)

Alliances:

- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Buddleja racemosa* - *Ungnadia speciosa* Shrubland Alliance (A.894)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Edwards Plateau Carbonate Glade and Barrens (CES303.655)
- Edwards Plateau Dry-Mesic Slope Forest and Woodland (CES303.656)
- Edwards Plateau Floodplain (CES303.651)
- Edwards Plateau Limestone Savanna and Woodland (CES303.660)
- Edwards Plateau Limestone Shrubland (CES303.041)
- Edwards Plateau Mesic Canyon (CES303.038)
- Edwards Plateau Riparian (CES303.652)
- Edwards Plateau Upland Depression (CES303.654)

DISTRIBUTION

Range: This system occurs throughout the Edwards Plateau and west Texas.

Divisions: 302:C; 303:C

Nations: US

Subnations: TX

Map Zones: 35:C

TNC Ecoregions: 24:C, 29:C

SOURCES

References: Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.791388#references

Description Author: J. Teague

Version: 09 Feb 2007
Concept Author: L. Elliott and J. Teague

Stakeholders: Midwest, Southeast, West
ClassifResp: Southeast

FLORIDA PANHANDLE BEACH VEGETATION (CES203.266)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: East Gulf Coastal Plain; Beach (Substrate); Graminoid; Coast

National Mapping Codes: ESLF 3147

CONCEPT

Summary: The panhandle beach system ranges from northwestern Florida (Ochlockonee River) to southeastern Mississippi. It includes the outermost zone of coastal vegetation extending seaward from foredunes. Within the northern Gulf of Mexico, the natural boundaries of this system are fairly distinct; the western boundary is mineralogical and the eastern is defined by a region of sunken, flooded coast line where beaches are absent. In addition, these beaches are distinguished by high cover of *Uniola paniculata* and *Schizachyrium maritimum*, along with local endemic species of *Chrysoma* and *Paronychia* (Barbour et al. 1987).

Similar Ecological Systems:

- Southwest Florida Dune and Coastal Grassland (CES203.539)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Unconsolidated Substrate (FNAI 1990) Intersecting

DESCRIPTION

Environment: These beaches are rich in pyroxene, epidote, and garnet (Barbour et al. 1987). Within the northern Gulf of Mexico the sandy substrate of this system is uniquely rich in medium, nutritionally poor sands. Especially low concentrations of potassium may be of great importance to plant growth and species distributions (Barbour et al. 1987).

MEMBERSHIP

Associations:

- *Cakile constricta* Sparse Vegetation (CEGL004398, G2G3)
- *Sesuvium portulacastrum* - *Atriplex* spp. - *Suaeda* spp. Sparse Vegetation (CEGL004406, G3)
- *Uniola paniculata* - *Panicum amarum* var. *amarulum* - *Iva imbricata* Herbaceous Vegetation (CEGL004041, G2)

Alliances:

- *Cakile constricta* Sparsely Vegetated Alliance (A.1860)
- *Sesuvium* spp. - *Atriplex* spp. - *Suaeda* spp. Tidal Sparsely Vegetated Alliance (A.1868)
- *Uniola paniculata* Temperate Herbaceous Alliance (A.1199)

DISTRIBUTION

Range: Ranges from northwestern Florida (Ochlockonee River) to southeastern Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

USFS Ecomap Regions: 232L:CC

TNC Ecoregions: 53:C

SOURCES

References: Barbour et al. 1987, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723220#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

GREAT LAKES ACIDIC ROCKY SHORE AND CLIFF (CES201.025)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Igneous Rock; Coast

Non-Diagnostic Classifiers: Lowland [Lowland]; Moss/Lichen (Nonvascular); Cliff (Substrate); Rock Outcrops/Barrens/Glades; Sedimentary Rock; Metamorphic Rock

National Mapping Codes: ESLF 3146

CONCEPT

Summary: This system is found in the Great Lakes region of the U.S. and Canada where exposed bedrock dominates the shoreline. The bedrock may consist of acidic igneous, metamorphic, or sedimentary rock. Some bedrock shorelines are solid rock, others more cobbly or fragmented. The bedrock may be relatively horizontal or tilted, rounded or blocky, and sometimes cliff-like. The leading edge of the shoreline may be heavily impacted by wave action and winter ice movement, decreasing in effect with distance inland. Vegetation varies from sparse nonvascular vegetation to open-treed or shrubby communities along the same transect.

MEMBERSHIP

Associations:

- *Corylus cornuta* - *Amelanchier* spp. - *Prunus virginiana* Rocky Shrubland (CEGL005197, GNR)
- Granite - Metamorphic Bedrock Great Lakes Shore Sparse Vegetation (CEGL005216, GNR)
- Granite - Metamorphic Great Lakes Shore Cliff Sparse Vegetation (CEGL005244, GNR)
- Igneous - Metamorphic Bedrock Inland Lake Shore Sparse Vegetation (CEGL002301, G4G5)
- Non-alkaline Cobble - Gravel Great Lakes Shore Sparse Vegetation (CEGL002508, G2G3)
- *Picea glauca* - *Abies balsamea* Basalt - Conglomerate Woodland (CEGL005214, GNR)
- Sandstone Bedrock Great Lakes Shore Sparse Vegetation (CEGL002507, G3G4)
- Sandstone Great Lakes Shore Cliff Sparse Vegetation (CEGL002503, G4G5)

Alliances:

- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Corylus cornuta* - *Amelanchier* spp. Shrubland Alliance (A.898)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Picea glauca* Woodland Alliance (A.551)

DISTRIBUTION

Range: Found in the Great Lakes region of the U.S. and Canada, where exposed bedrock dominates the shoreline.

Divisions: 201:C

Nations: CA, US

Subnations: MI, MN, ON, WI

Map Zones: 41:C, 50:C, 51:C

USFS Ecomap Regions: 212Lb:CCC, 212Ra:CCP, 212Rd:CCP, 212Sb:CCC, 212Sc:CCC, 212Sn:CCC, 212Sq:CCC, 212Ya:CCC, 222Ud:CCC

TNC Ecoregions: 48:C

SOURCES

References: Albert et al. 1995, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722680#references

Description Author: D. Albert

Version: 25 Mar 2003

Concept Author: D. Albert

Stakeholders: Canada, East, Midwest
ClassifResp: Midwest

GREAT LAKES ALKALINE ROCKY SHORE AND CLIFF (CES201.995)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

National Mapping Codes: ESLF 3115

CONCEPT

Summary: This system is found in the Great Lakes region of the U.S. and Canada where exposed bedrock dominates the shoreline. The bedrock may consist of alkaline igneous, metamorphic, or sedimentary rocks. Some bedrock shorelines are solid rock, others more cobbly or fragmented. The bedrock may be relatively horizontal or tilted, rounded or blocky, and sometimes cliff-like. The leading edge of the shoreline may be heavily impacted by wave action and winter ice movement, decreasing in effect with distance inland. Alkaline rocky shores are predominantly dolostone when associated with the Niagaran Escarpment along the northern Lake Michigan and Lake Huron shorelines, perhaps best developed on Drummond Island and adjacent Ontario islands. Vegetation in these type is closely related to sparsely vegetated Great Lakes alvars. Alkaline basalts characterize these systems along portions of the Lake Superior shoreline, with a generally distinguishable flora from those on dolostone. Overall, vegetation varies from sparse nonvascular vegetation to open-treed or shrubby communities along the same transect.

Related Concepts:

- Limestone Pavement Lakeshore (Kost et al. 2007) Equivalent

MEMBERSHIP

Associations:

- Basalt - Conglomerate Bedrock Great Lakes Shore Sparse Vegetation (CEGL005215, G4G5)
- Basalt - Diabase Cobble - Gravel Great Lakes Shore Sparse Vegetation (CEGL005250, G4G5)
- Basalt - Diabase Great Lakes Shore Cliff Sparse Vegetation (CEGL005191, GNR)
- *Calamagrostis canadensis* - *Carex viridula* - *Cladium mariscoides* - *Lobelia kalmii* Herbaceous Vegetation (CEGL005115, G1G2)
- *Dasiphora fruticosa* ssp. *floribunda* - *Myrica gale* Rich Shore Fen Shrubland (CEGL005275, G1G2)
- *Dasiphora fruticosa* ssp. *floribunda* / *Clinopodium arkansanum* - *Argentina anserina* - *Primula mistassinica* Sparse Vegetation (CEGL002506, G3)
- Limestone - Dolostone Great Lakes Shore Cliff Sparse Vegetation (CEGL002504, G4G5)
- Limestone Cobble - Gravel Great Lakes Shore Sparse Vegetation (CEGL005169, G2G3)
- *Picea glauca* - *Abies balsamea* Basalt - Conglomerate Woodland (CEGL005214, GNR)

Alliances:

- *Calamagrostis canadensis* - *Carex viridula* - *Cladium mariscoides* - *Lobelia kalmii* Saturated Herbaceous Alliance (A.3525)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Dasiphora fruticosa* ssp. *floribunda* - *Myrica gale* - (*Carex lasiocarpa*) Saturated Shrubland Alliance (A.1017)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Picea glauca* Woodland Alliance (A.551)

DISTRIBUTION

Range: Found in the Great Lakes region of the U.S. and Canada, where exposed bedrock dominates the shoreline.

Divisions: 201:C

Nations: CA, US

Subnations: MI, MN, ON, VT, WI

Map Zones: 41:C, 50:C, 51:C

USFS Ecomap Regions: 212Ha:CCP, 212Hf:CCC, 212Hl:CCC, 212Lb:CCC, 212Ra:CC?, 212Rc:CCC, 212Rd:CC?, 212Re:CCC, 212Sb:CCC, 212Sc:CC?, 212Sn:CCC, 212Te:CCC, 212Tf:CCC, 212Ya:C??

TNC Ecoregions: 48:C

SOURCES

References: Albert et al. 1995, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722710#references

Description Author: D. Albert

Version: 24 Mar 2003

Concept Author: D. Albert

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

GREAT LAKES DUNE (CES201.026)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Dune field; Foredune; Lowland [Lowland]; Interdune flat; Longshore bar; Herbaceous; Beach (Landform); Blowout

National Mapping Codes: ESLF 3137

CONCEPT

Summary: This system occurs along the Great Lakes shores region of the United States and Canada. Component plant communities vary from sparsely vegetated, active dunes to communities dominated by grasses, shrubs, and trees, depending on the degree of sand deposition, sand erosion, and distance from the lake. Many open dunes on Lake Michigan are considered "perched dunes" in that sands were deposited on top of glacial moraine located along the coast. In some instances, dunefields sit several hundred feet above current lake levels. Depositional areas, where Great Lakes beachgrass foredunes are found, are dominated by *Ammophila breviligulata* (or in the eastern part of the range *Ammophila champlainensis*); erosional areas, such as slacks in blowouts and dunefields, by *Calamovilfa longifolia*; and stabilized areas by *Schizachyrium scoparium*. In dunefields and on the most stable dune ridges, especially around northern Lake Michigan and Lake Huron, low evergreen shrubs (*Arctostaphylos uva-ursi*, *Juniperus communis*, *Juniperus horizontalis*) occupy dune crests and also the ground layer in the savanna edge of dunes; elsewhere, deciduous shrubs are dominant, including *Prunus pumila*, *Salix cordata*, and *Salix myricoides* (= *Salix glaucophylloides*). Backdunes tend to succeed to forests and savanna indistinguishable from corresponding types found on sandy substrates further inland.

Classification Comments: The system, as described, includes the open grassland, shrubland, and woodland parts of the dune. The lee side of the dunes often contains forests on deep, moist to dry sands that resemble other forested systems. Such forests may include hemlock-hardwood and red oak forests.

Similar Ecological Systems:

- Great Lakes Wooded Dune and Swale (CES201.726)

MEMBERSHIP

Associations:

- *Ammophila breviligulata* - (*Schizachyrium scoparium*) Herbaceous Vegetation (CEGL005098, G3G5)
- *Cakile edentula* Great Lakes Shore Sparse Vegetation (CEGL005162, G3?)
- *Cakile edentula* var. *lacustris* - *Argentina anserina* Sparse Vegetation (CEGL006235, GNR)
- *Juniperus horizontalis* - *Arctostaphylos uva-ursi* - *Juniperus communis* Dune Dwarf-shrubland (CEGL005064, G3G4)
- *Pinus banksiana* - *Pinus resinosa* - *Pinus strobus* Dune Forest (CEGL002589, G3Q)
- *Populus deltoides* - (*Juniperus virginiana*) Dune Woodland (CEGL005119, G1G2)
- *Prunus pumila* - (*Ptelea trifoliata*) Dune Shrubland (CEGL005075, G2Q)

Alliances:

- *Ammophila breviligulata* Herbaceous Alliance (A.1207)
- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)
- *Juniperus horizontalis* Dwarf-shrubland Alliance (A.1080)
- *Pinus banksiana* Forest Alliance (A.116)
- *Populus deltoides* Woodland Alliance (A.1493)
- *Prunus pumila* Shrubland Alliance (A.912)

DISTRIBUTION

Range: This system occurs along the Great Lakes shores of the United States and Canada on stabilized foredunes, ranging from Wisconsin to Ontario and New York in the Great Lakes, and in isolated occurrences along the shores of Lake Champlain, Vermont.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: IL, IN, MI, MN, NY, OH, ON, VT, WI

Map Zones: 41:C, 49:C, 50:C, 51:C, 52:C, 62:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 212Ha:CCC, 212Hf:CCC, 212Hi:CCC, 212Ra:CCC, 212Rd:CCC, 212Re:CCC, 212Sb:CCC, 212Sn:CCC, 212Te:CCC, 212Ya:CCC, 222Ja:CCC

TNC Ecoregions: 48:C, 64:C

SOURCES

References: Albert 1995b, Chapman et al. 1989, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003, Dorr and Eschman 1970, Dorroh 1971

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722679#references

Description Author: D. Faber-Langendoen

Version: 25 Mar 2003

Concept Author: D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

INTER-MOUNTAIN BASINS ACTIVE AND STABILIZED DUNE (CES304.775)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Dune (Landform); Dune field; Dune (Substrate); Temperate [Temperate Continental]; Sand Soil Texture; Aridic; W-Landscape/High Intensity

Non-Diagnostic Classifiers: Dune (undifferentiated); Lowland [Lowland]; Shrubland (Shrub-dominated); Woody-Herbaceous

National Mapping Codes: ESLF 3160

CONCEPT

Summary: This ecological system occurs in the Intermountain western U.S. on basins, valleys and plains. Often it is composed of a mosaic of migrating, bare dunes; anchored dunes with sparse to moderately dense vegetation (<10-30% canopy cover); and stabilized dunes. The system is defined by the presence of migrating dunes or, where the dunes are entirely anchored or stabilized, evidence that the substrate is eolian and not residual, that the vegetation is early- or mid-seral, and that the substrate is likely to become actively migrating again with disturbance or increased aridity. In the Colorado Plateau, there are many small active and partially vegetated dunes along some of the larger washes and playas (where sand is blown out of wash and forms dunes) and some larger dunes such as Coral Pink Dunes in southwestern Utah. Substrates are usually eolian sand, but small dunes composed of silt and clay downwind from playas in the Wyoming Basins (which usually support greasewood vegetation) also are included here. Species occupying these environments are often adapted to shifting, coarse-textured substrates (usually quartz sand) and form patchy or open grasslands, shrublands or steppe, and occasionally woodlands. Vegetation varies and may be composed of *Achnatherum hymenoides*, *Artemisia filifolia*, *Artemisia tridentata* ssp. *tridentata*, *Atriplex canescens*, *Ephedra* spp., *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ericameria nauseosa*, *Hesperostipa comata*, *Leymus flavescens*, *Muhlenbergia pungens*, *Psoralidium lanceolatum*, *Purshia tridentata*, *Redfieldia flexuosa*, *Sporobolus airoides*, *Sarcobatus vermiculatus*, *Tetradymia tetrameres*, or *Tiquilia* spp. Herbaceous species such as *Achnatherum hymenoides*, *Redfieldia flexuosa*, and *Psoralidium lanceolatum* are characteristic of early-seral vegetation through much of this system's range. Shrubs are commonly dominant on mid- to late-seral stands, and *Ericameria nauseosa* can be found at any stage.

Classification Comments: Rules should be devised for deciding whether shrub or shrub-steppe vegetation on completely stabilized dunes should be considered part of this active and stabilized dune system, or part of another system. The areas include Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784), Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777), and Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) on sand, and Inter-Mountain Basins Greasewood Flat (CES304.780) on clay and silt.

Similar Ecological Systems:

- Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)--some areas appear to be small stabilized dune fields or isolated dunes.
- Southern Colorado Plateau Sand Shrubland (CES304.793)

DESCRIPTION

Vegetation: Vegetation is absent or sparse on active dunes, but canopy cover may be as much as 30% on stable dunes and sandsheets. Species are often adapted to shifting, coarse-textured substrates (usually quartz sand) and form patchy or open grasslands, shrublands or steppe, and occasionally woodlands. Characteristic taxa include *Achnatherum hymenoides*, *Artemisia filifolia*, *Artemisia tridentata* ssp. *tridentata*, *Atriplex canescens*, *Ephedra* spp., *Chrysothamnus viscidiflorus*, *Coleogyne ramosissima*, *Ericameria nauseosa*, *Hesperostipa comata*, *Leymus flavescens*, *Muhlenbergia pungens*, *Psoralidium lanceolatum*, *Purshia tridentata*, *Redfieldia flexuosa*, *Sporobolus airoides*, *Sarcobatus vermiculatus*, *Tetradymia tetrameres*, or *Tiquilia* spp. Herbaceous species such as *Achnatherum hymenoides*, *Redfieldia flexuosa*, and *Psoralidium lanceolatum* are characteristic of early-seral vegetation throughout much of this system's range. In the Centennial Valley of southwestern Montana, where the dunes are more stable, *Artemisia tridentata* ssp. *tridentata* and *Artemisia tripartita* ssp. *tripartita* contribute a moderate amount of cover and are associated with *Hesperostipa comata* or *Festuca idahoensis* (in more mesic settings). Early- and mid-seral shrub communities in these dunes are dominated by *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Purshia tridentata*, and *Hesperostipa comata*. Several rare plant species occur in the Centennial Valley dunes and are associated with early-successional stages. These dunes are very similar to the St. Anthony dunes in Idaho. In the Killpecker Dunes in west-central Wyoming, *Artemisia tridentata* ssp. *tridentata* dominates late-seral vegetation and *Ericameria nauseosa* dominates mid-seral vegetation (Jones 2005). The Great Sand Dunes in southern Colorado consist of an active dune field surrounded by a stabilized sandsheet dominated *Ericameria nauseosa*, *Sarcobatus vermiculatus*, or *Pinus ponderosa* (on a sand ramp). The stabilized areas are periodically disturbed by parabolic dunes tracking across them from blowouts caused by fire or drought (Marin et al. 2005).

Dynamics: Periodic drought influences dune migration rates by reducing vegetation cover that anchors dunes (Marin 2005, Forman et al. 2006). A typical primary successional sere on sands appears to be as follows: bare sand or sparse herbaceous vegetation on migrating sand, denser herbaceous vegetation or shrub stands of *Ericameria nauseosa* or *Ericameria nauseosa* (= *Chrysothamnus nauseosus*) on anchored or recently stabilized sand, and shrub vegetation of *Artemisia tridentata* on longer-stabilized sands.

MEMBERSHIP

Associations:

- *Achnatherum hymenoides* - *Psoralegium lanceolatum* Herbaceous Vegetation (CEGL001650, G3Q)
- *Achnatherum hymenoides* - *Sporobolus contractus* Herbaceous Vegetation (CEGL001652, G2G4)
- *Artemisia filifolia* - *Ephedra (torreyana, viridis)* Shrubland (CEGL002786, GNR)
- *Artemisia filifolia* Colorado Plateau Shrubland (CEGL002697, GNR)
- *Atriplex canescens* - *Ephedra viridis* Shrubland (CEGL003828, GNR)
- *Elymus lanceolatus* - *Phacelia hastata* Herbaceous Vegetation (CEGL001745, G2)
- *Ephedra cutleri* Shrubland [Provisional] (CEGL005804, GNR)
- *Ephedra torreyana* - *Achnatherum hymenoides* Hummock Shrubland (CEGL005802, GNR)
- *Ephedra torreyana* / *Achnatherum hymenoides* - *Pleuraphis jamesii* Shrubland (CEGL002352, GNR)
- *Ephedra viridis* / (*Achnatherum hymenoides*, *Hesperostipa comata*) Shrubland (CEGL002354, GNR)
- *Ephedra viridis* / *Pleuraphis jamesii* Shrubland (CEGL002356, GNR)
- *Ericameria nauseosa* / *Leymus flavescens* / *Psoralegium lanceolatum* Shrubland (CEGL001329, G1?)
- *Ericameria nauseosa* Sand Deposit Sparse Shrubland (CEGL002980, GNR)
- *Eriogonum leptocladon* Sparse Vegetation (CEGL002822, GNR)
- *Leymus flavescens* Herbaceous Vegetation (CEGL001563, G2)
- *Muhlenbergia pungens* Herbaceous Vegetation (CEGL002363, GNR)
- *Pinus ponderosa* / *Achnatherum hymenoides* Sparse Vegetation (CEGL001490, G1)
- *Poliomintha incana* - *Artemisia filifolia* - *Vancleavea stylosa* Shrubland (CEGL002418, GNR)
- *Populus angustifolia* Sand Dune Forest (CEGL002643, G1)
- *Psoralegium polydenius* var. *polydenius* / *Achnatherum hymenoides* Shrubland (CEGL001353, G3G4)
- *Purshia tridentata* - *Artemisia tridentata* ssp. *tridentata* Shrubland (CEGL001054, G1)
- *Purshia tridentata* - *Ericameria nauseosa* Shrubland (CEGL001056, G1)
- *Purshia tridentata* / *Achnatherum hymenoides* Shrubland (CEGL001058, G1)
- *Purshia tridentata* / *Prunus virginiana* Shrubland (CEGL001060, G1?)
- *Quercus havardii* var. *tuckeri* Shrubland (CEGL002486, GNR)
- Redbeds (Siltstone, Sandstone, Gypsum) Sparse Vegetation (CEGL005261, GNR)
- *Redfieldia flexuosa* - (*Psoralegium lanceolatum*) Herbaceous Vegetation (CEGL002917, G1?)
- *Sarcobatus vermiculatus* Dune Shrubland (CEGL001364, G5?)
- *Tetradymia tetrameres* Dune Sparse Vegetation (CEGL002759, G3Q)

Alliances:

- *Achnatherum hymenoides* Herbaceous Alliance (A.1262)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Elymus lanceolatus* Herbaceous Alliance (A.1242)
- *Ephedra cutleri* Shrubland Alliance [Provisional] (A.2644)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Leymus flavescens* Herbaceous Alliance (A.1237)
- *Muhlenbergia pungens* Herbaceous Alliance (A.2652)
- Painted Desert Sparsely Vegetated Alliance (A.2545)
- *Pinus ponderosa* Sparsely Vegetated Alliance (A.1859)
- *Poliomintha incana* Shrubland Alliance (A.862)
- *Populus angustifolia* Temporarily Flooded Forest Alliance (A.310)
- *Psoralegium polydenius* Shrubland Alliance (A.1039)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Quercus havardii* var. *tuckeri* Shrubland Alliance (A.2654)
- *Redfieldia flexuosa* Herbaceous Alliance (A.2505)
- Rock Outcrop Sparsely Vegetated Alliance (A.1838)
- *Sarcobatus vermiculatus* Shrubland Alliance (A.1041)
- *Tetradymia tetrameres* Sparsely Vegetated Alliance (A.2525)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)

DISTRIBUTION

Range: This system occurs in intermountain basins of the western U.S. including southwestern Montana in the Centennial Valley.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 7:P, 8:P, 9:C, 12:P, 13:?, 15:?, 16:C, 17:C, 18:C, 19:C, 20:?, 21:C, 22:C, 23:C, 24:C, 25:C, 27:?, 28:C, 29:?, 33:P
USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315H:CC, 321A:PP, 322A:??, 331F:CC, 331G:CC, 331J:CC, 341A:CC, 341B:CC, 341D:C?, 341E:CC, 341F:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342H:CC, M242C:??, M261G:PP, M313A:CP, M313B:CC, M331A:CC, M331F:CC, M331G:CC, M331H:C?, M331I:CC, M332E:CC, M332G:CC, M341D:??
TNC Ecoregions: 6:C, 8:C, 10:C, 11:C, 19:C

SOURCES

References: Anderson 1999a, Bowers 1982, Caicco and Wellner 1983e, Chadwick and Dalke 1965, Comer et al. 2003, Forman et al. 2006, Fryberger et al. 1990, Hallock et al. 2007, Jones 2006, Knight 1994, Marin et al. 2005, Pineada et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722897#references

Description Author: K.A. Schulz, mod. M.S. Reid and G.P. Jones

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

INTER-MOUNTAIN BASINS CLIFF AND CANYON (CES304.779)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades; Cliff (Landform)

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Rockfall avalanche; Ridge/Summit/Upper Slope; Sideslope; Toeslope/Valley Bottom; Sedimentary Rock; Metamorphic Rock; Igneous Rock; Temperate [Temperate Continental]; Very Shallow Soil; Canyon

National Mapping Codes: ESLF 3173

CONCEPT

Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included is vegetation of unstable scree and talus slopes that typically occurs below cliff faces. Widely scattered trees and shrubs may include *Abies concolor*, *Pinus edulis*, *Pinus flexilis*, *Pinus monophylla*, *Juniperus* spp., *Artemisia tridentata*, *Purshia tridentata*, *Cercocarpus ledifolius*, *Ephedra* spp., *Holodiscus discolor*, and other species often common in adjacent plant communities.

Similar Ecological Systems:

- Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765)

MEMBERSHIP

Associations:

- *Cercocarpus intricatus* Montane Shrubland (CEGL002587, GNR)
- *Cercocarpus intricatus* Slickrock Sparse Vegetation (CEGL002977, GNR)
- *Cercocarpus montanus* Rock Pavement Sparse Vegetation (CEGL002978, GNR)
- *Chrysothamnus viscidiflorus* Talus Shrubland (CEGL002347, GNR)
- *Crataegus rivularis* Shrubland (CEGL002889, G2Q)
- *Glossopetalon spinescens* var. *aridum* / *Pseudoroegneria spicata* Shrubland (CEGL001100, G4)
- *Juniperus osteosperma* / *Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Leymus salinus* Shale Sparse Vegetation (CEGL002745, GNR)
- *Pinus monophylla* - *Juniperus osteosperma* / Sparse Understory Woodland (CEGL000829, G5)
- *Pinus ponderosa* Slickrock Sparse Vegetation (CEGL002972, GNR)

Alliances:

- *Cercocarpus intricatus* Shrubland Alliance (A.2659)
- *Cercocarpus intricatus* Sparsely Vegetated Alliance (A.2543)
- *Cercocarpus montanus* Sparsely Vegetated Alliance (A.2544)
- *Chrysothamnus viscidiflorus* Shrubland Alliance (A.2651)
- *Crataegus rivularis* Temporarily Flooded Shrubland Alliance (A.2597)
- *Glossopetalon spinescens* Shrubland Alliance (A.1032)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Leymus salinus* Sparsely Vegetated Alliance (A.1258)
- *Pinus monophylla* - (*Juniperus osteosperma*) Woodland Alliance (A.543)
- Wooded Bedrock Sparsely Vegetated Alliance (A.2546)

DISTRIBUTION

Divisions: 304:C

Nations: US

Subnations: CA, ID, NV, OR, UT, WA, WY

Map Zones: 1:C, 6:?, 7:P, 8:C, 9:C, 10:P, 12:C, 13:C, 16:C, 17:C, 18:P, 21:P, 22:C, 23:?, 24:?

USFS Ecomap Regions: 322A:CC, 331A:CC, 331G:CP, 341A:CC, 341C:C?, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:??, M331A:CC, M331B:CC, M331D:CC, M331E:CP, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:C?, M332G:CC, M333A:CC, M333D:C?, M341A:CC, M341B:C?, M341C:C?, M341D:CC

TNC Ecoregions: 4:?, 6:C, 11:C, 18:C

SOURCES

References: Comer et al. 2003, Knight 1994

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722893#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

INTER-MOUNTAIN BASINS PLAYA (CES304.786)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Alkaline Water; Saline Water Chemistry; Caliche Layer; Impermeable Layer; Intermittent Flooding; Lowland [Lowland]; Playa; Temperate [Temperate Xeric]; Depressional; Alkaline Soil; Saline Substrate Chemistry; Aridic

Non-Diagnostic Classifiers: Clay Subsoil Texture; Shrubland (Shrub-dominated); Herbaceous; Isolated Wetland [Partially Isolated]; Dwarf-Shrub; Forb; Graminoid

National Mapping Codes: ESLF 3179

CONCEPT

Summary: This ecological system is composed of barren and sparsely vegetated playas (generally <10% plant cover) found in the intermountain western U.S. Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. These systems are intermittently flooded. The water is prevented from percolating through the soil by an impermeable soil subhorizon and is left to evaporate. Soil salinity varies greatly with soil moisture and greatly affects species composition.

Characteristic species may include *Allenrolfea occidentalis*, *Sarcobatus vermiculatus*, *Grayia spinosa*, *Puccinellia lemmonii*, *Leymus cinereus*, *Distichlis spicata*, and/or *Atriplex* spp.

Classification Comments: Bjork (1997) refers to these as vernal lakes in Washington; his one example was ditched and may be artificial. There might have been these in Grand Coulee prior to Columbia Basin irrigation project.

DESCRIPTION

Dynamics: Playas are shallow, seasonal wetlands that lie in the lowest point of a closed watershed. Their basins are lined with clay soils, which collect and hold water from rainfall and runoff events. Water evaporates, leaving high salt concentrations in the soils. Some playas will only flood with water during years with high precipitation, sometimes only once or twice in a decade. Others will have standing water every spring, except in the driest of years. During flooded years, some salt-tolerant marsh plant species may grow, such as cattails (*Typha* spp.) or bulrush (*Scirpus* spp.).

MEMBERSHIP

Associations:

- (*Sarcocornia utahensis*) - (*Arthrocnemum subterminale*) Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003120, GNR)
- *Allenrolfea occidentalis* / *Atriplex gardneri* Shrubland (CEGL000989, G4?)
- *Allenrolfea occidentalis* Shrubland (CEGL000988, G3)
- *Artemisia papposa* / *Danthonia californica* - *Festuca idahoensis* Shrubland (CEGL002991, GNR)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Chrysothamnus albidus* / *Puccinellia nuttalliana* Shrubland (CEGL001328, G3)
- *Distichlis spicata* - (*Scirpus nevadensis*) Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata* - *Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* - Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Krascheninnikovia lanata* / *Poa secunda* Dwarf-shrubland (CEGL001326, G3)
- *Leymus cinereus* - *Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Leymus cinereus* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001483, G3Q)
- *Leymus cinereus* Bottomland Herbaceous Vegetation (CEGL001480, G1)
- *Leymus triticoides* - *Poa secunda* Herbaceous Vegetation (CEGL001572, G2)
- *Leymus triticoides* Herbaceous Vegetation (CEGL001571, G4?)
- *Pluchea sericea* Seasonally Flooded Shrubland (CEGL003080, G3?)
- *Poa secunda* - *Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002755, GNR)
- *Puccinellia lemmonii* - *Poa secunda* Seasonally Flooded Herbaceous Vegetation (CEGL001658, G1)
- *Sarcobatus vermiculatus* - *Atriplex parryi* / *Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus* - *Psoralea polydenius* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus* / *Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus* / *Artemisia tridentata* Shrubland (CEGL001359, G4)
- *Sarcobatus vermiculatus* / *Atriplex confertifolia* - (*Picrothamnus desertorum*, *Suaeda moquinii*) Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus* / *Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus* / *Distichlis spicata* Shrubland (CEGL001363, G4)
- *Sarcobatus vermiculatus* / *Elymus elymoides* - *Pascopyrum smithii* Shrubland (CEGL001365, G2?)

- *Sarcobatus vermiculatus* / *Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus* / *Ericameria nauseosa* Shrubland (CEGL001362, G5)
- *Sarcobatus vermiculatus* / *Leymus cinereus* Shrubland (CEGL001366, G3)
- *Sarcobatus vermiculatus* / *Nitrophila occidentalis* - *Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Sarcobatus vermiculatus* / *Sporobolus airoides* Shrubland (CEGL001368, G3?)
- *Sarcobatus vermiculatus* Disturbed Shrubland (CEGL001357, G5)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Sporobolus airoides* - *Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Suaeda moquinii* Shrubland (CEGL001991, G5)

Alliances:

- (*Sarcocornia utahensis*) - (*Arthrocnemum subterminale*) Semipermanently Flooded Herbaceous Alliance (A.1676)
- *Allenrolfea occidentalis* Shrubland Alliance (A.866)
- *Artemisia papposa* Shrubland Alliance (A.2551)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Chrysothamnus albidus* Shrubland Alliance (A.834)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Leymus triticoides* Temporarily Flooded Herbaceous Alliance (A.1353)
- *Pluchea sericea* Seasonally Flooded Shrubland Alliance (A.798)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)
- *Suaeda moquinii* Intermittently Flooded Shrubland Alliance (A.941)

DISTRIBUTION

Range: This system occurs throughout the Intermountain western U.S., extending east into the southwestern Great Plains.

Divisions: 304:C

Nations: US

Subnations: CA, CO, ID, NM, NV, OR, UT, WA?, WY

Map Zones: 6:?, 7:P, 8:P, 9:C, 12:C, 13:P, 15:?, 16:P, 17:C, 18:C, 19:?, 21:?, 22:P, 23:P, 24:C, 25:?, 28:P

USFS Ecomap Regions: 313A:CP, 313B:CP, 313D:CC, 322A:??, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:CC, M242C:CC, M261D:P?, M261G:PP, M313A:CC, M331D:??, M331E:??, M332G:CC, M341A:CC, M341B:C?, M341D:CC

TNC Ecoregions: 6:C, 10:C, 11:C, 19:C

SOURCES

References: Bjork 1997, Comer et al. 2003, Knight 1994, Nachlinger et al. 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722886#references

Description Author: NatureServe Western Ecology Team

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

INTER-MOUNTAIN BASINS SHALE BADLAND (CES304.789)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Badland; Badlands; Alkaline Soil; Shale and Mudstone; Silt Soil Texture; Clay Soil Texture

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Temperate [Temperate Continental]; Aridic; Very Short Disturbance Interval; Broad-Leaved Shrub; Dwarf-Shrub; Semi-Shrub

National Mapping Codes: ESLF 3139

CONCEPT

Summary: This widespread ecological system of the Intermountain western U.S. is composed of barren and sparsely vegetated substrates (<10% plant cover) typically derived from marine shales but also includes substrates derived from siltstones and mudstones (clay). In southern Wyoming, the shales are not marine in origin, but often have bentonite, derived from volcanic ash deposition that occurred during several eruptions of the Yellowstone volcanic fields. Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs, e.g., *Atriplex corrugata*, *Atriplex gardneri*, *Artemisia pedatifida*, and herbaceous vegetation.

Classification Comments: Exactly where this transitions to Western Great Plains Badlands (CES303.663) in central Wyoming needs to be clarified.

Similar Ecological Systems:

- Columbia Plateau Ash and Tuff Badland (CES304.081)

MEMBERSHIP

Associations:

- *Achnatherum hymenoides* Shale Barren Herbaceous Vegetation (CEGL001651, G2)
- *Artemisia arbuscula ssp. longiloba* / Cushion Plants Shrubland (CEGL005996, GNR)
- *Artemisia arbuscula ssp. longiloba* / *Elymus lanceolatus* Shrubland (CEGL002585, GNR)
- *Artemisia arbuscula ssp. longiloba* / *Poa fendleriana* Shrubland (CEGL005997, GNR)
- *Artemisia bigelovii* / *Achnatherum hymenoides* Shrubland (CEGL000990, G3Q)
- *Artemisia pygmaea* / *Elymus elymoides* - *Achnatherum hymenoides* Shrubland (CEGL001436, G3G4)
- *Atriplex confertifolia* Sparse Shrubland (CEGL003830, GNR)
- *Atriplex corrugata* Dwarf-shrubland (CEGL001437, G5)
- *Atriplex cuneata* - *Frankenia jamesii* / *Sporobolus airoides* Shrubland (CEGL001316, G1?)
- *Atriplex gardneri* / *Achnatherum hymenoides* Dwarf-shrubland (CEGL001444, G3)
- *Atriplex gardneri* / *Leymus salinus* Dwarf-shrubland (CEGL001442, G2?)
- *Atriplex gardneri* / *Pleuraphis jamesii* Dwarf-shrubland (CEGL001441, G3G5)
- *Atriplex gardneri* / *Xylorhiza venusta* Dwarf-shrubland (CEGL001446, G3G5)
- *Atriplex gardneri* Dwarf-shrubland (CEGL001438, G3G5)
- *Atriplex obovata* Badland Sparse Vegetation (CEGL002928, GNR)
- *Atriplex obovata* Dwarf-shrubland [Placeholder] (CEGL001789, GNR)
- *Atriplex* spp. Desert Pavement Sparse Vegetation (CEGL003767, GNR)
- *Ephedra nevadensis* / Lichens Sparse Vegetation [Provisional] (CEGL002976, GNR)
- *Ephedra torreyana* - (*Atriplex* spp.) / Nonvascular Gypsum Sparse Vegetation (CEGL002349, GNR)
- *Ephedra torreyana* Sparse Vegetation (CEGL002353, GNR)
- *Ericameria nauseosa* Sparse Shrubland (CEGL003961, GNR)
- *Eriogonum brevicaule* - Cushion Plants Sparse Vegetation [Provisional] (CEGL005319, GNR)
- *Eriogonum corymbosum* / *Leymus salinus* Dwarf-shrubland (CEGL001343, G2G4)
- *Eriogonum corymbosum* Badlands Sparse Vegetation (CEGL002979, GNR)
- *Eriogonum leptophyllum* Sparse Vegetation (CEGL004013, GNR)
- *Leymus salinus* Shale Sparse Vegetation (CEGL002745, GNR)
- *Pseudoroegneria spicata* - *Eriogonum brevicaule* Sparse Vegetation (CEGL001667, G3?)
- *Zuckia brandegeei* Sparse Vegetation (CEGL002493, GNR)

Alliances:

- *Achnatherum hymenoides* Herbaceous Alliance (A.1262)
- *Artemisia arbuscula ssp. longiloba* Shrubland Alliance (A.2549)
- *Artemisia bigelovii* Shrubland Alliance (A.1103)
- *Artemisia pygmaea* Shrubland Alliance (A.1106)

- *Atriplex confertifolia* Shrubland Alliance (A.870)
- *Atriplex corrugata* Dwarf-shrubland Alliance (A.1109)
- *Atriplex cuneata* Shrubland Alliance (A.871)
- *Atriplex gardneri* Dwarf-shrubland Alliance (A.1110)
- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Ephedra torreyana* Sparsely Vegetated Alliance (A.2571)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Eriogonum (corymbosum, leptocladon)* Dwarf-shrubland Alliance (A.1126)
- *Leymus salinus* Sparsely Vegetated Alliance (A.1258)
- Painted Desert Sparsely Vegetated Alliance (A.2545)
- *Pseudoroegneria spicata* - Cushion Plants Sparsely Vegetated Alliance (A.1876)
- *Zuckia brandegeei* Sparse Vegetation Alliance (A.2653)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765)

DISTRIBUTION

Range: This system is found in the Intermountain western U.S., from Arizona and New Mexico north to Idaho and Montana. It is confirmed by Oregon and Washington reviewers to not occur in either of those states.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CA, CO, ID, MT, NM, NV, UT, WY

Map Zones: 8:?, 9:C, 12:?, 13:P, 15:?, 16:C, 17:P, 18:P, 21:?, 22:C, 23:C, 24:C, 25:P, 27:?, 28:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315H:CC, 322A:??, 331F:CC, 331G:CC, 331I:C?, 331J:CP, 341A:CP, 341B:CC, 341C:CC, 342A:CC, 342B:C?, 342C:CP, 342D:CC, 342F:CC, 342G:CC, 342H:CC, 342I:C?, 342J:C?, M261D:??, M313A:PP, M313B:PP, M331B:C?, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CP, M334A:CC, M341B:CC, M341C:CC

TNC Ecoregions: 6:P, 9:C, 10:C, 11:C, 12:?, 18:C, 19:C, 20:C, 21:C

SOURCES

References: Comer et al. 2003, DeVelice and Lesica 1993, Knight 1994, Knight et al. 1987

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722883#references

Description Author: NatureServe Western Ecology Team

Version: 29 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

INTER-MOUNTAIN BASINS VOLCANIC ROCK AND CINDER LAND (CES304.791)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lava flow (undifferentiated); Lava; Cinder; Basalt; Temperate [Temperate Continental]; Cinder cone

Non-Diagnostic Classifiers: Montane; Lowland; Shrubland (Shrub-dominated); Herbaceous; Dune (Substrate); Igneous Rock; Very Shallow Soil; Sand Soil Texture; Aridic; W-Landscape/Medium Intensity

National Mapping Codes: ESLF 3128

CONCEPT

Summary: This ecological system occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates (generally <10% plant cover) such as basalt lava (malpais), basalt dikes with associated colluvium, basalt cliff faces and uplifted "backbones," tuff, cinder cones or cinder fields. It may occur as large-patch, small-patch and linear (dikes) spatial patterns. Vegetation is variable and includes a variety of species depending on local environmental conditions, e.g., elevation, age and type of substrate. At montane and foothill elevations scattered *Pinus ponderosa*, *Pinus flexilis*, or *Juniperus* spp. trees may be present. Shrubs such as *Ephedra* spp., *Atriplex canescens*, *Eriogonum corymbosum*, *Eriogonum ovalifolium*, and *Fallugia paradoxa* are often present on some lava flows and cinder fields. Species typical of sand dunes such as *Andropogon hallii* and *Artemisia filifolia* may be present on cinder substrates.

DESCRIPTION

Dynamics: This ecological system is relatively young (geologically speaking). Lichens are the primary erosion process in this system, and therefore, soil buildup is a slow process. Lichens are susceptible to changes in air quality (Brodo et. al. 2001) and are considered a good indicator of air quality.

MEMBERSHIP

Associations:

- *Andropogon hallii* Colorado Plateau Herbaceous Vegetation (CEGL002785, GNR)
- *Artemisia filifolia* - *Ephedra (torreyana, viridis)* Shrubland (CEGL002786, GNR)
- *Artemisia tridentata ssp. vaseyana* / *Poa secunda* Shrubland (CEGL001029, G3)
- *Ephedra nevadensis* Basalt Shrubland [Provisional] (CEGL002936, GNR)
- *Eriogonum corymbosum* Cinder Sparse Vegetation (CEGL005803, GNR)
- *Eriogonum fasciculatum* Rock Outcrop Shrubland (CEGL001260, G5?)
- *Eriogonum ovalifolium var. depressum* Dwarf-shrubland (CEGL001401, G1)
- *Fallugia paradoxa* - (*Atriplex canescens*, *Ephedra torreyana*) Cinder Shrubland (CEGL005806, GNR)
- *Juniperus monosperma* Cinder Wooded Herbaceous Vegetation (CEGL005807, GNR)
- *Pinus flexilis* / *Purshia tridentata* Woodland (CEGL000814, G1?)
- *Pinus ponderosa* - (*Populus tremuloides*) / *Fallugia paradoxa* - (*Holodiscus dumosus*) Lava Bed Sparse Vegetation (CEGL002929, GNR)
- *Pinus ponderosa* / *Andropogon hallii* Woodland (CEGL005808, GNR)
- *Pinus ponderosa* / Cinder Woodland (CEGL002998, GNR)
- *Purshia tridentata* / *Pseudoroegneria spicata* - *Leymus cinereus* Shrub Herbaceous Vegetation (CEGL001497, G1?)
- *Tiquilia latior* / *Sporobolus airoides* Dwarf-shrubland [Provisional] (CEGL005809, GNR)

Alliances:

- Aa Lava Bed Sparsely Vegetated Alliance (A.2569)
- *Andropogon hallii* Herbaceous Alliance (A.1193)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Artemisia tridentata ssp. vaseyana* Shrubland Alliance (A.831)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Eriogonum corymbosum* Sparsely Vegetated Alliance (A.2573)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)
- *Eriogonum ovalifolium var. depressum* Dwarf-shrubland Alliance (A.1082)
- *Fallugia paradoxa* Shrubland Alliance (A.2575)
- *Juniperus monosperma* Wooded Herbaceous Alliance (A.2576)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Purshia tridentata* Shrub Tall Herbaceous Alliance (A.1517)
- *Tiquilia hispidissima* Dwarf-shrubland Alliance (A.1101)

DISTRIBUTION

Range: This system occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates. It occurs in Montana along the Rocky Mountain Front (east of the Continental Divide).

Divisions: 304:C

Nations: US

Subnations: AZ, ID, MT, NM, NV, OR, UT, WY

Map Zones: 7:?, 8:?, 9:C, 10:C, 12:P, 13:P, 15:P, 16:C, 17:C, 18:C, 19:C, 20:C, 23:C, 24:C, 25:P, 27:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315H:CC, 322A:PP, 331B:CC, 331D:CP, 331J:CC, 341A:CC, 341B:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342J:CP, M242C:PP, M313A:CC, M331A:C?, M331F:CC, M331G:C?, M332D:CC, M332F:CC, M332G:CC, M341C:CC

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C

SOURCES

References: Barbour and Billings 2000, Brodo et al. 2001, Comer et al. 2003, Day and Wright 1985, Hansen et al. 2004c, Tisdale et al. 1965

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722881#references

Description Author: NatureServe Western Ecology Team

Version: 23 Jan 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: West

ClassifResp: West

INTER-MOUNTAIN BASINS WASH (CES304.781)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Wash; Toeslope/Valley Bottom; Riverine / Alluvial; Alkaline Soil; Xeromorphic Shrub; *Sarcobatus vermiculatus*

Non-Diagnostic Classifiers: Deep (>15 cm) Water; Temperate [Temperate Continental]; Saline Substrate Chemistry

National Mapping Codes: ESLF 3152

CONCEPT

Summary: This barren and sparsely vegetated (generally <10% plant cover) ecological system is restricted to intermittently flooded streambeds and banks that are often lined with shrubs such as *Sarcobatus vermiculatus*, *Ericameria nauseosa*, *Fallugia paradoxa*, *Artemisia tridentata ssp. tridentata*, and/or *Artemisia cana ssp. cana* (in more northern and mesic stands) that form relatively dense stringers in open dry uplands. *Grayia spinosa* may dominate in the Great Basin. Shrubs form a continuous or intermittent linear canopy in and along drainages but do not extend out into flats. Typically it includes patches of saltgrass meadow where water remains for the longest periods. In parts of Wyoming, stringers or patches of *Artemisia tridentata ssp. tridentata* are large and distinct enough from surrounding upland vegetation due to the influence of the wash that they can be classified separately. However, small intermittent washes may also be included with adjacent uplands if vegetation is not different enough floristically or structurally from uplands (e.g., just a little denser canopy). Soils are variable but are generally less alkaline than those found in the playa system. Desert scrub species (e.g., *Acacia greggii*, *Prosopis* spp.) that are common in the Mojave, Sonoran and Chihuahuan desert washes are not present. This type can occur in limited portions of the southwestern Great Plains.

Classification Comments: Where the stringers or patches of *Artemisia tridentata ssp. tridentata* are large enough to be mapped separately from both the wash and from the adjacent upland, then they should be mapped as Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777) or Inter-Mountain Basins Big Sagebrush Steppe (CES304.778). Compare this wash system with Inter-Mountain Basins Greasewood Flat (CES304.780); the wash should be restricted to the periphery of the wash and distinct from adjacent vegetation. If not, consider including with greasewood flat. Invasive, exotic shrubs shrub as *Tamarix* spp. or *Chamaebatiaria millefolium* may be present to dominant in these washes where disturbed.

Similar Ecological Systems:

- Inter-Mountain Basins Greasewood Flat (CES304.780)

Related Concepts:

- Riparian (422) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Allenrolfea occidentalis* Shrubland (CEGL000988, G3)
- *Artemisia tridentata ssp. tridentata* / *Sporobolus cryptandrus* Shrubland (CEGL003826, GNR)
- *Atriplex canescens* Desert Wash Shrubland (CEGL003470, GNR)
- *Distichlis spicata* - (*Scirpus nevadensis*) Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata* - *Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* - Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Ericameria nauseosa* / *Bromus tectorum* Semi-natural Shrubland (CEGL002937, GNA)
- *Ericameria nauseosa* Desert Wash Shrubland (CEGL002261, GNR)
- *Fraxinus anomala* Woodland (CEGL002752, GUQ)
- *Grayia spinosa* / *Poa secunda* Shrubland (CEGL001351, G1)
- *Hordeum brachyantherum* Herbaceous Vegetation (CEGL003430, G2)
- *Leymus cinereus* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001483, G3Q)
- *Sarcobatus vermiculatus* - *Atriplex parryi* / *Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus* - *Psoralea polydenius* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus* / *Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus* / *Atriplex confertifolia* - (*Picrothamnus desertorum*, *Suaeda moquinii*) Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus* / *Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus* / *Distichlis spicata* Shrubland (CEGL001363, G4)
- *Sarcobatus vermiculatus* / *Elymus elymoides* - *Pascopyrum smithii* Shrubland (CEGL001365, G2?)
- *Sarcobatus vermiculatus* / *Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus* / *Ericameria nauseosa* Shrubland (CEGL001362, G5)
- *Sarcobatus vermiculatus* / *Leymus cinereus* Shrubland (CEGL001366, G3)

- *Sarcobatus vermiculatus* / *Nitrophila occidentalis* - *Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Sarcobatus vermiculatus* / *Sporobolus airoides* Shrubland (CEGL001368, G3?)
- *Sarcobatus vermiculatus* / *Suaeda moquinii* Shrubland (CEGL001370, GUQ)
- *Sarcobatus vermiculatus* Disturbed Shrubland (CEGL001357, G5)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)

Alliances:

- *Allenrolfea occidentalis* Shrubland Alliance (A.866)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Fraxinus anomala* Temporarily Flooded Woodland Alliance (A.2511)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Hordeum brachyantherum* Temporarily Flooded Herbaceous Alliance (A.2585)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)

DISTRIBUTION

Range: This system occurs throughout the Intermountain western U.S. extending east into the western Great Plains.

Divisions: 303:C; 304:C; 306:C

Nations: US

Subnations: AZ, CA, CO, ID, MT, NV, OR, UT, WA, WY

Map Zones: 8:?, 9:?, 12:C, 16:C, 17:C, 18:?, 22:?, 23:C, 24:C, 25:C, 27:P, 28:?, 29:?, 33:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315H:PP, 331B:CC, 331H:C?, 331I:CC, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342E:CC, 342F:CC, 342G:CC, M313A:CC, M313B:CP, M331I:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C

SOURCES

References: Comer et al. 2003, Knight 1994, West 1983b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722891#references

Description Author: K.A. Schulz

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

KLAMATH-SISKIYOU CLIFF AND OUTCROP (CES206.902)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Moss/Lichen (Nonvascular); Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Mediterranean [Mediterranean Xeric-Oceanic]

Non-Diagnostic Classifiers: Canyon Mosaic; Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Canyon; Cliff (Landform)

National Mapping Codes: ESLF 3170

CONCEPT

Summary: Found from foothill to subalpine elevations of the Klamath Range, these are barren and sparsely vegetated landscapes (<10% plant cover) of steep cliff faces, bald ridgetops and shoulder outcrops, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock. Vegetative cover is dominated by forbs, grasses, mosses, or lichens. This also includes unstable scree and talus slopes typically occurring below cliff faces. Scattered vegetation may include *Pseudotsuga menziesii* and *Acer macrophyllum* along with herbaceous and nonvascular species such as *Achnatherum lemmonii* (= *Stipa lemmonii*), *Achnatherum occidentale* (= *Stipa occidentalis*), *Elymus elymoides* (= *Sitanion hystris*), *Sedum oregonense*, and *Racomitrium ericoides* (= *Racomitrium canescens* var. *ericoides*). Soil development is limited as is herbaceous cover.

DISTRIBUTION

Range: Found from foothill to subalpine elevations of the Klamath Range.

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 7:C

USFS Ecomap Regions: M242A:??, M261A:CC, M261B:CC

TNC Ecoregions: 5:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722779#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

LAURENTIAN-ACADIAN ACIDIC CLIFF AND TALUS (CES201.569)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Cliff (Substrate); Talus (Substrate); Acidic Soil; Landslide

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane; Lowland; Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Glaciated; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]

National Mapping Codes: ESLF 3188

CONCEPT

Summary: This cliff system occurs at low to mid elevations, well below treeline, from New England west to the Great Lakes. It consists of vertical or near-vertical cliffs and the talus slopes below, formed on hills of granitic or otherwise acidic bedrock. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be more well-developed and floristically different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees (e.g., *Betula* and *Picea* spp.). Calciphilic species are absent. In north-facing or other sheltered settings where cold air accumulates at the bottom of slopes, a shrubland of heaths and reindeer lichens can develop. This system differs from the more southerly North-Central Appalachian Acidic Cliff and Talus (CES202.601) in the more boreal affinities of its flora, for example *Picea* spp. rather than *Juniperus virginiana*.

Similar Ecological Systems:

- North-Central Appalachian Acidic Cliff and Talus (CES202.601)

MEMBERSHIP

Associations:

- *Acer spicatum* - *Thuja occidentalis* - *Betula papyrifera* / *Taxus canadensis* Shrubland (CEGL005251, GNR)
- Basalt - Diabase Northern Open Talus Sparse Vegetation (CEGL005247, GNR)
- *Betula alleghaniensis* - *Quercus rubra* / *Polypodium virginianum* Woodland (CEGL006320, G3G5)
- *Betula papyrifera* - *Picea glauca* / *Acer spicatum* - *Alnus viridis* / *Polypodium virginianum* Talus Shrubland [Provisional] (CEGL005252, GNR)
- *Drosera rotundifolia* - *Viola* spp. Cliff Sparse Vegetation (CEGL006429, GNR)
- Granite - Metamorphic Talus Northern Sparse Vegetation (CEGL002409, G4G5)
- Igneous - Metamorphic Northern Dry Cliff Sparse Vegetation (CEGL002300, GNR)
- *Picea mariana* / *Ledum groenlandicum* - *Empetrum nigrum* / *Cladina* spp. Dwarf-shrubland (CEGL006268, G3G5)
- *Picea rubens* / *Ribes glandulosum* Woodland (CEGL006250, G3G5)
- *Polypodium (virginianum, appalachianum)* / Lichens Nonvascular Vegetation (CEGL006534, GNR)
- *Polypodium (virginianum, appalachianum)* Cliff Sparse Vegetation (CEGL006528, GNR)
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045, G4G5)
- Sandstone Midwest Moist Cliff Sparse Vegetation (CEGL002287, G4G5)

Alliances:

- *Acer spicatum* Shrubland Alliance (A.3508)
- *Kalmia angustifolia* - *Ledum groenlandicum* Dwarf-shrubland Alliance (A.1086)
- Lichen spp. Nonvascular Alliance (A.3013)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Picea rubens* Woodland Alliance (A.546)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)

DISTRIBUTION

Range: This system is found in New England and adjacent Canada west to the Great Lakes.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: MA?, ME, MI, MN, NH, NY, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 212Jb:CCC, 212Jc:CCP, 212Jo:CCP, 212K:CC, 212Lb:CPP, 212M:CC, 212Q:CC, 212Ra:CCC, 212Sb:CCC, 212Sc:CCP, 212Sn:CCP, 212Sq:CCC, 212Tb:CCP, 212Tc:CCP, 212X:CP, 212Ya:CCC, 222Jc:CCC

TNC Ecoregions: 47:C, 48:C, 61:C, 63:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723036#references

Description Author: S.C. Gawler

Version: 05 Oct 2004

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest

ClassifResp: East

LAURENTIAN-ACADIAN CALCAREOUS CLIFF AND TALUS (CES201.570)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Cliff (Substrate); Talus (Substrate); Alkaline Soil; Circumneutral Soil

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Montane; Lowland; Glaciated; Very Shallow Soil; Intermediate Disturbance Interval; Landslide

National Mapping Codes: ESLF 3144

CONCEPT

Summary: This cliff system occurs at low to mid elevations, well below treeline, from New England west to the Great Lakes. It consists of vertical or near-vertical cliffs and the talus slopes below, where weathering and/or bedrock chemistry produce circumneutral to calcareous pH and enriched nutrient availability. The vegetation is often sparse but may include patches of small trees. *Thuja occidentalis* may dominate on some cliffs (and reach very old ages, upwards of 1000 years). *Fraxinus* spp. and *Tilia americana* are woody indicators of the enriched setting.

Similar Ecological Systems:

- North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)

DESCRIPTION

Vegetation: *Thuja occidentalis* may dominate on some cliffs (and reach very old ages, upwards of 1000 years). *Fraxinus* spp. and *Tilia americana* are woody indicators of the enriched setting (Kelly and Larson 1997).

MEMBERSHIP

Associations:

- *Acer saccharum* - *Tilia americana* - *Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland (CEGL005058, G3G5)
- *Carex scirpoidea* Alkaline Cliff Sparse Vegetation (CEGL006526, GNR)
- Limestone - Dolostone Midwest Dry Cliff Sparse Vegetation (CEGL002291, G4G5)
- Limestone - Dolostone Midwest Moist Cliff Sparse Vegetation (CEGL002292, G4G5)
- Limestone - Dolostone Talus Sparse Vegetation (CEGL002308, G4G5)
- *Thuja occidentalis* Carbonate Talus Woodland (CEGL005172, G3G4)
- *Thuja occidentalis* Cliff Woodland (CEGL002451, G3)

Alliances:

- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

DISTRIBUTION

Range: This system is found in scattered locations from New England and adjacent Canada west to the Great Lakes and northern Minnesota

Divisions: 201:C

Nations: US

Subnations: ME, MI, MN, NH, NY, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 66:C

USFS Ecomap Regions: 212Hl:CCC, 212Jb:CCC, 212Jc:CCP, 212Jo:CCP, 212Lb:CPP, 212Q:CC, 212Ra:CCC, 212Rc:CCC, 212Re:CCC, 212Sb:CCC, 212Sc:CCC, 212Sn:CCP, 212Sq:CCC, 212Tb:CCC, 212Tc:CCP, 212Tf:CCC, 212X:CP, 212Ya:CCP, 212Z:CC, 222Jc:CCC

TNC Ecoregions: 47:C, 48:C, 63:C

SOURCES

References: Comer et al. 2003, Kelly and Larson 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723035#references

Description Author: S.C. Gawler

Version: 09 Jan 2003

Concept Author: S.C. Gawler

Stakeholders: East, Midwest
ClassifResp: East

LAURENTIAN-ACADIAN LAKESHORE BEACH (CES201.586)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval [Short interval, Irregular Flooding]; Depressional; Flood Scouring; Broad-Leaved Shrub; Dwarf-Shrub; Graminoid

Non-Diagnostic Classifiers: Lowland; Glaciated; Mesotrophic Soil; Oligotrophic Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Very Short Disturbance Interval

National Mapping Codes: ESLF 3182

CONCEPT

Summary: This system encompasses primarily upland vegetation along lakeshores or rivershores in the glaciated Northeast and upper Midwest (not including the Great Lakes). Some areas may be briefly inundated during high water periods. The substrate is sandy to gravelly, sometimes consolidated rock; there may be muddy patches. Ice-scour is not a major influence although it may be locally important. These shores may be narrow zones of shrubs and/or sparse vegetation on rocks or sandy beaches.

Classification Comments: Very little data on these. May not be defensible as a separate system, keep in for now as a placeholder. If it is combined with the surrounding uplands, the associations tagged to this system may become orphans.

MEMBERSHIP

Associations:

- *Dasiphora fruticosa ssp. floribunda* / *Rhynchospora capillacea* - *Scleria verticillata* Shrub Herbaceous Vegetation (CEGL006356, G1)
- *Eriocaulon aquaticum* Sparse Vegetation (CEGL006538, GNR)
- Eroding Clay Bank Sparse Vegetation (CEGL002584, GNR)
- *Hudsonia tomentosa* - *Lupinus perennis* Dwarf-shrubland (CEGL006233, G1)
- Igneous - Metamorphic Cobble - Gravel Inland Lake Shore Sparse Vegetation (CEGL002303, G4G5)
- Inland Freshwater Strand Beach Sparse Vegetation (CEGL002310, G4G5)
- Lake Mudflats Sparse Vegetation (CEGL002313, GNR)
- *Spartina pectinata* North Atlantic Coast Herbaceous Vegetation (CEGL006095, GNR)

Alliances:

- *Carex (flava, hystericina, interior, sterilis)* Saturated Shrub Herbaceous Alliance (A.1561)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Hudsonia tomentosa* Dwarf-shrubland Alliance (A.1062)
- Inland Strand Beach Sparsely Vegetated Alliance (A.1862)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- Small Eroding Bluffs Sparsely Vegetated Alliance (A.1872)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

DISTRIBUTION

Range: Northern New England and northern New York west across the upper Great Lakes to northern Minnesota, and adjacent Canada; occasional southwards.

Divisions: 201:C

Nations: US

Subnations: MA, ME, MI, MN, NH, NY, RI, VT, WI

Map Zones: 41:C, 50:C, 51:C, 63:C, 64:C, 66:C

USFS Ecomap Regions: 211A:CP, 211B:CP, 211C:CP, 211D:CP, 211F:CC, 212Tb:CCC, 221:C

TNC Ecoregions: 47:C, 48:C, 60:C, 61:C, 63:C, 64:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723020#references

Description Author: S.C. Gawler

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: East, Midwest

ClassifResp: East

LOUISIANA BEACH (CES203.469)

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Barren**Spatial Scale & Pattern:** Small patch**Required Classifiers:** Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland**Diagnostic Classifiers:** Beach (Substrate); Graminoid; Coast**National Mapping Codes:** ESLF 3131**CONCEPT**

Summary: Louisiana beaches are predominantly found on remnant barrier islands associated with historic delta lobes of the Mississippi River. Since normal deltaic processes have been altered, the formation of new barrier islands has been halted and most Louisiana barrier islands are undergoing deterioration. Within the northern Gulf region these beaches are distinguished by dominance of *Spartina patens* instead of *Uniola paniculata*. Also characteristic are *Cenchrus spinifex* (= *Cenchrus incertus*) and *Sporobolus virginicus* (Barbour et al. 1987).

MEMBERSHIP**Associations:**

- *Ipomoea pes-caprae* - *Ipomoea imperati* - (*Cakile geniculata*) Herbaceous Vegetation (CEGL004402, G3?)
- *Spartina patens* - *Panicum amarum* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004971, G2?)

Alliances:

- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)

DISTRIBUTION**Range:** Found on remnant barrier islands associated with historic delta lobes of the Mississippi River.**Divisions:** 203:C**Nations:** US**Subnations:** LA**Map Zones:** 98:C**TNC Ecoregions:** 31:C**SOURCES****References:** Barbour et al. 1987, Comer et al. 2003**Full References:**See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723117#references**Description Author:** J. Teague**Version:** 13 Jan 2003**Concept Author:** J. Teague**Stakeholders:** Southeast**ClassifResp:** Southeast

MEDITERRANEAN CALIFORNIA ALPINE BEDROCK AND SCREE (CES206.899)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Alpine Mosaic; Ridge/Summit/Upper Slope; Temperate [Temperate Oceanic]; Nonvascular

Non-Diagnostic Classifiers: Hillslope bedrock outcrop; Peak; Periglacial boulderfield; Pinnacle; Ridgetop bedrock outcrop; Rockfall avalanche; Herbaceous; Summit; Moss/Lichen (Nonvascular); Talus (Landform); Glaciated; Periglacial; Very Shallow Soil; Landslide; Avalanche; W-Landscape/High Intensity; Cliff (Landform)

National Mapping Codes: ESLF 3172

CONCEPT

Summary: This system occurs in limited alpine environments mostly concentrated in the Sierra Nevada, but also on Mount Shasta and as far south as the Peninsular Ranges and White Mountains. Alpine elevations begin around 3500 m (10,600 feet) in the southern mountain ranges and 2700 m (8200 feet) in the southern Cascades. These are barren and sparsely vegetated alpine substrates, typically including both bedrock outcrops and scree slopes, with nonvascular (lichen)-dominated communities. This also encompasses a limited area of "alpine desert" with unstable sandy substrates and scattered individuals of *Astragalus* spp., *Arabis* spp., *Draba* spp., and *Oxytropis* spp., which mostly fall to the east of the Sierra Nevada crest. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth.

DISTRIBUTION

Range: Concentrated in the Sierra Nevada, but also on Mount Shasta and as far south as the Peninsular Ranges and White Mountains. Alpine elevations begin around 3500 m (10,600 feet) in the southern mountain ranges and 2700 m (8200 feet) in the southern Cascades.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), NV, OR

Map Zones: 2:C, 3:?, 4:C, 6:C, 7:C, 12:P

USFS Ecomap Regions: 341D:CC, 342B:??, M261D:CP, M261E:CC

TNC Ecoregions: 5:C, 12:C, 16:P

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722782#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West

ClassifResp: West

MEDITERRANEAN CALIFORNIA COASTAL BLUFF (CES206.906)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Headland; Sea cliff; Mediterranean [Mediterranean Xeric-Oceanic]; Salt Spray; Landslide; W-Landscape/High Intensity; Bluff; Succulent Shrub; Dwarf-Shrub

Non-Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Cliff (Substrate); Saline Substrate Chemistry; Xeric; Intermediate Disturbance Interval; Succulent Forb; Cliff (Landform); Coast

National Mapping Codes: ESLF 3166

CONCEPT

Summary: Areas of sea bluffs and rocky headlands occur just above the tidal zone throughout rugged portions of coastal Oregon, California, Baja Norte, and off-shore islands (e.g., Channel Islands). Plant communities along these often vertical slopes are typically sparse, with many succulents and prostrate shrubs, and species that readily withstand salt spray and saline soils, as well as seasonal drought. These may include *Baccharis pilularis*, *Dudleya* spp., *Carpobrotus chilensis*, *Carpobrotus edulis*, *Hazardia squarrosa* (= *Haplopappus squarrosus*), *Eriogonum parvifolium*, *Erigeron glaucus*, *Eriophyllum stoechadifolium*, and *Plantago maritima*. Slope instability and erosion result in severe climate, setting back succession in this system.

DISTRIBUTION

Range: Rugged portions of coastal Oregon, California, Baja Norte, and off-shore islands (e.g., Channel Islands).

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX), OR

Map Zones: 2:P, 3:C, 4:C

USFS Ecomap Regions: 261B:CC, 263A:CC

TNC Ecoregions: 14:C, 15:C, 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722775#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West
ClassifResp: West

MEDITERRANEAN CALIFORNIA NORTHERN COASTAL DUNE (CES206.907)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Dune field; Coastal Dune Mosaic; Dune (Substrate); Mediterranean [Mediterranean Xeric-Oceanic]; Sand Soil Texture; Very Short Disturbance Interval; W-Patch/High Intensity; *Abronia latifolia*

Non-Diagnostic Classifiers: Foredune; Lowland [Lowland]; Longshore bar; Sagpond; Woody-Herbaceous; Shoreline; Spit; Salt Spray; Unconsolidated; Beach (Landform); Blowout; Coast

National Mapping Codes: ESLF 3165

CONCEPT

Summary: This coastal system occurs in scattered locations from Point Conception, California, north to Coos Bay, Oregon. Coastal dunes include beaches, foredunes, sand spits, and active to stabilizing backdunes and sandsheets derived from quartz or gypsum sands. The mosaic of sparse to dense vegetation in dune systems is driven by sand deposition, erosion, and lateral movement. Coastal dunes often front portions of inlets and tidal marshes. They may also occur as extensive dune fields dominating large coastal bays. Dune vegetation typically includes herbaceous, succulent, and low-shrub species with varying degrees of tolerance for salt spray, wind and sand abrasion, and substrate stability. Dune succession is highly variable, so species composition can vary significantly between occurrences. Generally, these dune systems can be dominated by *Leymus mollis*, *Abronia latifolia*, *Ambrosia chamissonis*, *Baccharis pilularis*, *Calystegia soldanella*, *Artemisia pycnocephala*, *Ericameria ericoides*, *Eriogonum latifolium*, *Camissonia cheiranthifolia*, and *Carpobrotus chilensis* (= *Carpobrotus aequilateralis*). Disturbance processes include dune blowouts caused by wind and occasional wave overwash during storm tidal surges.

MEMBERSHIP

Associations:

- *Ammophila arenaria* - *Cardionema ramosissimum* Herbaceous Vegetation (CEGL003373, GNA)
- *Ammophila arenaria* Semi-natural Herbaceous Vegetation (CEGL003006, GNA)

Alliances:

- *Ammophila arenaria* Semi-natural Herbaceous Alliance (A.1206)

DISTRIBUTION

Range: Occurs in scattered locations from Point Conception, California, north to Coos Bay, Oregon.

Divisions: 204:P; 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 4:C

USFS Ecomap Regions: 263A:CC

TNC Ecoregions: 1:P, 14:C, 15:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722774#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

MEDITERRANEAN CALIFORNIA SERPENTINE BARRENS (CES206.905)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Montane [Lower Montane]; Herbaceous; Moss/Lichen (Nonvascular); Serpentine; Mediterranean [Mediterranean Xeric-Oceanic]; Ultramafic with low Ca:Mg ratio; Very Shallow Soil; Xeric; Unconsolidated

National Mapping Codes: ESLF 3167

CONCEPT

Summary: This uncommon system is found in the central and southern Sierra Nevada, Central and Northern Coast Ranges, and Klamath Ranges at elevations between 150 to 1800 m (450-5500 feet), where serpentine outcrops and related soils are common. Not all serpentinite outcrops support distinct vegetation. Only those with very low Ca:Mg ratio impact biotic composition. This system is usually found on steep slopes with loosely consolidated soils and harsh soil chemical conditions (large rock outcrops and gravelly soil). There is typically a very low cover (<10%) of herbaceous species, including *Streptanthus* spp., *Hesperolinon* spp., *Allium falcifolium*, *Allium cratericola*, *Asclepias solanoana*, *Eriogonum ursinum*, and *Eriogonum nudum*.

Classification Comments: This system is very similar to North Pacific Serpentine Barren (CES204.095) of the East and West Cascades (Oregon and Washington) but tends to be more herbaceous in species composition, whereas North Pacific Serpentine Barren has a more developed woody component.

Similar Ecological Systems:

- North Pacific Serpentine Barren (CES204.095)

DISTRIBUTION

Range: This system is found in the central and southern Sierra Nevada, central and northern Coast Ranges, and Klamath Ranges at elevations between 150 and 1800 m (450-5500 feet).

Divisions: 206:C

Nations: US

Subnations: CA, OR

Map Zones: 2:C, 3:C, 6:C, 7:P

USFS Ecomap Regions: M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC

TNC Ecoregions: 5:C, 12:C, 14:C, 15:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722776#references

Description Author: P. Comer, T. Keeler-Wolf, mod. M.S. Reid

Version: 23 Jan 2006

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

MEDITERRANEAN CALIFORNIA SOUTHERN COASTAL DUNE (CES206.908)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Dune field; Coastal Dune Mosaic; Foredune; Dune (Substrate); Mediterranean [Mediterranean Xeric-Oceanic]; Salt Spray; W-Patch/High Intensity; Blowout; *Abronia maritima*

Non-Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Sagpond; Woody-Herbaceous; Shoreline; Barrier beach; Sand Soil Texture; Xeric; Unconsolidated; Very Short Disturbance Interval; Beach (Landform)

National Mapping Codes: ESLF 3164

CONCEPT

Summary: This coastal system occurs in scattered locations from Point Conception, California, south to north-central Baja California. Coastal dunes include beaches, foredunes, sand spits, and active to stabilizing backdunes and sandsheets derived from quartz or gypsum sands. The mosaic of sparse to dense vegetation in dune systems is driven by sand deposition, erosion, and lateral movement. Coastal dunes often front portions of inlets and tidal marshes. They may also occur as extensive dune fields dominating large coastal bays. Dune vegetation typically includes herbaceous, succulent, and low-shrub species with varying degrees of tolerance for salt spray, wind and sand abrasion, and substrate stability. Dune succession is highly variable, so species composition can vary significantly between occurrences. Generally, this dune system includes fewer perennial grasses and more suffrutescent plants than more northern dune systems. This system can be dominated by *Abronia maritima*, *Abronia umbellata*, *Atriplex leucophylla*, *Isocoma menziesii* (= *Haplopappus venetus*), *Distichlis spicata*, *Croton californicus*, *Lupinus chamissonis*, and *Carpobrotus chilensis* (= *Carpobrotus aequilateralis*). Disturbance processes include dune blowouts caused by wind and occasional wave overwash during storm tidal surges.

DISTRIBUTION

Range: Occurs in scattered locations from Point Conception, California, south to north-central Baja California.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C

USFS Ecomap Regions: 261B:CC

TNC Ecoregions: NT1301:C, 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722773#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West
ClassifResp: West

1735 NORTH AMERICAN GLACIER AND ICE FIELD (CES100.728)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Alpine Slopes; Alpine/AltiAndino [Alpine/AltiAndino]; Ice Fields / Glaciers; Glaciated

Non-Diagnostic Classifiers: Mediterranean [Mediterranean Xeric-Continental]; Temperate [Temperate Continental]

National Mapping Codes: EVT 2735; ESLF 3130; ESP 1735

CONCEPT

Summary: This widespread ecological system is composed of unvegetated landscapes of annual/perennial ice and snow in the North American arctic, and south into the highest elevations of the Rocky Mountains, Pacific coastal ranges, and the Sierra Madre of Mexico. They occur where snowfall accumulation exceeds melting. The primary ecological processes include snow/ice retention, wind desiccation, and permafrost. The snowpack/ice field never melts or, if so, then for only a few weeks. In places the ice fields are extensive, covering huge areas, while in the alpine, ice fields are part of the alpine mosaic consisting of alpine bedrock and scree, tundra dry meadow, wet meadow, fell-fields, and dwarf-shrubland. There are no vascular plants occurring in this system; biotic composition may include algal blooms, insect communities, and birds or mammals foraging on the insects.

Classification Comments: The barren rock and rubble within the glaciers is part of this system, not the alpine rock and scree systems.

DISTRIBUTION

Range: This ecological system is found throughout North America where high latitude or altitude results in permanent ice and snow fields, from the arctic and boreal regions south into the mountains of Alaska south and east through the cordillera of the Cascades and the Rocky Mountains. It also occurs in the alpine areas of the Sierra Madre in Mexico.

Divisions: 101:C; 102:C; 103:C; 104:C; 105:C; 204:C; 207:C; 305:C; 306:C

Nations: CA, MX, US

Subnations: AB, AK, BC, CO, ID, MB, MT, NT, ON, OR, QC, WA, WY, YT

Map Zones: 1:C, 2:?, 3:C, 7:C, 9:P, 10:C, 16:C, 19:C, 21:C, 28:C, 29:?, 67:C, 68:C, 69:C, 70:C, 71:C, 72:C, 73:C, 74:C, 75:C, 76:C, 77:C, 78:C

USFS Ecomap Regions: 331J:CC, 341G:CC, 342J:??, M242A:CC, M242B:CC, M242C:CP, M242D:CC, M261A:PP, M261E:PP, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:C?, M332E:CP, M332F:CP, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

TNC Ecoregions: 3:C, 7:C, 9:C, 20:C, 69:C, 70:C, 71:P, 76:C, 77:P, 78:C, 79:C

SOURCES

References: Comer et al. 2003, Meidinger and Pojar 1991, Neely et al. 2001, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722944#references

Description Author: NatureServe Western Ecology Team, mod. M.S. Reid

Version: 22 Aug 2008

Stakeholders: Canada, Latin America, Midwest, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

NORTH AMERICAN WARM DESERT ACTIVE AND STABILIZED DUNE (CES302.744)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Dune (Landform); Dune field; Dune (Substrate); Temperate [Temperate Xeric]; Sand Soil Texture; W-Landscape/High Intensity

Non-Diagnostic Classifiers: Dune (undifferentiated); Lowland [Lowland]; Shrubland (Shrub-dominated); Herbaceous; Tropical/Subtropical [Tropical Xeric]; Gypsiferous; Aridic

National Mapping Codes: ESLF 3121

CONCEPT

Summary: This ecological system occurs across the warm deserts of North America and is composed of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sandsheets derived from quartz or gypsum sands. Common vegetation includes *Ambrosia dumosa*, *Abronia villosa*, *Artemisia filifolia*, *Atriplex canescens*, *Eriogonum deserticola*, *Larrea tridentata*, *Pleuraphis rigida*, *Poliomintha* spp., *Prosopis* spp., *Psoralea* spp., *Rhus microphylla*, and *Sporobolus flexuosus*. Dune "blowouts" and subsequent stabilization through succession are characteristic processes.

Similar Ecological Systems:

- Chihuahuan Gypsophilous Grassland and Steppe (CES302.732)

MEMBERSHIP

Associations:

- *Abronia villosa* Sparse Vegetation (CEGL003001, G2G3)
- *Artemisia filifolia* - *Psoralea scoparius* - *Dalea lanata* Gypsum Dune Shrubland (CEGL004561, G1G2)
- *Artemisia filifolia* / *Andropogon hallii* - *Achnatherum hymenoides* Gypsum Dune Shrubland (CEGL004559, G1G2)
- *Artemisia filifolia* / *Sporobolus flexuosus* Shrubland (CEGL001547, G5)
- *Artemisia filifolia* / *Sporobolus giganteus* Shrubland (CEGL001078, G5)
- *Cleome isomeris* - *Ephedra californica* - *Ericameria linearifolia* Shrubland (CEGL003056, G1G3)
- *Ephedra viridis* / (*Achnatherum hymenoides*, *Hesperostipa comata*) Shrubland (CEGL002354, GNR)
- *Ephedra viridis* / *Pleuraphis jamesii* Shrubland (CEGL002356, GNR)
- *Eriogonum deserticola* Sand Dune Sparse Vegetation (CEGL001962, G1)
- *Heliotropium convolvulaceum* - *Psoralea lanceolatum* - *Polanisia jamesii* Sparse Vegetation (CEGL004581, G2?)
- *Heliotropium racemosum* - *Chamaesyce* sp. Sparse Vegetation (CEGL004582, G1?)
- *Poliomintha incana* / *Muhlenbergia pungens* Shrubland (CEGL002672, G3)
- *Prosopis glandulosa* / *Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa* / *Sporobolus flexuosus* Shrubland (CEGL001386, G4)
- *Psoralea polydenius* var. *polydenius* / *Achnatherum hymenoides* Shrubland (CEGL001353, G3G4)
- *Psoralea spinosus* Shrubland [Placeholder] (CEGL002701, G4G5)
- *Sporobolus flexuosus* - *Dasyochloa pulchella* Herbaceous Vegetation (CEGL001693, G2?)
- *Sporobolus flexuosus* - *Paspalum setaceum* Herbaceous Vegetation (CEGL001694, G1G2)
- *Sporobolus flexuosus* - *Sporobolus contractus* Herbaceous Vegetation (CEGL001696, GNRQ)

Alliances:

- *Abronia villosa* Sparsely Vegetated Alliance (A.1852)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Cleome isomeris* - *Ephedra californica* - *Ericameria linearifolia* Shrubland Alliance (A.819)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Eriogonum deserticola* Sparsely Vegetated Alliance (A.1856)
- *Heliotropium convolvulaceum* Sparsely Vegetated Alliance (A.1853)
- *Heliotropium racemosum* Sparsely Vegetated Alliance (A.1854)
- *Poliomintha incana* Shrubland Alliance (A.862)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Psoralea polydenius* Shrubland Alliance (A.1039)
- *Psoralea spinosus* Intermittently Flooded Shrubland Alliance (A.2520)
- *Sporobolus flexuosus* Herbaceous Alliance (A.1268)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North American Warm Desert Interdunal Swale Wetland (CES302.039)

DISTRIBUTION

Range: This system occurs across the warm deserts of North America.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXBS(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 13:C, 14:C, 15:?, 24:?, 25:C, 26:C, 27:C

USFS Ecomap Regions: 313B:??, 315A:CC, 315B:CC, 315H:CP, 321A:CC, 322A:CC, 322B:CC, 322C:CC, 331B:CC, M313A:CC, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Bowers 1982, Bowers 1984, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Powell and Turner 1974, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722928#references

Description Author: K.A. Schulz

Version: 21 Apr 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West
ClassifResp: West

NORTH AMERICAN WARM DESERT BADLAND (CES302.743)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Badland; Badlands; Alkaline Soil; Shale and Mudstone; Silt Soil Texture; Clay Soil Texture

Non-Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic; Very Short Disturbance Interval

National Mapping Codes: ESLF 3123

CONCEPT

Summary: This ecological system is restricted to barren and sparsely vegetated (generally <10% plant cover) substrates typically derived from marine shale or mudstone (badlands and mudhills). The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse shrubs and dwarf-shrubs e.g., *Atriplex hymenelytra*, and herbaceous vegetation.

MEMBERSHIP

Associations:

- *Atriplex hymenelytra* Shrubland (CEGL001317, G5)
- *Cleome isomeris* - *Ephedra californica* - *Ericameria linearifolia* Shrubland (CEGL003056, G1G3)

Alliances:

- *Atriplex hymenelytra* Shrubland Alliance (A.872)
- *Cleome isomeris* - *Ephedra californica* - *Ericameria linearifolia* Shrubland Alliance (A.819)

DISTRIBUTION

Divisions: 302:C

Nations: MX, US

Subnations: AZ, MXCH(MX), MXSO(MX), NM, TX

Map Zones: 13:C, 14:?, 15:?, 25:P, 26:?

USFS Ecomap Regions: 322A:CC, 322B:C?, 322C:C?

TNC Ecoregions: 17:C, 22:P, 23:P, 24:C

SOURCES

References: Comer et al. 2003, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722929#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

NORTH AMERICAN WARM DESERT BEDROCK CLIFF AND OUTCROP (CES302.745)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades; Temperate [Temperate Xeric]; Canyon; Cliff (Landform)

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Rockfall avalanche; Ridge/Summit/Upper Slope; Sideslope; Toeslope/Valley Bottom; Granitic Rock; Sedimentary Rock; Metamorphic Rock; Igneous Rock; Tropical/Subtropical [Tropical Xeric]; Very Shallow Soil

National Mapping Codes: ESLF 3120

CONCEPT

Summary: This ecological system is found from subalpine to foothill elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus slopes that typically occur below cliff faces. Species present are diverse and may include *Bursera microphylla*, *Fouquieria splendens*, *Nolina bigelovii*, *Opuntia bigelovii*, and other desert species, especially succulents. Lichens are predominant lifeforms in some areas. May include a variety of desert shrublands less than 2 ha (5 acres) in size from adjacent areas.

Similar Ecological Systems:

- Edwards Plateau Cliff (CES303.653)

MEMBERSHIP

Associations:

- *Fouquieria splendens* / *Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Fouquieria splendens* Shrubland (CEGL004452, GNR)
- *Larrea tridentata* - *Jatropha dioica* var. *graminea* Shrubland (CEGL004566, G3?)
- *Larrea tridentata* - *Opuntia schottii* Shrubland (CEGL004567, G4?)
- *Opuntia bigelovii* Shrubland [Placeholder] (CEGL003065, G4?)

Alliances:

- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Larrea tridentata* Shrubland Alliance (A.851)
- *Opuntia bigelovii* Shrubland Alliance (A.877)

DISTRIBUTION

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXBS(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 12:?, 13:C, 14:C, 15:P, 16:?, 17:P, 23:?, 24:C, 25:C, 26:C, 27:P, 28:?

USFS Ecomap Regions: 313A:CC, 313B:CC, 313C:CC, 313D:CC, 315A:CC, 315B:CC, 315H:CC, 321A:CC, 322A:CC, 322B:CC, 322C:CC, 341F:CC, M313A:CC, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Dick-Peddie 1993, MacMahon 1988, MacMahon and Wagner 1985, Shreve and Wiggins 1964, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722927#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West

ClassifResp: West

NORTH AMERICAN WARM DESERT PAVEMENT (CES302.750)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Playa; Desert Pavement; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; W-Landscape/High Intensity

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Aridic

National Mapping Codes: ESLF 3143

CONCEPT

Summary: This ecological system occurs throughout much of the warm deserts of North America and is composed of unvegetated to very sparsely vegetated (<2% plant cover) landscapes, typically flat basins where extreme temperature and wind develop ground surfaces of fine to medium gravel coated with "desert varnish." This sparsely vegetated system may surround playas in valley bottoms or near washes and, less commonly, on dissected, eroding alluvial fans. Very low cover of desert scrub species such as *Larrea tridentata* or *Eriogonum fasciculatum* is usually present. However, ephemeral herbaceous species may have high cover in response to seasonal precipitation, including *Chorizanthe rigida*, *Eriogonum inflatum*, and *Geraea canescens*.

MEMBERSHIP

Associations:

- *Ambrosia deltoidea* / *Simmondsia chinensis* Shrubland (CEGL000953, G4)
- *Ambrosia dumosa* - *Larrea tridentata* var. *tridentata* Dwarf-shrubland (CEGL000956, G4)
- *Eriogonum fasciculatum* - *Purshia glandulosa* Shrubland (CEGL001259, G4)
- *Eriogonum fasciculatum* Shrubland (CEGL001258, G5)

Alliances:

- *Ambrosia deltoidea* Shrubland Alliance (A.852)
- *Ambrosia dumosa* Dwarf-shrubland Alliance (A.1102)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)

DISTRIBUTION

Range: Occurs throughout much of the warm deserts of North America.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 13:C, 14:C, 15:?, 24:?, 25:C, 26:C

USFS Ecomap Regions: 321A:CC, 322A:CC, 322B:CC, 322C:CC, 341F:PP, M313A:CP, M313B:CC

TNC Ecoregions: 17:C, 23:C, 24:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, MacMahon 1988, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722922#references

Description Author: NatureServe Western Ecology Team

Version: 16 Jan 2009

Stakeholders: Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

NORTH AMERICAN WARM DESERT PLAYA (CES302.751)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Alkaline Water; Saline Water Chemistry; Caliche Layer; Impermeable Layer; Intermittent Flooding; Lowland [Lowland]; Playa; Desert Pavement; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Depressional; Alkaline Soil; Aridic

Non-Diagnostic Classifiers: Clay Subsoil Texture; Shrubland (Shrub-dominated); Woody-Herbaceous; Isolated Wetland [Partially Isolated]; Dwarf-Shrub; Forb; Graminoid

National Mapping Codes: ESLF 3161

CONCEPT

Summary: This ecological system is composed of barren and sparsely vegetated playas (generally <10% plant cover) found across the warm deserts of North America, extending into the extreme southern end of the San Joaquin Valley in California. Playas form with intermittent flooding, followed by evaporation, leaving behind a saline residue. Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. Subsoils often include an impermeable layer of clay or caliche. Large desert playas tend to be defined by vegetation rings formed in response to salinity. Given their common location in windswept desert basins, dune fields often form downwind of large playas. In turn, playas associated with dunes often have a deeper water supply. Species may include *Allenrolfea occidentalis*, *Suaeda* spp., *Distichlis spicata*, *Eleocharis palustris*, *Oryzopsis* spp., *Sporobolus* spp., *Tiquilia* spp., or *Atriplex* spp. Ephemeral herbaceous species may have high cover periodically. Adjacent vegetation is typically Sonora-Mojave Mixed Salt Desert Scrub (CES302.749), Chihuahuan Mixed Salt Desert Scrub (CES302.017), Gulf of California Coastal Mixed Salt Desert Scrub (CES302.015), Baja California del Norte Gulf Coast Ocotillo-Limberbush-Creosotebush Desert Scrub (CES302.014), or Chihuahuan Creosotebush Desert Scrub (CES302.731).

Related Concepts:

- Saltbush - Greasewood (501) (Shiflet 1994) Intersecting. Desert playas can have salt desert scrub in low cover.

MEMBERSHIP

Associations:

- (*Sarcocornia utahensis*) - (*Arthrocnemum subterminale*) Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003120, GNR)
- *Allenrolfea occidentalis* Shrubland (CEGL000988, G3)
- *Atriplex (lentiformis, polycarpa)* Shrubland [Placeholder] (CEGL003016, G3)
- *Atriplex polycarpa* / *Pleuraphis mutica* Shrubland (CEGL001319, GU)
- *Atriplex polycarpa* Shrubland (CEGL001318, G5)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Bouteloua breviseta* Sparse Vegetation (CEGL004609, G3?)
- *Sesuvium verrucosum* Sparse Vegetation (CEGL004595, G3?)

Alliances:

- (*Sarcocornia utahensis*) - (*Arthrocnemum subterminale*) Semipermanently Flooded Herbaceous Alliance (A.1676)
- *Allenrolfea occidentalis* Shrubland Alliance (A.866)
- *Atriplex (lentiformis, polycarpa)* Shrubland Alliance (A.864)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Bouteloua breviseta* Sparsely Vegetated Alliance (A.1870)
- *Sesuvium verrucosum* Temporarily Flooded Sparsely Vegetated Alliance (A.1865)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Baja California del Norte Gulf Coast Ocotillo-Limberbush-Creosotebush Desert Scrub (CES302.014)
- Chihuahuan Creosotebush Desert Scrub (CES302.731)
- Chihuahuan Mixed Salt Desert Scrub (CES302.017)
- Gulf of California Coastal Mixed Salt Desert Scrub (CES302.015)
- Sonora-Mojave Mixed Salt Desert Scrub (CES302.749)

Adjacent Ecological System Comments: Adjacent vegetation is typically Sonora-Mojave Mixed Salt Desert Scrub (CES302.749), Chihuahuan Mixed Salt Desert Scrub (CES302.017), Gulf of California Coastal Mixed Salt Desert Scrub (CES302.015), Baja California del Norte Gulf Coast Ocotillo-Limberbush-Creosotebush Desert Scrub (CES302.014), or Chihuahuan Creosotebush Desert Scrub (CES302.731).

DISTRIBUTION

Range: Found across the warm deserts of North America, extending into the extreme southern end of the San Joaquin Valley in California.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 13:C, 14:C, 16:?, 17:?, 25:C, 26:C, 27:P, 28:?

USFS Ecomap Regions: 313A:CC, 315A:CC, 315B:CC, 315H:CP, 321A:CC, 322A:CC, 322B:CC, 322C:CP, 341F:CC, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Holland and Keil 1995, Muldavin et al. 2000b, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722921#references

Description Author: NatureServe Western Ecology Team

Version: 14 Dec 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: Latin America, Southeast, West
ClassifResp: West

NORTH AMERICAN WARM DESERT VOLCANIC ROCKLAND (CES302.754)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lava; Cinder; Basalt; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill];

Lowland [Lowland]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Sideslope; Toeslope/Valley Bottom; Aridic

National Mapping Codes: ESLF 3180

CONCEPT

Summary: This ecological system occurs across the warm deserts of North America and is restricted to barren and sparsely vegetated (<10% plant cover) volcanic substrates such as basalt lava (malpais) and tuff. Vegetation is variable and includes a variety of species depending on local environmental conditions, e.g., elevation, age and type of substrate. Typically scattered *Larrea tridentata*, *Atriplex hymenelytra*, or other desert shrubs are present.

MEMBERSHIP

Associations:

- *Aloysia wrightii* / *Perityle staurophylla* Shrubland (CEGL001280, GNRQ)
- *Opuntia bigelovii* Shrubland [Placeholder] (CEGL003065, G4?)

Alliances:

- *Aloysia wrightii* Shrubland Alliance (A.1035)
- *Opuntia bigelovii* Shrubland Alliance (A.877)

DISTRIBUTION

Range: Occurs across the warm deserts of North America.

Divisions: 302:C

Nations: MX, US

Subnations: AZ, CA, MXBC(MX), MXCH(MX), MXSO(MX), NM, NV, TX

Map Zones: 13:C, 14:C, 15:P, 17:?, 25:C, 26:C

USFS Ecomap Regions: 313A:CC, 313C:CP, 321A:CC, 322A:CC, 322B:CC, 322C:C?, 341F:CC, M313A:CP, M313B:CC

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Thomas et al. 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722918#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Stakeholders: Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team

ClassifResp: West

NORTH ATLANTIC COBBLE SHORE (CES201.051)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: <24-hour hydroperiod; Lowland [Lowland]; Boreal [Boreal Hyperoceanic]; Salt Spray; Beach (Landform)

National Mapping Codes: ESLF 3132

CONCEPT

Summary: This system encompasses areas of varying exposure that include boulder, cobble, and gravel shores, often adjacent to bedrock shoreline and rocky intertidal areas. Cobble shores may have >75% cobble bottom. Some occurrences are mixed sand and gravel beaches, others have different combinations of particle sizes. These areas have sufficient exposure to winnow out the fine sand-, silt- and clay-sized particles without removing the larger grain sizes. The bottom is usually comprised of cobble and gravel, although shell hash may also be present in various amounts. These areas have low diversity, probably due to insufficient nutrition for and high disturbance of infauna. Diagnostic species include species colonizing from nearby rocky areas if present, e.g., Irish moss (*Chandrus crispus*), rockweed (*Fucus vesiculosus*), knotted wrack (*Ascophyllum nodosum*), coralline algae (*Corallina officinalis*), and kelp (*Laminaria* spp.). Fauna is composed of the following: segmented worms (*Enchytraeus* spp.), collembola (mostly *Anurida maritima*), blue mussels (*Mytilus* spp.), periwinkles (*Littorina littorea*, *Littorina obtusata*, *Littorina saxatilis*), limpets (*Tectura testudinalis*), and barnacles (*Semibalanus balanoides*), among others.

Similar Ecological Systems:

- North Atlantic Rocky Intertidal (CES201.048)

DISTRIBUTION

Divisions: 103:P; 201:C; 202:P

Nations: CA, US

Subnations: LB, MA, ME, NB, NH, NS, QC

Map Zones: 66:C

TNC Ecoregions: 63:C

SOURCES

References: Brown 1993, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722658#references

Description Author: S. Gawler, P. Comer

Version: 18 Apr 2003

Concept Author: S. Gawler, P. Comer

Stakeholders: Canada, East

ClassifResp: East

NORTH ATLANTIC INTERTIDAL MUDFLAT (CES201.050)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Wetland

Non-Diagnostic Classifiers: <24-hour hydroperiod; Lowland [Lowland]; Herbaceous

National Mapping Codes: ESLF 3133

CONCEPT

Summary: Mudflats are usually located in quiet pockets of bays and protected by headlands. Sand-sized particles are mixed with silt and clay. These flats can be highly productive of clams and other invertebrates, and are important habitats for many shorebird species, including the semipalmated sandpiper, semipalmated plover, short-billed dowitcher, black-bellied plover, and least sandpiper. In the summer, *Enteromorpha intestinalis* can cover these mudflats. Other characteristic species include *Enteromorpha prolifera*, *Ulva lactuca*, *Rhizoclonium riparium*, *Ruppia maritima*, and *Zostera marina*.

Classification Comments: This system currently extends from Cape Hatteras to the Canadian Maritimes. Compositional variation is known to exist across this range; it is left as one system pending finalization of NatureServe's marine/estuarine classification and determination of how the two classifications relate. For example, on the more local scale of the Gulf of Maine, it has been suggested that mudflats east of the Penobscot River contain somewhat different assemblages of organisms than do mudflats west of the Penobscot River (Brown 1993). Some factor (perhaps temperature) would be necessary to separate these communities.

Similar Ecological Systems:

- North Atlantic Tidal Sand Flat (CES201.049)

MEMBERSHIP

Associations:

- Intertidal Mudflats Sparse Vegetation (CEGL006614, G5)
- *Zostera marina* Herbaceous Vegetation (CEGL004336, G4G5)

Alliances:

- Estuarine Tidal Mudflat Sparsely Vegetated Alliance (A.3010)
- *Zostera marina* Permanently Flooded - Tidal Herbaceous Alliance (A.1766)

DISTRIBUTION

Range: This system occurs along the mid- and north Atlantic coasts from North Carolina north into Canada.

Divisions: 103:P; 201:C; 202:C; 203:C

Nations: CA, US

Subnations: CT, DE, LB, MA, MD, ME, NB, NC, NH, NJ, NS, NY, QC?, RI, VA

Map Zones: 58:P, 60:C, 65:C, 66:C

TNC Ecoregions: 57:P, 58:C, 62:C, 63:C

SOURCES

References: Brown 1993, Comer et al. 2003, Nova Scotia Museum of Natural History 1996

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722659#references

Description Author: S. Gawler and P. Comer

Version: 05 Feb 2009

Concept Author: S. Gawler, P. Comer

Stakeholders: Canada, East, Southeast

ClassifResp: East

NORTH ATLANTIC ROCKY INTERTIDAL (CES201.048)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); <24-hour hydroperiod; Moss/Lichen (Nonvascular); Tidal flat; Lichen; Alga

Non-Diagnostic Classifiers: Lowland [Lowland]; Nonvascular

National Mapping Codes: ESLF 3190

CONCEPT

Summary: This ecological system represents the intertidal zone with solid rock substrates that can experience extremes of exposure to winds, waves, currents, and ice-scour. This encompasses both exposed and partially exposed habitats. Lichens (often *Xanthoria* spp., *Verrucaria* spp., and *Vaucheria* spp.) and blue-green algae (*Caliothrix* spp.) are present in the supralittoral and high littoral zones, respectively. Barnacles, usually *Semibalanus balanoides*, are found in the mid-intertidal zone, usually in crevices that offer some protection from the extreme elements. Mussels are found in the lower intertidal, also appearing mostly in crevices. Diagnostic species include Irish moss (*Chondrus crispus*), rockweed (*Fucus vesiculosus*, *Fucus evanescens*, and *Fucus spiralis*), knotted wrack (*Ascophyllum nodosum*), hollow-stemmed kelp (*Laminaria* spp.), blue mussels (*Mytilus edulis*), common periwinkles (*Littorina littorea*), dogwhelks (*Nucella lapillus*), and springtails (*Anurida maritima*). In the low-intertidal zone, small fronds of kelp may be present, but short, torn stipes are often all that remain. Rockweed and knotted wrack, which are typically found in less exposed rocky habitats, are small, restricted to crevices, or missing. Tidepools are frequently found in these habitats and are inhabited by both intertidal and subtidal species. Tidepools are nurseries for lumpfish, sea snails, and pollock. Many other fish have also been identified in tidepools. Many species of birds are found on these rocky shores. Purple sandpipers are found in the winter; ruddy turnstone and sanderlings are the main species in spring and fall migrations. Other shorebirds that also use rocky shores include black-bellied plovers, American oystercatchers, and pectoral sandpipers.

Classification Comments: This system currently extends from New York to the Canadian Maritimes. Compositional variation may exist across this range; it is left as one system pending finalization of NatureServe's marine/estuarine classification and determination of how the two classifications relate.

Similar Ecological Systems:

- North Atlantic Cobble Shore (CES201.051)--is similar but on a loose rock substrate.

MEMBERSHIP

Associations:

- *Ascophyllum nodosum* - *Fucus vesiculosus* Tidal Algal Nonvascular Vegetation (CEGL006341, GNR)

Alliances:

- *Ascophyllum nodosum* - *Fucus vesiculosus* Tidal Algal Nonvascular Alliance (A.3011)

DISTRIBUTION

Range: This system is found throughout the Gulf of Maine and extending sporadically down to New York.

Divisions: 103:C; 201:C; 202:C

Nations: CA, US

Subnations: CT, LB, MA, ME, NB, NH, NS, NY, QC?, RI

Map Zones: 65:C, 66:C

TNC Ecoregions: 62:C, 63:C

SOURCES

References: Brown 1993, Comer et al. 2003, Olivero n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722661#references

Description Author: S. Gawler and P. Comer

Version: 04 Feb 2009

Concept Author: S. Gawler, P. Comer

Stakeholders: Canada, East

ClassifResp: East

NORTH ATLANTIC TIDAL SAND FLAT (CES201.049)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Wetland

Diagnostic Classifiers: Boreal [Boreal Hyperoceanic]; Unconsolidated; Alga

Non-Diagnostic Classifiers: Lowland [Lowland]

National Mapping Codes: ESLF 3134

CONCEPT

Summary: This system of intertidal sand flats occurs primarily in the embayed areas of the mid-Atlantic and north Atlantic coasts. Rocky or sandy barriers help create protected sounds and lagoons, providing areas for colonization of hydromorphic herbaceous vegetation. Local habitats range from small guts, shallow tributary creeks, and large saline pools to shallow estuarine bays, tidal creeks, and estuary pools. *Zostera marina* is the dominant plant species in saline habitats, but not all sand flats are vegetated. The invertebrate diversity in these sheltered habitats is higher than that of exposed and partially exposed sandy beaches. These habitats are frequently used by shorebirds, such as sanderlings, semipalmated sandpipers, black-bellied plovers, red knots, and semipalmated plovers.

Classification Comments: This system currently extends from Cape Hatteras to the Canadian Maritimes. Compositional variation is known to exist across this range; it is left as one system pending finalization of NatureServe's marine/estuarine classification and determination of how the two classifications relate.

Similar Ecological Systems:

- North Atlantic Intertidal Mudflat (CES201.050)
- Northern Atlantic Coastal Plain Seagrass Bed (CES203.246)

MEMBERSHIP

Associations:

- *Zostera marina* Herbaceous Vegetation (CEGL004336, G4G5)

Alliances:

- *Zostera marina* Permanently Flooded - Tidal Herbaceous Alliance (A.1766)

DISTRIBUTION

Range: This system occurs primarily in the embayed regions of mid- and north Atlantic coast from North Carolina north into Canada.

Divisions: 103:C; 201:C; 202:C; 203:C

Nations: CA, US

Subnations: CT, DE, LB, MA, MD, ME, NB, NC, NF, NH, NJ, NS, NY, QC?, RI, VA

Map Zones: 58:P, 60:C, 65:C, 66:C

TNC Ecoregions: 57:P, 58:C, 62:C, 63:C

SOURCES

References: Brown 1993, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722660#references

Description Author: S. Gawler and P. Comer

Version: 05 Feb 2009

Concept Author: S. Gawler, P. Comer

Stakeholders: Canada, East, Southeast

ClassifResp: East

NORTH PACIFIC ACTIVE INLAND DUNE (CES204.861)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Dune (Substrate); Very Short Disturbance Interval; Graminoid

Non-Diagnostic Classifiers: Lowland [Lowland]; Temperate [Temperate Continental]; Unconsolidated

National Mapping Codes: ESLF 3157

CONCEPT

Summary: Active inland dunes occur near the terminus of glaciers and on the edge of outwash plains, located mostly in south-central and southeastern Alaska; one rare remnant outlier example occurs in the western Columbia River Gorge of Oregon. Species composition is variable, ranging from *Leymus arenarius* (= *Elymus arenarius*) to *Betula papyrifera* to *Alnus* species. Disturbance is primarily from dune blowouts and the deposition of sand and loess. The Oregon occurrence is now mostly stabilized by vegetation because sand resupply from the Columbia River has been cut off by hydroelectric dams, but about 20 acres of open dunes remain active because of perennially strong winds. Dune creep continues to bury a bottomland forest of *Populus balsamifera* ssp. *trichocarpa*, *Fraxinus latifolia*, and *Cornus sericea*. This dune is 24-30.5 m (80-100 feet) tall, and a stabilized dune nearby is about 49 m (160 feet) tall.

Classification Comments: In Alaska, active inland dunes (as opposed to coastal dunes) have not been identified for the maritime region. It's now unclear whether this system occurs in Alaska, or only in one location in Oregon. Inland dunes apparently do not occur in the Cook Inlet Basin.

DISTRIBUTION

Range: This system is found from the Columbia River Gorge north. In Washington, only coastal dunes occur.

Divisions: 204:C

Nations: US

Subnations: AK?, OR

Map Zones: 1:P, 7:P

USFS Ecomap Regions: 331A:PP

TNC Ecoregions: 1:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722814#references

Description Author: K. Boggs and J. Kagan, mod. C. Chappell and G. Kittel

Version: 07 Feb 2005

Concept Author: K. Boggs and J. Kagan

Stakeholders: West

ClassifResp: West

NORTH PACIFIC ACTIVE VOLCANIC ROCK AND CINDER LAND (CES204.092)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lava; Cinder; Basalt

National Mapping Codes: ESLF 3140

CONCEPT

Summary: This ecological system includes active volcanic landscapes dominated by ash, pyroclastic deposits, lava, landslides and other exposed bare mineral and rock. Periodic eruptions and earthquakes are the primary processes maintaining a primarily barren environment. Decades of inactivity slowly provide opportunity for development of other systems, such as North American Glacier and Ice Field (CES300.728) or North Pacific Wooded Volcanic Flowage (CES204.883), or primary successional stages of surrounding vegetated systems to develop.

Classification Comments: Mount St. Helens is the prototype. Barren volcanic landscapes on the Alaska Peninsula and Aleutian Islands have been placed into Aleutian Volcanic Rock and Talus (CES105.308).

Similar Ecological Systems:

- Aleutian Volcanic Rock and Talus (CES105.308)

DISTRIBUTION

Range: This system is found in the Cascade Range from northern California north to Washington and is limited to barren and sparsely vegetated volcanic substrates.

Divisions: 204:C

Nations: US

Subnations: CA?, OR, WA

Map Zones: 1:C, 2:P, 6:P, 7:C, 8:P, 9:P

USFS Ecomap Regions: M242B:C?, M242C:CC, M242D:CP

TNC Ecoregions: 3:C, 4:C, 5:C, 81:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769600#references

Description Author: R. Crawford

Version: 16 Jan 2009

Concept Author: R. Crawford

Stakeholders: West

ClassifResp: West

1734 NORTH PACIFIC ALPINE AND SUBALPINE BEDROCK AND SCREE (CES204.853)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine Slopes; Alpine/AltiAndino; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Glaciated; Unconsolidated

National Mapping Codes: EVT 2734; ESLF 3118; ESP 1734

CONCEPT

Summary: This ecological system includes all the exposed rock and rubble above the forest line (subalpine parkland and above) in the North Pacific mountain ranges and is restricted to the highest elevations in the Cascade Range, from southwestern British Columbia south into northern California, and also north into southeastern Alaska. It is composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrops and scree slopes, upper mountain slopes, summits and nunataks. Nonvascular- (lichen-) dominated communities are common. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. In Alaska, this system usually occurs above alpine dwarf-shrub, herbaceous meadow, and dwarf-shrub-herbaceous systems typically at elevations higher than 915 m (3000 feet) (possibly higher in southeastern Alaska). There can be sparse cover of forbs, grasses, lichens, shrubs and small trees, but the total vascular plant cover is typically less than 25% due to the high cover of exposed rock. Species composition is variable and may include *Artemisia arctica*, *Astragalus alpinus*, *Carex microchaeta*, *Minuartia arctica*, *Salix rotundifolia*, *Saxifraga bracteata*, *Saxifraga bronchialis*, *Sibbaldia procumbens*, and *Silene acaulis*. Common nonvascular genera include *Racomitrium* and *Stereocaulon*.

Classification Comments: This system now includes the type known as Maritime High Alpine Herbaceous by the Alaska Natural Heritage Program.

Related Concepts:

- AN Alpine Sparsely Vegetated (Ecosystems Working Group 1998) Broader
- AU Alpine Unvegetated (Ecosystems Working Group 1998) Broader
- III.B.1.c - Alpine herbs (Viereck et al. 1992) Broader. sparse to unvegetated

DISTRIBUTION

Range: This ecological system is restricted to the highest elevations in the North Pacific ranges, from southeastern Alaska south into northern California.

Divisions: 204:C

Nations: CA, US

Subnations: AK, BC, CA, OR, WA

Map Zones: 1:C, 7:C, 77:C, 78:C

USFS Ecomap Regions: 342I:PP, M242A:CC, M242B:CC, M242C:CC, M242D:CC

TNC Ecoregions: 1:C, 2:C, 3:C, 4:P, 69:C, 70:C, 81:C

SOURCES

References: Ecosystems Working Group 1998, Meidinger and Pojar 1991, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.767930#references

Description Author: R. Crawford and M.S. Reid, mod. C. Chappell and T. Boucher

Version: 10 Dec 2008

Concept Author: R. Crawford

Stakeholders: Canada, West
ClassifResp: West

NORTH PACIFIC COASTAL CLIFF AND BLUFF (CES204.094)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Headland; Sea cliff; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Salt Spray; Very Shallow Soil; Landslide; W-Landscape/High Intensity; Bluff

Non-Diagnostic Classifiers: Lowland [Lowland]; Cliff (Substrate); Temperate [Temperate Oceanic]; Saline Substrate Chemistry; Xeric; Cliff (Landform); Coast

National Mapping Codes: ESLF 3158

CONCEPT

Summary: This ecological system includes unvegetated or sparsely vegetated rock cliffs and very steep bluffs of glacial deposits along the Pacific Ocean and associated marine and estuarine inlets. It is restricted to degrading slopes from southwestern British Columbia south into central Oregon. It is composed of barren and sparsely vegetated substrates, typically including exposed sediments, bedrock, and scree slopes. Exposure to waves, eroding and desiccating winds, slope failures and sheet erosion create gravelly to rocky substrates that are often unstable. There can be sparse cover of forbs, grasses, lichens and low shrubs.

Classification Comments: Small areas of rock outcrop within a mosaic of vegetated systems are best considered part of an adjacent system, e.g., within herbaceous balds and bluffs. In Washington, North Pacific Hypermaritime Shrub and Herbaceous Headland (CES204.088) and this cliff system sometimes occur adjacent or in a mosaic together, but not always. It is quite frequent to get cliffs without the vegetated part. The shrub and herbaceous component is less common. In Mediterranean California these two types of systems are split from each other (coastal grassland from coastal bluff). As far as biodiversity goes, the vegetated versus the nonvegetated are very different. This system is distinguished from Mediterranean California Coastal Bluff (CES206.906) by being further north in areas where summers are typically cooler, and winters may include some snow.

DISTRIBUTION

Range: This system is found from central Oregon north along the immediate coast into British Columbia.

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C

USFS Ecomap Regions: 242A:CC, 263A:??, M242A:CC, M261A:??

TNC Ecoregions: 1:C, 69:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769613#references

Description Author: R. Crawford and C. Chappell

Version: 30 Mar 2005

Concept Author: R. Crawford and C. Chappell

Stakeholders: Canada, West

ClassifResp: West

NORTH PACIFIC MARITIME COASTAL SAND DUNE AND STRAND (CES200.881)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Dune (Substrate); Beach (Substrate); Temperate [Temperate Oceanic]; Salt Spray

Non-Diagnostic Classifiers: Lowland [Lowland]

National Mapping Codes: ESLF 3177

CONCEPT

Summary: Coastal sand dunes are found throughout the northern Pacific Coast, from south-central Alaska to the central Oregon coast (roughly Coos Bay). This system covers large areas of the southern Washington and central Oregon coasts, but coastal dunes in Alaska have been placed into a different system. Coastal dunes include beach strand (not the beach itself but sparsely or densely vegetated areas behind the beach), foredunes, sand spits, and active to stable backdunes and sandsheets derived from quartz or gypsum sands. The mosaic of sparse to dense vegetation in dune systems is driven by sand deposition, erosion, and lateral movement. Disturbance processes include dune blowouts caused by wind and occasional wave overwash during storm tidal surges. Coastal dunes often front portions of inlets and tidal marshes. Dune vegetation typically includes herbaceous, succulent, shrub, and tree species with varying degrees of tolerance for salt spray, wind and sand abrasion, and substrate stability. Dune succession is highly variable, so species composition can vary significantly among occurrences. These dunes can be dominated by *Leymus arenarius* (= *Elymus arenarius*), *Festuca rubra*, *Leymus mollis*, or various forbs adapted to salty dry conditions. *Gaultheria shallon* and *Vaccinium ovatum* are major shrub species. Forested portions of dunes are included within this system and are characterized (at least in the south) by *Pinus contorta* var. *contorta* early in succession, *Picea sitchensis* somewhat later in the sere, and in some cases *Tsuga heterophylla* later still. *Pseudotsuga menziesii* sometimes codominates in Oregon. Disturbance processes include dune blowouts caused by wind and occasional wave overwash during storm tidal surges. Late-sere forests, dominating stabilized dune systems where active dune processes are nearly absent and that compositionally represent the adjacent matrix system, are excluded from this dune system. Interdunal wetlands occur commonly within the matrix of this system and sometimes are extensive in deflation plains or old dune troughs, but are considered part of various separate wetland ecological systems depending on their hydrology, and are not part of this upland system.

Classification Comments: Concept has been revised with input from John Christy. We include forested dunes here and put wetlands in other wetland systems. Forested dunes eventually become very similar to the matrix forest, i.e., *Picea sitchensis* basically late-successional forest dunes. Mapping issues are expected as forested dunes lose the *Pinus contorta* var. *contorta* component and become completely dominated by *Picea sitchensis* and/or *Tsuga heterophylla* (old-growth or late-successional forest composition). As long as *Pinus contorta* var. *contorta* is a prominent component, the forested dune continues to be part of the dune system.

Similar Ecological Systems:

- Alaskan Pacific Maritime Coastal Dune, Beach, and Beach Meadow (CES204.166)

Related Concepts:

- Lodgepole Pine: 218 (Eyre 1980) Intersecting
- Sitka Spruce: 223 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Artemisia campestris* - *Festuca rubra* / *Racomitrium canescens* Herbaceous Vegetation (CEGL003370, G1)
- *Carex macrocephala* Herbaceous Vegetation (CEGL003368, G1G2)
- *Empetrum nigrum* - *Gaultheria shallon* Dwarf-shrubland (CEGL000971, G2)
- *Festuca rubra* - *Ambrosia chamissonis* Herbaceous Vegetation (CEGL003290, G1)
- *Festuca rubra* Stabilized Dune Herbaceous Vegetation (CEGL001774, G1)
- *Gaultheria shallon* - *Vaccinium ovatum* / *Pteridium aquilinum* Shrubland (CEGL000972, G3)
- *Juncus falcatus* - *Trifolium wormskioldii* Herbaceous Vegetation (CEGL001570, G4)
- *Leymus mollis* ssp. *mollis* - *Abronia latifolia* Herbaceous Vegetation (CEGL001796, G2?)
- *Lupinus littoralis* Dune Herbaceous Vegetation (CEGL001974, G3)
- *Picea sitchensis* - *Pinus contorta* / *Gaultheria shallon* - *Vaccinium ovatum* Forest (CEGL000403, G3)
- *Pinus contorta* var. *contorta* - *Pseudotsuga menziesii* / *Morella californica* - *Vaccinium ovatum* Forest (CEGL000151, G3)
- *Pinus contorta* var. *contorta* / *Gaultheria shallon* - *Rhododendron macrophyllum* - *Vaccinium ovatum* Forest (CEGL000152, G1)

Alliances:

- *Carex macrocephala* Herbaceous Alliance (A.2591)
- *Empetrum nigrum* Dwarf-shrubland Alliance (A.1078)
- *Festuca rubra* Herbaceous Alliance (A.1236)
- *Festuca rubra* Intermittently Flooded Herbaceous Alliance (A.1333)

- *Gaultheria shallon* Shrubland Alliance (A.753)
- *Juncus falcatus* Temporarily Flooded Herbaceous Alliance (A.1352)
- *Leymus mollis* Herbaceous Alliance (A.1243)
- *Lupinus littoralis* Herbaceous Alliance (A.1648)
- *Picea sitchensis* Forest Alliance (A.139)
- *Pinus contorta* Forest Alliance (A.118)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North Pacific Coastal Interdunal Wetland (CES204.062)

DISTRIBUTION

Range: This system is found throughout the northern Pacific Coast, including large inlets such as Puget Sound, from south-central British Columbia to the central Oregon coast (roughly Coos Bay).

Divisions: 204:C

Nations: CA, US

Subnations: BC, OR, WA

Map Zones: 1:C, 2:C, 3:C

USFS Ecomap Regions: 242A:CC, M242A:CC

TNC Ecoregions: 1:C, 2:C, 69:P

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722794#references

Description Author: C. Chappell, G. Kittel, mod. M.S. Reid and R. Crawford

Version: 08 Dec 2008

Concept Author: K. Boggs, C. Chappell, G. Kittel

Stakeholders: Canada, West

ClassifResp: West

1733 NORTH PACIFIC MONTANE MASSIVE BEDROCK, CLIFF AND TALUS (CES204.093)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Temperate [Temperate Oceanic]; Canyon

National Mapping Codes: EVT 2733; ESLF 3155; ESP 1733

CONCEPT

Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% vascular plant cover) of steep cliff faces, narrow canyons, and larger rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus that typically occur below cliff faces. The dominant process is drought, especially farther south in its distribution, and other extreme growing conditions created by exposed rock or unstable slopes typically associated with steep slopes. Alaskan montane rock and talus probably has a significant component on nonvascular species, and is not drought-limited. Fractures in the rock surface and less steep or more stable slopes may be occupied by small patches of dense vegetation, typically scattered trees and/or shrubs. Characteristic trees includes *Chamaecyparis nootkatensis*, *Tsuga* spp., *Thuja plicata*, *Pseudotsuga menziesii* (not in Alaska), or *Abies* spp. There may be scattered shrubs present, such as *Acer circinatum*, *Alnus viridis*, and *Ribes* spp. Soil development is limited as is herbaceous cover. Mosses or lichens may be very dense, well-developed and display cover well over 10%.

Classification Comments: This system was distinguished from montane cliffs and barrens in the Rockies based on a change in floristic division and the apparent abundance of nonvascular cover on rocks compared to drier divisions. It also includes cliffs, barrens and rock outcrops in coastal southeastern Alaska, if they are not covered with snow and ice.

DISTRIBUTION

Range: This system occurs from northern California (north of Sierra Nevada Cliff and Canyon (CES206.901)) to southeastern Alaska.

Divisions: 204:C

Nations: CA, US

Subnations: AK, BC, OR, WA

Map Zones: 1:C, 2:C, 3:P, 7:C, 77:C, 78:C

USFS Ecomap Regions: 242A:CC, 242B:C?, 342D:C?, 342H:CP, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M242D:CC, M261A:CC, M261D:CP

TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 5:P, 69:C, 70:C, 81:C

SOURCES

References: Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769606#references

Description Author: R. Crawford, mod. M.S. Reid

Version: 10 Dec 2008

Concept Author: R. Crawford

Stakeholders: Canada, West

ClassifResp: West

NORTH PACIFIC SERPENTINE BARREN (CES204.095)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Montane [Lower Montane]; Herbaceous; Moss/Lichen (Nonvascular); Serpentine; Ultramafic with low Ca:Mg ratio; Very Shallow Soil; Xeric; Unconsolidated

National Mapping Codes: ESLF 3159

CONCEPT

Summary: This uncommon ecological system is found in the east and west Cascades. It is usually found on steep slopes with loosely consolidated soils and harsh soil chemical conditions (large rock outcrops and gravelly soil), although exposed ridges occur. This system occurs primarily in the Wenatchee Mountains in the east Cascades between 760 and 2100 m elevation (2500-7000 feet) on thin rocky, ultramafic (peridotite, serpentinite) soils of varying extent up to several square km. Most sites support often stunted conifers, typically stress-tolerant species. Not all ultramafic outcrops support a distinct vegetation. Only those with very low Ca:Mg ratio impact biotic composition, whereas others reflect increased influence of soil drought on ultramafic material. These systems are highly variable and are described here to include barren slopes to patches of nearly closed forests. Low-elevation sites support *Pseudotsuga menziesii*, *Pinus ponderosa*, and *Pinus monticola* trees with a sparse ground cover with *Aspidotis densa*, *Arctostaphylos nevadensis*, and *Pseudoroegneria spicata*. Higher elevations have *Pinus contorta* var. *latifolia*, *Pinus albicaulis*, *Abies lasiocarpa*, and *Tsuga mertensiana* with *Juniperus communis*, *Ledum glandulosum*, *Vaccinium scoparium*, *Poa curtifolia*, and *Festuca viridula*.

Classification Comments: This is very similar to Mediterranean California Serpentine Barrens (CES206.905) of California and southern Oregon but tends to have a more developed woody component, whereas the California serpentine barrens are more herbaceous.

Similar Ecological Systems:

- Mediterranean California Serpentine Barrens (CES206.905)

MEMBERSHIP

Associations:

- *Pinus ponderosa* / *Aspidotis densa* Woodland (CEGL000847, G1)
- *Pseudotsuga menziesii* / *Aspidotis densa* Woodland (CEGL000896, G1)

Alliances:

- *Pinus ponderosa* Woodland Alliance (A.530)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

DISTRIBUTION

Range: This uncommon system is found in the east and west Cascades of Washington.

Divisions: 204:C

Nations: US

Subnations: WA

Map Zones: 1:C, 2:C, 7:C

USFS Ecomap Regions: M242A:CC, M242B:C?, M242C:CP, M242D:CP

TNC Ecoregions: 3:P, 4:C, 81:C

SOURCES

References: del Moral 1982, Kruckeberg 1984, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.769619#references

Description Author: R. Crawford

Version: 30 Mar 2005

Concept Author: R. Crawford

Stakeholders: West

ClassifResp: West

NORTH-CENTRAL APPALACHIAN ACIDIC CLIFF AND TALUS (CES202.601)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Temperate; Acidic Soil

Non-Diagnostic Classifiers: Lowland; Sideslope; Very Shallow Soil; Ustic; Landslide

National Mapping Codes: ESLF 3154

CONCEPT

Summary: This system comprises sparsely vegetated to partially wooded cliffs and talus slopes in the Central Appalachians and adjacent ecoregions, occurring on rocks of acidic lithology and lacking any indicators of enriched conditions. This cliff system occurs at low to mid elevations from central New England south to Virginia, and up to 1500 m in West Virginia. It consists of vertical or near-vertical cliffs and the talus slopes below, formed on hills of granitic, sandstone, or otherwise acidic bedrock. In some cases, especially in periglacial areas, this system may take the form of upper-slope boulderfields without adjacent cliffs, where talus forms from freeze/thaw action cracking the bedrock. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be more well-developed and floristically different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. *Juniperus virginiana* is a characteristic tree species, *Toxicodendron radicans* a characteristic woody vine, and *Polypodium virginianum* a characteristic fern. Within its range, *Pinus virginiana* is often present.

Similar Ecological Systems:

- Central Interior Acidic Cliff and Talus (CES202.689)--occurs farther west.
- Cumberland Acidic Cliff and Rockhouse (CES202.309)--occurs to the south.
- Laurentian-Acadian Acidic Cliff and Talus (CES201.569)

DESCRIPTION

Environment: This cliff system consists of vertical or near-vertical cliffs at low to mid elevations and the talus slopes below, formed on hills of granitic, sandstone, or otherwise acidic bedrock. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present.

Vegetation: Vegetation in seepage areas tends to be more well-developed and floristically different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. *Juniperus virginiana* is a characteristic tree species, *Toxicodendron radicans* a characteristic woody vine, and *Polypodium virginianum* a characteristic fern.

MEMBERSHIP

Associations:

- Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation (CEGL006435, GNR)
- *Asplenium montanum* Central Appalachian Sandstone Sparse Vegetation (CEGL004391, GNR)
- *Betula alleghaniensis* - *Quercus rubra* / *Polypodium virginianum* Woodland (CEGL006320, G3G5)
- *Betula lenta* - *Quercus prinus* / *Parthenocissus quinquefolia* Woodland (CEGL006565, G3G4)
- *Hydrangea arborescens* / *Sedum ternatum* - *Polypodium virginianum* Shrubland (CEGL006479, GNR)
- *Juniperus virginiana* - *Corydalis sempervirens* Cliff Sparse Vegetation (CEGL006422, G4)
- *Lasallia (papulosa, pensylvanica)* - *Dimelaena oreina* - (*Melanelia culbersonii*) Nonvascular Vegetation (CEGL004142, G4?)
- *Lasallia papulosa* - *Stereocaulon glaucescens* - *Chrysothrix chlorina* Nonvascular Vegetation (CEGL004143, G1?)
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045, G4G5)
- Sandstone Midwest Moist Cliff Sparse Vegetation (CEGL002287, G4G5)
- *Umbilicaria mammulata* Nonvascular Vegetation (CEGL004387, G4?)
- *Umbilicaria muehlenbergii* - *Lasallia papulosa* - (*Melanelia stygia*) Nonvascular Vegetation (CEGL004389, G2?)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Lasallia (papulosa, pensylvanica)* Nonvascular Alliance (A.1824)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Umbilicaria mammulata* Nonvascular Alliance (A.1827)
- *Umbilicaria muehlenbergii* Nonvascular Alliance (A.1825)

DISTRIBUTION

Range: This system is found from central New England and New York south to Virginia.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, NJ, NY, OH, PA, VA, WV

Map Zones: 60:C, 61:C, 62:C, 63:P, 64:P, 65:C

USFS Ecomap Regions: 221E:CC, M221A:CC, M221B:CC, M221D:CC

TNC Ecoregions: 49:C, 52:?, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723008#references

Description Author: S.C. Gawler

Version: 26 Jul 2007

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTH-CENTRAL APPALACHIAN CIRCUMNEUTRAL CLIFF AND TALUS (CES202.603)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Temperate; Alkaline Soil

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Lowland; Sideslope; Circumneutral Soil; Very Shallow Soil; Ustic; Landslide

National Mapping Codes: ESLF 3153

CONCEPT

Summary: This cliff system occurs at low to mid elevations from central New England south to Virginia and West Virginia. It consists of vertical or near-vertical cliffs and steep talus slopes where weathering and/or bedrock lithology produce circumneutral to calcareous pH and enriched nutrient availability. Substrates include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. *Fraxinus* spp., *Tilia americana*, and *Staphylea trifolia* are woody indicators of the enriched setting. *Thuja occidentalis* may occasionally be present but is more characteristic of the related Laurentian-Acadian system to the north. The herb layer is typically not extensive but includes at least some species that are indicators of enriched conditions, e.g., *Impatiens pallida*, *Pellaea atropurpurea*, *Asplenium platyneuron*, or *Woodsia obtusa*.

Similar Ecological Systems:

- Central Appalachian Alkaline Glade and Woodland (CES202.602)--overlaps with this system in all but the northernmost portions of the range; it is closely related but distinguished by being in a setting other than cliff/talus (e.g., rocky ridges) and by having a greater prominence of graminoids in the ground layer.
- Central Interior Calcareous Cliff and Talus (CES202.690)
- Laurentian-Acadian Calcareous Cliff and Talus (CES201.570)--occurs farther north.
- Southern Interior Calcareous Cliff (CES202.356)--includes circumneutral cliff and talus communities from southern Virginia south.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Fraxinus americana* - *Juglans cinerea* / *Staphylea trifolia* / *Adlumia fungosa* Forest (CEGL006577, GNR)
- *Acer saccharum* - *Quercus muehlenbergii* / *Carex platyphylla* Forest (CEGL006162, GNR)
- *Acer saccharum* - *Quercus muehlenbergii* Forest (CEGL005010, GNR)
- *Acer saccharum* - *Tilia americana* - *Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland (CEGL005058, G3G5)
- *Acer saccharum* - *Tilia americana* / *Staphylea trifolia* / *Dryopteris marginalis* - (*Impatiens pallida*) Forest (CEGL006471, G3G4)
- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparse Vegetation (CEGL004476, G3G4)
- *Pellaea atropurpurea* Cliff Sparse Vegetation (CEGL006527, GNR)
- *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596, G2G3)
- *Tilia americana* - *Fraxinus americana* / *Acer pensylvanicum* - *Ostrya virginiana* / *Parthenocissus quinquefolia* - *Impatiens pallida* Woodland (CEGL008528, G3)
- *Tilia americana* - *Fraxinus americana* / *Cornus florida* Woodland (CEGL006054, G3G5)

Alliances:

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparsely Vegetated Alliance (A.1832)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

DISTRIBUTION

Range: This system ranges from central New England and New York south to Virginia and West Virginia. The extent of the Virginia range remains to be documented, but it appears to be absent from the Southern Blue Ridge and Southern Ridge and Valley portions of the state.

Divisions: 202:C

Nations: US

Subnations: MA, MD, NH, NJ, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 59:P, 61:C, 62:?, 63:P, 64:C, 65:C, 66:P

USFS Ecomap Regions: 221B:CC, 221D:CC, 221E:CC, M221A:CC, M221B:CC

TNC Ecoregions: 52:?, 59:P, 60:?, 61:C

SOURCES

References: Comer et al. 2003, Vanderhorst pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723006#references

Description Author: S.C. Gawler, mod. M. Pyne

Version: 05 May 2008

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTHEASTERN EROSIONAL BLUFF (CES203.498)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Deep Soil; Unconsolidated; Bluff

National Mapping Codes: EVT 3114

CONCEPT

Summary: These steep, linear cliffs form where erosion in deep glacial or alluvial deposits has left tall (>3 m), nearly vertical banks of sand, silt, clay, or a mixture. They typically develop in landscapes that are otherwise of rather low relief. The substrate is unconsolidated and provides habitat for certain animals that burrow into steep banks, such as bank swallows and certain invertebrates. Vegetation is very sparse, mostly herbaceous, and variable in composition. Known examples occur in the Chesapeake Bay, some maritime bluffs along the Northern Atlantic Coast, the Lake Erie and Lake Ontario coastlines, and some of the larger northeastern rivers.

Classification Comments: These features are very narrow but may extend over hundreds of meters or more. They are distinctly different from adjacent habitats. They are sometimes referred to as cliffs; the usage of "cliff" and "bluff" is colloquially inconsistent.

Related Concepts:

- Dry River Bluff (Sperduto and Nichols 2004) Undetermined
- Dry Riverside Bluff (Swain and Kearsley 2001) Undetermined
- Erosional River Bluff (Thompson and Sorenson 2000) Undetermined
- Erosional Slope/Bluff (Edinger et al. 2002) Broader

DESCRIPTION

Dynamics: This system is subject to continuing erosion from wind or water such that persistent vegetation rarely develops. Instability can also lead to slumps where large sections of the bank let go.

MEMBERSHIP

Associations:

- Maritime Erosional Cliffs (CEGL006618, GNR)

Alliances:

- Open Cliff Sparsely Vegetated Alliance (A.1836)

SPATIAL CHARACTERISTICS

Spatial Summary: Linear features that may extend for only a few tens of meters to hundreds of meters or more.

DISTRIBUTION

Range: This system is currently documented from the Chesapeake Bay north to Maine and along the shores of Lakes Erie and Ontario.

Divisions: 201:C; 202:C; 203:C

Nations: CA, US

Subnations: CT?, MA, MD, ME, NH, NY, PA, VA?, VT

Map Zones: 60:C, 63:C, 64:P, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 221A:CC, 222I:CC, 232H:CC

TNC Ecoregions: 48:C, 58:C, 62:C, 63:C, 64:C

SOURCES

References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson and Sorenson 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.820014#references

Description Author: S.C. Gawler

Version: 12 Nov 2008

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN SANDY BEACH (CES203.301)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Graminoid; Coast

National Mapping Codes: ESLF 3124

CONCEPT

Summary: This system includes sparsely vegetated ocean beaches constituting the outermost zone of coastal vegetation ranging from northern North Carolina (north of Bodie Island) northward to the terminus of extensive sandy coastlines and the beginning of rocky coasts. Examples generally extend seaward from foredunes but may include flats behind breached foredunes. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by waves and may be flooded by high spring tides and storm surges (Fleming et al. 2001). Constant salt spray and rainwater maintain generally moist conditions. Substrates consist of unconsolidated sand and shell sediments that are constantly shifted by winds and floods. Dynamic disturbance regimes largely limit vegetation to pioneering, salt-tolerant, succulent annuals. *Cakile edentula* ssp. *edentula* and *Salsola kali* (= *Salsola caroliniana*) are usually most numerous and characteristic. Other scattered associates include *Sesuvium maritimum*, *Polygonum glaucum*, *Polygonum ramosissimum* var. *prolificum*, *Suaeda linearis* and *Suaeda maritima*, and *Atriplex cristata* (= *Atriplex pentandra*).

Classification Comments: In Virginia, this system is distributed along the ocean side of the Eastern Shore (Accomack and Northampton counties) and on Cape Henry and False Cape (City of Virginia Beach).

Similar Ecological Systems:

- Central Atlantic Coastal Plain Sandy Beach (CES203.064)--is found to the south.
- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)

DESCRIPTION

Environment: This system includes sparsely vegetated ocean beaches that constitute the outermost zone of coastal vegetation ranging from northern North Carolina northward to the terminus of extensive sandy coastlines and the beginning of rocky coasts. Examples generally extend seaward from foredunes but may include flats behind breached foredunes.

Dynamics: Extensive construction of high, artificial dunes along the Atlantic Coast has reduced the extent of these habitats by increasing oceanside beach erosion and eliminating the disturbance regime that creates and maintains overwash flats.

MEMBERSHIP

Associations:

- *Cakile edentula* ssp. *edentula* - *Chamaesyce polygonifolia* Sparse Vegetation (CEGL004400, G4G5)
- *Sesuvium portulacastrum* - *Atriplex* spp. - *Suaeda* spp. Sparse Vegetation (CEGL004406, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)
- *Sesuvium* spp. - *Atriplex* spp. - *Suaeda* spp. Tidal Sparsely Vegetated Alliance (A.1868)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Dune and Swale (CES203.264)

DISTRIBUTION

Range: This system ranges from northern North Carolina northward to the terminus of extensive sandy coastlines and the beginning of rocky coasts in southern Maine.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NC, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 211D:CC, 221A:CC, 232A:CC, 232H:CC, 232I:CC

TNC Ecoregions: 57:C, 58:C, 62:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723190#references

Description Author: R. Evans

Version: 12 Oct 2004

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

1341 NORTHWESTERN GREAT PLAINS CANYON (CES303.658)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Very Shallow Soil; Flood Scouring; Canyon

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2341; ESLF 4148; ESP 1341

CONCEPT

Summary: This system occurs primarily along springbranch and dry canyons. Soils can range from deep loams to alluvial to sandy. Limestone and sandstone rock outcrops and cliffs are common. This system often contains elements of other systems that form a complex, small-patch or linear mosaic. Ecological processes are related to canyon landforms and patchy vegetation. Examples of this system are found along the Niobrara and North Platte rivers in Nebraska. Areas along the tributaries of the White River and within the Black Hills region of South Dakota also may be considered part of this system. Vegetation varies locally depending on aspect, slope position and substrate and can range from riparian vegetation to xeric or mesic woodlands. Rock outcrops with sparse vegetation are also common. Dominant tree species include *Quercus macrocarpa*, *Populus deltoides*, *Fraxinus pennsylvanica*, *Ulmus rubra*, *Pinus ponderosa*, and *Juniperus scopulorum* and *Juniperus virginiana*; shrub species may be present as well. This system can grade into areas dominated by *Pinus ponderosa*. Other system elements contained in this system include Western Great Plains Cliff and Outcrop (CES303.665) on south aspects and rims; Western Great Plains Riparian (CES303.956) in drainages, and Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822) and Northwestern Great Plains Shrubland (CES303.662), but unique geology and dynamics bring these together to form this canyon system. Occasionally, fens may occur in canyon bottom seeps.

DESCRIPTION

Vegetation: Vegetation can vary locally with aspect, slope position and substrate. It can range from riparian to mesic to xeric woodlands. Several tree species, such as *Quercus macrocarpa*, *Populus deltoides*, *Betula papyrifera*, *Fraxinus pennsylvanica*, *Ulmus rubra*, and *Pinus ponderosa*, and shrub species, such as *Juniperus virginiana* and *Juniperus scopulorum*, can occur within this system. Cover of these species can range from less than 10% on rock outcrops to greater than 60%.

MEMBERSHIP

Associations:

- *Betula papyrifera* - (*Tilia americana*, *Quercus macrocarpa*) Canyon Forest (CEGL002013, G2?)
- *Carex pellita* - *Carex* spp. - *Schoenoplectus tabernaemontani* Fen Herbaceous Vegetation (CEGL002041, G1)
- *Cercocarpus montanus* / *Bouteloua curtipendula* Shrubland (CEGL001086, G5)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix (exigua, interior)* Woodland (CEGL000659, G3G4)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Carex pellita* Woodland (CEGL002649, G2)
- *Populus deltoides* / *Panicum virgatum* - *Schizachyrium scoparium* Woodland (CEGL001454, G2)
- *Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (CEGL002072, G4)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Hesperostipa spartea* Woodland (CEGL002053, G2G3)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Panicum virgatum* Woodland (CEGL002052, G1G2)
- *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203, G5)

Alliances:

- *Betula papyrifera* Forest Alliance (A.267)
- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Quercus macrocarpa* Forest Alliance (A.245)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Shrubland (CES303.662)
- Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)
- Western Great Plains Cliff and Outcrop (CES303.665)

- Western Great Plains Riparian (CES303.956)

Adjacent Ecological System Comments: Other system elements contained in this system include Western Great Plains Cliff and Outcrop (CES303.665) on south aspects and rims; Western Great Plains Riparian (CES303.956) in drainages, and Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822) and Northwestern Great Plains Shrubland (CES303.662), but unique geology and dynamics bring these together to form this canyon system.

DISTRIBUTION

Range: This system occurs along springbranch and dry canyons along the Niobrara and North Platte rivers in Nebraska and likely ranges north along the tributaries of the White River and areas within the Black Hills region of South Dakota.

Divisions: 303:C

Nations: US

Subnations: NE, SD?, WY?

Map Zones: 22:?, 29:C, 30:?, 31:C, 33:?, 38:C, 39:?, 40:?

USFS Ecomap Regions: 331K:PP, 331L:PP, 331M:P?, M331I:PP

TNC Ecoregions: 26:C, 33:C, 35:P

SOURCES

References: Midwestern Ecology Working Group n.d., Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.735388#references

Description Author: S. Menard

Version: 27 May 2004

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, West

ClassifResp: Midwest

ROCKY MOUNTAIN ALPINE BEDROCK AND SCREE (CES306.809)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Alpine Slopes; Alpine/AltiAndino [Alpine/AltiAndino]; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Glaciated; Unconsolidated

National Mapping Codes: ESLF 3135

CONCEPT

Summary: This ecological system is restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, west into the highest mountain ranges of the Great Basin. It is composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrop and scree slopes, with nonvascular- (lichen) dominated communities. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. There can be sparse cover of forbs, grasses, lichens and low shrubs.

Related Concepts:

- Alpine Rangeland (410) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Aquilegia caerulea* - *Cirsium scopulorum* Scree Sparse Vegetation (CEGL001938, GU)
- *Aquilegia flavescens* - *Senecio megacephalus* Sparse Vegetation (CEGL005899, G2G3)
- *Athyrium americanum* - *Cryptogramma acrostichoides* Sparse Vegetation (CEGL005900, G2G3)
- *Cirsium scopulorum* - *Polemonium viscosum* Herbaceous Vegetation (CEGL001959, GU)
- *Claytonia megarhiza* Herbaceous Vegetation (CEGL001878, GU)
- *Ivesia cryptocaulis* Alpine Sparse Vegetation (CEGL002735, G1)
- *Phacelia hastata* - (*Penstemon ellipticus*) Sparse Vegetation (CEGL005901, G2G3)
- *Polemonium viscosum* Herbaceous Vegetation (CEGL001928, G3G4)
- *Saxifraga bronchialis* Scree Slope Sparse Vegetation (CEGL005902, G3?)
- *Saxifraga mertensiana* Cliff Crevice Sparse Vegetation (CEGL005903, G2?)
- *Senecio taraxacoides* - *Oxyria digyna* Herbaceous Vegetation (CEGL001932, GU)
- Sparse (on rock and unconsolidated substrates) Nonvascular Vegetation (CEGL002888, GNR)

Alliances:

- *Aquilegia (caerulea, flavescens)* Sparsely Vegetated Alliance (A.1603)
- *Athyrium americanum* Sparsely Vegetated Alliance (A.1625)
- *Cirsium scopulorum* Herbaceous Alliance (A.1608)
- *Claytonia megarhiza* Herbaceous Alliance (A.1626)
- *Ivesia cryptocaulis* Sparsely Vegetated Alliance (A.2513)
- *Phacelia hastata* Sparsely Vegetated Alliance (A.2634)
- *Polemonium viscosum* Herbaceous Alliance (A.1631)
- *Saxifraga (chrysantha, mertensiana)* Sparsely Vegetated Alliance (A.1632)
- *Saxifraga bronchialis* Sparsely Vegetated Alliance (A.2635)
- *Senecio taraxacoides* Herbaceous Alliance (A.1634)
- Sparse Nonvascular Vegetation Alliance (on rock and unconsolidated substrates) (A.2660)

DISTRIBUTION

Range: Restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, west into the highest mountain ranges of the Great Basin.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Map Zones: 1:P, 9:P, 10:C, 12:P, 15:P, 16:C, 17:C, 18:?, 19:C, 21:C, 22:P, 23:C, 24:C, 25:C, 28:C, 29:P

USFS Ecomap Regions: 331G:PP, 331J:P?, 341A:C?, 341B:CC, 341E:CP, 341F:CP, 341G:CC, 342A:CC, 342B:C?, 342C:C?, 342D:CP, 342H:C?, 342J:CP, M242D:PP, M313A:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:??, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:C

SOURCES

References: Anderson 1999a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Nelson 1998, Willard 1963

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722864#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

ROCKY MOUNTAIN CLIFF, CANYON AND MASSIVE BEDROCK (CES306.815)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Ridgetop bedrock outcrop; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil; Landslide; Canyon; Cliff (Landform)

Non-Diagnostic Classifiers: Escarpment; Long (>500 yrs) Persistence; Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Temperate [Temperate Continental]; Butte

National Mapping Codes: ESLF 3129

CONCEPT

Summary: This ecological system of barren and sparsely vegetated landscapes (generally <10% plant cover) is found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous (intrusives), sedimentary, and metamorphic bedrock types. It is located throughout the Rocky Mountains and northeastern Cascade Ranges in North America. Also included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry sparsely vegetated places on a landscape. The biota on them reflect what is surrounding them, unless it is an extreme parent material. There may be small patches of dense vegetation, but it typically includes scattered trees and/or shrubs. Characteristic trees includes species from the surrounding landscape, such as *Pseudotsuga menziesii*, *Pinus ponderosa*, *Pinus flexilis*, *Populus tremuloides*, *Abies concolor*, *Abies lasiocarpa*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus*, *Ribes*, *Physocarpus*, *Rosa*, *Juniperus*, and *Jamesia americana*, *Mahonia repens*, *Rhus trilobata*, or *Amelanchier alnifolia*. Soil development is limited, as is herbaceous cover.

Classification Comments: This has a very broad elevation range (<3350 m) for a system; consider dividing into foothills/montane and subalpine. And/or by floristic division. This is in the Okanagan and Rockies as the montane sparse. North Pacific Montane Massive Bedrock, Cliff and Talus (CES204.093) includes everything in the Cascades and west, except the northeastern Cascades, where occurrences are this system (CES306.815). Inter-Mountain Basins Cliff and Canyon (CES304.779) occurs in the dry foothills on the east side of EDC MapZone1.

Related Concepts:

- CL Cliff (Ecosystems Working Group 1998) Broader
- RO Rock (Ecosystems Working Group 1998) Broader
- TA Talus (Ecosystems Working Group 1998) Broader

MEMBERSHIP

Associations:

- *Abies concolor* - (*Pseudotsuga menziesii*) / *Jamesia americana* - *Holodiscus dumosus* Scree Woodland (CEGL000890, GNR)
- *Abies lasiocarpa* / *Holodiscus dumosus* Scree Woodland (CEGL000918, G3)
- *Abies lasiocarpa* / *Salix brachycarpa* Scree Woodland (CEGL000922, GUQ)
- *Abies lasiocarpa* / *Salix glauca* Scree Woodland (CEGL000923, GUQ)
- *Abies lasiocarpa* / *Saxifraga bronchialis* Scree Woodland (CEGL000924, G4)
- *Abies lasiocarpa* Scree Woodland (CEGL000925, G5?)
- *Aletes anisatus* - *Scutellaria brittonii* Scree Herbaceous Vegetation (CEGL001948, GU)
- *Athyrium americanum* Sparse Vegetation (CEGL001849, GU)
- *Carex nardina* Scree Herbaceous Vegetation (CEGL001812, GNR)
- Granite - Metamorphic Black Hills Rock Outcrop Sparse Vegetation (CEGL002295, G4)
- *Heuchera bracteata* - *Heuchera parvifolia* var. *nivalis* Herbaceous Vegetation (CEGL001971, GU)
- *Holodiscus dumosus* Rock Outcrop Sparse Vegetation (CEGL002801, GNR)
- Igneous - Metamorphic Black Hills Butte Sparse Vegetation (CEGL005283, GNR)
- *Jamesia americana* Rock Outcrop Shrubland (CEGL002783, GNR)
- *Picea engelmannii* / *Saxifraga bronchialis* Scree Sparse Vegetation (CEGL000893, G4)
- *Pinus contorta* Scree Woodland (CEGL000766, G5?)
- *Pinus flexilis* Scree Woodland (CEGL000815, G3Q)
- *Pinus ponderosa* / *Ribes inerme* Scree Woodland (CEGL000876, G4)
- *Pinus ponderosa* Limestone Cliff Sparse Vegetation (CEGL002055, G4?)
- *Populus tremuloides* / *Physocarpus malvaceus* - *Amelanchier alnifolia* Scree Woodland (CEGL000945, G4Q)
- *Pseudotsuga menziesii* / *Holodiscus dumosus* Scree Woodland (CEGL000902, G3G4)
- *Pseudotsuga menziesii* Scree Woodland (CEGL000911, G5)
- *Ribes cereum* / *Leymus ambiguus* Shrubland (CEGL001124, G2)
- *Rubus idaeus* Scree Shrubland (CEGL001134, GU)

- *Saxifraga rivularis* Herbaceous Vegetation (CEGL001930, GU)
- Scree - Talus Black Hills Sparse Vegetation (CEGL002307, GNR)
- Sparse (on rock and unconsolidated substrates) Nonvascular Vegetation (CEGL002888, GNR)

Alliances:

- *Abies concolor* Woodland Alliance (A.553)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Aletes anisatus* Herbaceous Alliance (A.1639)
- *Athyrium americanum* Sparsely Vegetated Alliance (A.1625)
- *Carex nardina* Herbaceous Alliance (A.1299)
- *Heuchera bracteata* Herbaceous Alliance (A.1646)
- *Jamesia americana* Shrubland Alliance (A.2566)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Picea engelmannii* Sparsely Vegetated Alliance (A.556)
- *Pinus contorta* Woodland Alliance (A.512)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Populus tremuloides* Woodland Alliance (A.610)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)
- *Ribes cereum* Shrubland Alliance (A.923)
- Rock Outcrop Sparsely Vegetated Alliance (A.1838)
- *Rubus idaeus* ssp. *strigosus* Shrubland Alliance (A.927)
- *Saxifraga rivularis* Herbaceous Alliance (A.1633)
- Sparse Nonvascular Vegetation Alliance (on rock and unconsolidated substrates) (A.2660)

DISTRIBUTION

Range: This system is located throughout the Rocky Mountain, including the isolated island ranges of central Montana, and northeastern Cascade Ranges in North America.

Divisions: 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, OR, TX, UT, WA, WY

Map Zones: 1:C, 8:?, 9:P, 10:C, 12:?, 15:P, 16:C, 17:C, 18:P, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:C, 29:C, 33:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 331A:C?, 331B:CC, 331D:C?, 331G:CC, 331H:CC, 331I:CP, 331J:CC, 331K:CP, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341F:CC, 341G:CC, 342A:CP, 342B:CC, 342C:CC, 342D:CP, 342E:CC, 342F:CP, 342G:CP, 342H:CP, 342I:CP, 342J:CC, M242B:CP, M242C:CC, M242D:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC

TNC Ecoregions: 7:C, 8:C, 9:C, 20:C, 21:C, 25:C, 26:C, 68:C

SOURCES

References: Andrews and Righter 1992, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Hess and Wasser 1982, Larson et al. 2000, Neely et al. 2001, Peet 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722858#references

Description Author: NatureServe Western Ecology Team, mod. M.S. Reid

Version: 04 Apr 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, Southeast, West

ClassifResp: West

SIERRA NEVADA CLIFF AND CANYON (CES206.901)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Mediterranean [Mediterranean Xeric-Oceanic]; Canyon

Non-Diagnostic Classifiers: Canyon Mosaic; Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Ridge/Summit/Upper Slope; Very Shallow Soil; Landslide; Needle-Leaved Tree; Broad-Leaved Evergreen Shrub; Graminoid; Nonvascular; Cliff (Landform)

National Mapping Codes: ESLF 3171

CONCEPT

Summary: Found from foothill to subalpine elevations throughout the Sierra Nevada and nearby mountain ranges, these are barren and sparsely vegetated areas (<10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock. This system also includes unstable scree and talus slopes typically occurring below cliff faces. Scattered vegetation may include *Abies magnifica*, *Pseudotsuga menziesii*, *Pinus contorta* var. *murrayana*, *Pinus ponderosa*, *Pinus jeffreyi*, *Populus tremuloides*, or *Pinus monophylla*, *Juniperus osteosperma*, and *Cercocarpus ledifolius* at lower elevations. There may be shrubs including species of *Arctostaphylos* or *Ceanothus*. Soil development is limited as is herbaceous cover.

DISTRIBUTION

Range: Found from foothill to subalpine elevations throughout the Sierra Nevada and nearby mountain ranges.

Divisions: 206:C

Nations: US

Subnations: CA, NV, OR

Map Zones: 4:?, 6:C, 7:C, 12:C

USFS Ecomap Regions: 322A:??, 341D:CC, 341E:CC, 341F:CC, 342B:CC, M261D:CC, M261E:CC, M261F:CC

TNC Ecoregions: 4:C, 5:C, 12:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722780#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: West

ClassifResp: West

SOUTH FLORIDA SHELL HASH BEACH (CES411.271)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Graminoid; Coast

National Mapping Codes: ESLF 3138

CONCEPT

Summary: This system represents carbonate sand beaches of the Florida Keys and south Florida mangrove islands (after Johnson and Barbour 1990). The vegetation is poorly known but apparently includes at least one endemic species, *Chamaesyce garberi*. Other diagnostic species may include *Piscidia piscipula* and *Pithecellobium keyense*.

Classification Comments: No associations have currently been described in the NVC for this system. More information is needed.

Related Concepts:

- Unconsolidated Substrate (FNAI 1990) Broader

MEMBERSHIP

Associations:

- *Uniola paniculata* - *Hymenocallis latifolia* Herbaceous Vegetation (CEGL003966, G1?)

Alliances:

- *Uniola paniculata* Subtropical Herbaceous Alliance (A.1153)

DISTRIBUTION

Range: The range of this system includes Cape Sable (the southernmost point of mainland Florida), Ten Thousand Islands (Collier County), Florida Keys, and islands in Biscayne Bay (near Miami).

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Johnson and Barbour 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723215#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1500 SOUTH TEXAS SALT AND BRACKISH TIDAL FLAT (CES301.461)

CLASSIFIERS

Classification Status: Standard

Primary Division: Madrean Semidesert (301)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Haline]

FGDC Crosswalk: Vegetated, No dominant lifeform, Sparsely vegetated

National Mapping Codes: EVT 2500; ESLF 3113; ESP 1500

CONCEPT

Summary: This system includes regularly to irregularly flooded hypersaline tidal flats (often exceeding a thousand acres in size). Dominants include a variety of vascular and nonvascular species. The cyanobacteria (blue-green algae) *Lyngbea* spp. may dominate thousands of acres. Total vegetative cover is quite variable, from near total absence of vascular plants to a dense cover of one of several dominant species including *Batis maritima*, *Monanthochloe littoralis*, *Spartina spartinae*, *Borrchia frutescens*, and *Sarcocornia perennis*. In addition to the dominants, other halophytic plants of this system include *Atriplex matamorensis*, *Distichlis spicata*, *Sarcocornia perennis*, *Sporobolus virginicus*, *Maytenus phyllanthoides*, *Prosopis reptans*, *Borrchia frutescens*, *Suaeda linearis*, *Suaeda conferta*, *Monanthochloe littoralis*, *Lycium carolinianum* var. *quadrifidum*, *Spartina spartinae*, *Sesuvium portulacastrum*, *Rayjacksonia phyllocephala*, and *Blutaparon vermiculare*. In addition to dominating non-vegetated areas, algal mats of blue-green and sometimes green algae are characteristically present, visible even in densely vegetated pannes. Blue-green algae may contribute significantly more biomass than vascular species. Widely scattered *Avicennia germinans* (and, less frequently, other mangroves) may occur.

DESCRIPTION

Environment: This system occurs in tidal and other hypersaline situations along upper marsh edges and in tidal flats ranging in scale from narrow bands to hundreds of hectares along the Gulf Coast of southern Texas and Mexico. It is regularly to irregularly flooded by shallow brackish waters as a result of lunar, wind and storm tides. As these waters evaporate, high concentrations of salt accumulate, producing hypersaline conditions, forming "salt pannes." It is found along barrier island and mainland shores of hypersaline lagoons and bays where evaporation often exceeds freshwater input.

MEMBERSHIP

Associations:

- *Avicennia germinans* / *Batis maritima* Shrubland (CEGL007757, G3?)
- *Batis maritima* - *Sarcocornia pacifica* Dwarf-shrubland (CEGL003956, G5)
- *Borrchia frutescens* / *Spartina spartinae* Shrubland (CEGL004617, G3G4)
- *Lyngbea* spp. Wind-Tidal Flat Nonvascular Vegetation (CEGL007840, G4)
- *Sarcocornia pacifica* - (*Batis maritima*, *Distichlis spicata*) Dwarf-shrubland (CEGL002278, G4)
- *Spartina spartinae* - *Monanthochloe littoralis* - *Suaeda linearis* Herbaceous Vegetation (CEGL004614, G3?)

Alliances:

- *Avicennia germinans* Tidal Shrubland Alliance (A.733)
- *Batis maritima* Tidal Dwarf-shrubland Alliance (A.1111)
- *Borrchia frutescens* Tidal Shrubland Alliance (A.1026)
- *Lyngbea* spp. Wind-Tidal Flat Nonvascular Alliance (A.1929)
- *Sarcocornia pacifica* - (*Distichlis spicata*, *Spartina alterniflora*) Tidal Dwarf-shrubland Alliance (A.1705)
- *Spartina spartinae* Tidal Herbaceous Alliance (A.1483)

DISTRIBUTION

Range: This system ranges south of Corpus Christi Bay along the northern Gulf of Mexico.

Divisions: 301:C

Nations: US

Subnations: TX

Map Zones: 36:C

USFS Ecomap Regions: 255D:CC, 315E:??

TNC Ecoregions: 31:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723125#references

Description Author: J. Teague

Version: 13 Jan 2003

Stakeholders: Southeast

SOUTHEAST FLORIDA BEACH (CES411.272)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Graminoid; Coast

National Mapping Codes: ESLF 3136

CONCEPT

Summary: This beach ecological system is the southernmost of its kind along the mainland coast of North America. Its southerly location distinguishes it from other types along the Atlantic Coast, primarily due to the prevalence of the tropical flora it supports. This type is related to Southwest Florida Beach (CES411.276) but is affected directly by much higher wave energy from the Atlantic. This region has some of the highest wave energy along the entire Atlantic Coastal Plain (Tanner 1960).

Classification Comments: Apparently few, if any, associations have currently been described in the NVC for this system. More information is needed.

Similar Ecological Systems:

- Southwest Florida Beach (CES411.276)

MEMBERSHIP

Associations:

- *Ipomoea pes-caprae* - *Cakile lanceolata* Herbaceous Vegetation (CEGL004403, G3G4)

Alliances:

- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)

DISTRIBUTION

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723214#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN GRANITIC DOME (CES202.297)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

National Mapping Codes: ESLF 3126

CONCEPT

Summary: This system consists of smooth, curved, exfoliated outcrops of massive granite and related rocks in the Southern Blue Ridge and adjacent upper/inner Piedmont. Smooth rock without crevices is the primary factor in the distinctive ecological character of this system. The outcrop surface is largely bare rock but has thin soil mats around the edges and patchily throughout. Mats vary in depth with age and level of development. Resulting vegetation is a complex of small patches of different species and structure on soil mats of different depths, ranging from moss and lichens to herbs to shrubs and trees

Classification Comments: Granitic domes are clearly related to other rock outcrop systems in the southern Appalachians. Most similar in the region are Southern and Central Appalachian Mafic Glade and Barrens (CES202.348), which are distinguished by having more continuous vegetation and only a minority of bare rock, resulting from a more irregular rock surface or less steep slope. Glades and barrens occur on a wider range of rock types, but it is possible that granitic domes develop into glades over long periods of time (probably centuries or longer) if exfoliation ceases to occur. Southern Appalachian Montane Cliff and Talus (CES202.330) and Southern Appalachian Rocky Summit (CES202.327) differ in having more fractured rock, with vegetation dominated by plants rooted in fixed microsites related to crevices, ledges, and other small features. Southern Piedmont Granite Flatrock and Outcrop (CES202.329) is most similar to Southern Appalachian Granitic Dome (CES202.297) in occurring on smooth, exfoliated outcrops and having vegetation driven by soil mat dynamics. Some species are shared, but biogeography and climatic differences make for vegetation that is different.

Deeper soils often have pine-dominated vegetation with dense shrubs, resembling that of Southern Appalachian Montane Pine Forest and Woodland (CES202.331). These communities should be treated as part of this system if they are closely associated with exfoliation outcrops with the more distinctive granitic dome communities. The same is true of closely associated islands and stunted patches of vegetation resembling Southern Appalachian Oak Forest (CES202.886).

Similar Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

DESCRIPTION

Environment: This system occurs on exfoliated granitic outcrops. In the upper/inner Piedmont, it usually occurs as isolated hills (inselbergs or monadnocks) that stand above the surrounding landscape. In the Blue Ridge, it usually occurs as part of larger mountain ranges but often still as somewhat distinctive knobs. Granite, granitic gneiss, and related rocks without many internal joints tend to fracture in thin sheets parallel to the surface, forming curved outcrops with smooth surfaces largely lacking crevices. Granitic dome outcrops develop on upper to midslopes, and most face south. Most individual outcrops grade from nearly level to very steep. The outcrop surface is largely bare rock but has thin soil mats around the edge and in patches throughout. Mats vary in depth with age and level of development. The smooth rock without crevices is the primary factor in the distinctive ecological character of this system. Distinct microenvironments are created by small irregularities in the rock surface and by areas of seepage at the edge. Elevation is an important factor affecting different associations within the system.

Vegetation: Most of the rock surface is bare or has only crustose or foliose lichen cover. Vegetation occurs as a series of small patches in the thin soil mats, with the kind of vegetation closely related to depth of the mat. Bare rock may have moss patches. The thinnest soils usually have a set of fine forbs, many of them annual. Slightly deeper soils often have grasses dominating. Deeper soils support shrubs or small trees. The flora shares some species with other rock outcrops of similar elevations but has some distinctive species and different dominance of species.

Dynamics: Granitic domes have a distinctive pattern of cyclical primary succession. Soil mats appear and deepen over time in a process that links vegetational and soil development, but are eventually destroyed by wind throw, drought, other natural disturbances, or simply falling off the rock. The result is a pattern with mats of different levels of development at any given time. Mat dynamics are different in different parts of the rock, with older mats and more permanent patterns near the edges, and sparser and younger mats in the interior. The dynamics are further modified by microtopography and the presence of seepage. The overall vegetation patterns likely respond to climatic cycles and natural disturbance events. The thin soils make these communities sensitive to drought, especially the long-lived woody species.

MEMBERSHIP

Associations:

- (*Quercus prinus*) / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Danthonia spicata* / *Cladonia* spp. Herbaceous Vegetation (CEGL004990, G1G2)
- *Carex biltmoreana* - *Pycnanthemum* spp. - *Krigia montana* Herbaceous Vegetation (CEGL004523, G2G3)
- *Lasallia papulosa* - *Umbilicaria caroliniana* Nonvascular Vegetation (CEGL004386, G2?)
- *Quercus rubra* / *Rhododendron catawbiense* - *Rhododendron arborescens* Woodland (CEGL004503, G2)
- *Selaginella rupestris* - *Schizachyrium scoparium* - *Hypericum gentianoides* - *Bulbostylis capillaris* Herbaceous Vegetation (CEGL007690, G2)
- *Selaginella tortipila* - *Krigia montana* - *Houstonia longifolia* Herbaceous Vegetation (CEGL004283, G2G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Carex biltmoreana* Herbaceous Alliance (A.1277)
- *Lasallia papulosa* - *Umbilicaria caroliniana* Nonvascular Alliance (A.1826)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Selaginella* (*tortipila*, *rupestris*) Herbaceous Alliance (A.1985)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system, most examples covering a few acres.

Size: Most examples naturally cover a few acres, with a few examples up to 10 or more acres. Most examples occur in a few clusters where geology is suitable (e.g., the Blue Ridge escarpment at the South Carolina-North Carolina border and the Brushy Mountains in North Carolina), but most examples in these clusters are probably far enough apart to be considered separate occurrences. Individual knobs may have a cluster of several closely associated outcrops separated by small patches of forest.

Adjacent Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Appalachian Oak Forest (CES202.886). Patches of oak forests may occur in a mosaic with the granitic domes.

DISTRIBUTION

Range: This system is restricted to the Southern Blue Ridge and adjacent upper/inner Piedmont in the Carolinas and Georgia.

Divisions: 202:C

Nations: US

Subnations: GA?, NC, SC

Map Zones: 57:C, 59:C

USFS Ecomap Regions: 221D:CC, 231A:CC, 231I:CC

TNC Ecoregions: 51:C, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723194#references

Description Author: M. Schafale and R. Evans

Version: 18 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN MONTANE CLIFF AND TALUS (CES202.330)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Moss/Lichen (Nonvascular); Cliff (Substrate)

National Mapping Codes: ESLF 3186

CONCEPT

Summary: This system consists of steep to vertical or overhanging rock outcrops (and related steep talus slopes) of the Southern Blue Ridge and adjacent parts of other ecoregions. It occurs on lower slopes, usually in river gorges or bluffs. The sparse vegetation is limited to plants growing on bare rock, small ledges, and crevices. Vegetation is primarily bryophytes, lichens, and herbs, with sparse trees and shrubs rooted in deeper soil pockets and crevices.

Classification Comments: This system is distinguished from other rock outcrops by a combination of low topographic position, vertical orientation, large amount of bare rock, and absence of specialized environments such as exfoliated granite, limestone or dolomite, and spray from waterfalls. In contrast, Southern Appalachian Rocky Summit (CES202.327) occurs in high topographic positions; they have more horizontal rock but may have some substantial vertical surfaces. Southern and Central Appalachian Mafic Glade and Barrens (CES202.348) are more horizontally oriented and have much more vegetation cover. Southern Appalachian Granitic Dome (CES202.297) may have steep portions but has smooth, unfractured rock surfaces with soil largely confined to mats adhering to the rock surface. The division of rock outcrop systems may be too fine and warrant combining some; however, each system has distinctive characteristics of structure and some distinctive flora.

The primary variation within this system, which could be the basis for further subdivision, is the distinction between mafic and felsic rock. The distribution north and west needs review. See also Cumberland Acidic Cliff and Rockhouse (CES202.309).

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Cumberland Acidic Cliff and Rockhouse (CES202.309)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Appalachian Spray Cliff (CES202.288)
- Southern Piedmont Cliff (CES202.386)

Related Concepts:

- Dry Sandstone Cliff (Evans 1991) Intersecting
- Moist Sandstone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: This system occurs on steep rock outcrops on lower slopes and occasionally higher in topographically sheltered sites. River gorges are probably the most common landforms, with bluffs of more open river valleys or meandering rivers also common. The substrate is mostly bare bedrock, which is steep to vertical or overhanging. Most examples are on felsic metamorphic rock such as gneiss or schist, a smaller number on mafic metamorphic rock or felsic or mafic igneous rock. [Examples may occur on any kind of rock except limestone and dolomite, with felsic metamorphic rock the most common in the Southern Blue Ridge and sandstone the most common in the Cumberland Mountains. Mafic metamorphic rocks form a less common but important fraction of examples, along with some more extreme rocks such as quartzite.] The physical structure of cliffs of metamorphic rock is usually irregular, with some ledges and crevices. [Sedimentary rocks often form more vertical cliffs, but with bedding planes and joints forming deep crevices that provide rooting sites.] Moisture levels vary drastically over short distances. Seepage of groundwater from adjacent soils or through rock fractures often creates permanently or seasonally flooded microsites, while lack of soil makes other portions extremely dry. In less sheltered topography, slope aspect affects overall moisture levels to some degree. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system. Elevation may also be an important factor causing variation, though few examples are known at high elevation.

Vegetation: Vegetation is sparse. Bryophytes and lichens may cover portions of the open rock. Vascular plants are limited to sparse rooting sites in soil pockets, ledges, and crevices. Some of these microsites may be deep enough to support shrubs or even stunted trees, while most support only herbs. The woody plants are usually species from surrounding forests, and may be mesophytic or xerophytic. The herbs include a suite of rock outcrop specialists such as *Saxifraga michauxii*, *Hylotelephium telephioides*, *Asplenium montanum*, and *Polypodium* spp. Mafic rock outcrops have an additional suite of specialist herbs, a number of them rare. Herbs from the surrounding forest are often also present and may make up a significant fraction of the flora.

Dynamics: The dynamics of this system have received little study. Most cliff communities are probably stable over long periods of time, with fine-scale disturbances affecting microsites. Rock falls, slides, and other mass movement are rare, but represent catastrophic disturbance to part or all of a cliff, and may be important in the long term for keeping cliffs open. Animal movements may be locally

important. Fire probably has little effect on cliffs, which have too little vegetation to carry fire and which tend to occur in topography that is not conducive to fire spread. Because of the limited natural disturbance and the fragility of soil and vegetation, human disturbance by trampling edges and by climbing may be particularly destructive.

MEMBERSHIP

Associations:

- (*Hydrangea arborescens*) / *Heuchera villosa* - *Asplenium trichomanes* - *Thalictrum clavatum* / *Conocephalum conicum* Shrubland (CEGL008435, G2)
- (*Hydrangea arborescens*) / *Heuchera villosa* - *Dicentra eximia* - *Campanula divaricata* Shrubland (CEGL008546, G2)
- (*Hydrangea arborescens*, *Toxicodendron radicans*) / *Heuchera americana* - (*Dichanthelium depauperatum*, *Woodsia obtusa*) Shrubland (CEGL004395, G3?)
- *Asplenium montanum* - *Heuchera villosa* Felsic Cliff Sparse Vegetation (CEGL004980, G3G4)
- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (CEGL004995, G2)
- *Parthenocissus quinquefolia* / (*Dicentra eximia*) Sparse Vegetation (CEGL004454, G2G3Q)
- *Physocarpus opulifolius* / *Campanula divaricata* - *Tradescantia subaspera* - (*Packera plattensis*) Sparse Vegetation (CEGL004759, G1?)
- *Umbilicaria mammulata* Nonvascular Vegetation (CEGL004387, G4?)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- *Physocarpus opulifolius* Sparsely Vegetated Alliance (A.1837)
- *Umbilicaria mammulata* Nonvascular Alliance (A.1827)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering a few acres. Examples tend to occur as isolated small patches or occasional small clusters.

Size: Most examples naturally cover an acre or less. A few occur as complexes of closely associated patches, but the aggregate size is still small. Size is somewhat ambiguous for this system, in that vertical surfaces may be as extensive as horizontal surfaces.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Appalachian Spray Cliff (CES202.288)

Adjacent Ecological System Comments: This system is surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern and Central Appalachian Cove Forest (CES202.373), Southern Appalachian Oak Forest (CES202.886), or various floodplain forest systems. Southern Appalachian Low-Elevation Pine Forest (CES202.332) or Southern Appalachian Montane Pine Forest and Woodland (CES202.331) may sometimes adjoin.

DISTRIBUTION

Range: Scattered throughout the Southern Appalachians and incidentally into adjacent ecoregions, from northern Alabama and Georgia through Virginia.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA

Map Zones: 48:?, 53:P, 54:C, 57:C, 59:C, 61:C

TNC Ecoregions: 50:?, 51:C, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723173#references

Description Author: M. Schafale and R. Evans

Version: 18 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN ROCKY SUMMIT (CES202.327)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

National Mapping Codes: ESLF 3178

CONCEPT

Summary: This system represents treeless rock outcrops of the southern Appalachian Mountains, primarily in western North Carolina and eastern Tennessee. Outcrops may be vertical to horizontal, rugged or fractured rock outcrops of peaks, ridgetops, upper slopes, and other topographically exposed locations (Schafale and Weakley 1990). Higher elevation examples occur from 1200 to 2030 m in elevation; other examples may be found at elevations of 305 m (1000 feet) or lower on foothills. These outcrops occur on felsic to mafic rocks and are distinguished from surrounding systems by the prevalence of bare or lichen-encrusted rocks. The vegetation component of this system is generally characterized by a mixture of low-growing lifeforms, especially lichens, mosses, and short-statured forbs. Less commonly, graminoids and low shrubs are encountered. Species common to all outcrop vegetation types include *Carex misera*, *Saxifraga michauxii*, and *Vaccinium corymbosum* (Wiser and White 1999).

Classification Comments: The primary variation within this system, which could be the basis for further subdivision, is the distinction between low and high elevation. High-elevation rocky summits may have a unique biogeographic history of having been adjacent to alpine tundra that existed in the region during the Pleistocene and of now providing a refugium for some of its flora. Their climate is substantially different from the lower elevation examples. However, their structure and the dynamics that results from it are probably similar.

Similar Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

Related Concepts:

- High Elevation Rocky Summit (Schafale and Weakley 1990) Finer
- Low Elevation Rocky Summit (Schafale and Weakley 1990) Finer

DESCRIPTION

Environment: This system occurs on rugged rock outcrops on peaks, ridgetops, upper slopes, and other topographically exposed landforms. Elevations may range from nearly the highest in the region (1200-2030 m), down to 305 m (1000 feet) or lower on foothills. The rock outcrops are irregular, with substantial horizontal surfaces, as well as often vertical surfaces, and generally with fractures. This structure allows soil accumulation in local pockets, sometimes to fair depth, even though most of the substrate is bare rock. Bedrock may be a variety of types. Erosion-resistant rocks such as felsic gneisses and schists or quartzite are most common, but mafic rocks such as amphibolite are also important substrates. Granite and granitic gneiss sometimes form rocky summits, but more often form the smoother outcrops that support Southern Appalachian Granitic Dome (CES202.297) or Southern and Central Appalachian Mafic Glade and Barrens (CES202.348). Moisture conditions are generally quite dry due to lack of soil but may be heterogeneous. Local deep crevices may accumulate water funneled from bare rock. Seepage is occasionally present but is usually minor. Climate varies substantially with elevation and has a strong effect on variation within the system. Higher elevation sites have high rainfall and receive substantial additional moisture from fog and rime ice.

Vegetation: Vegetation is sparse or patchy, with substantial expanses of lichen-covered or bare rock. Vegetation cover may be >25% (i.e., not technically "sparse") in local areas (including some plots), but the overall effect is of sparse vegetation. Mosses are usually present but often do not have substantial cover. A suite of typical rock outcrop herbs, including *Saxifraga michauxii*, *Carex misera*, *Paronychia argyrocoma*, *Heuchera villosa*, *Krigia montana*, and *Hylotelephium telephioides* (= *Sedum telephioides*), is usually present, along with more widespread herbs of open areas such as *Danthonia spicata*, *Danthonia compressa*, *Schizachyrium scoparium*, *Potentilla canadensis*, and *Houstonia caerulea*. High-elevation examples have an additional suite of herbs, which include some northern disjunct species such as *Minuartia groenlandica*, *Sibbaldiopsis tridentata*, *Trichophorum caespitosum*, and *Huperzia selago*. A suite of narrow endemic herbs is also characteristic of many high-elevation examples. Herbs of the adjacent forests may be present in small numbers. Shrubs and stunted trees are usually present in patches, where crevices or deeper soil accumulations are present. A few shrubs, such as *Leiophyllum buxifolium*, are largely limited to this system, but most are widespread species of dry forests and woodlands. Shrubs in the Ericaceae family are particularly prominent. Wiser and White (1999) found that in high-elevation rocky summits, less than a third of the flora was limited to rock outcrop sites.

Dynamics: The dynamics of this system have received little study. Most rocky summit sites are probably stable over long periods of

time, but variations in the always stressful environment may disturb and change vegetation. The role of crevices and soil in depressions as the primary rooting site makes for a relatively stable pattern of plant distribution and potentially long-lived individuals. This is in contrast to the shallow soil mats predominating in granitic domes. Between disturbances, accumulation of soil and succession of vegetation to greater woody abundance may occur. Fire may naturally be uncommon or fairly common. The topographically high location of this system would make it likely that fires would spread into it, though the sparse fuels would allow only patchy burning. Fires have been indicated to be important in preventing dense woody growth from encroaching on open outcrops in at least some instances. Rock falls or other mass movement are rare, but may be important in creating rock outcrops and keeping them open in the long term. Periodic drought is probably a significant disturbance. Animals and freeze-thaw action may be important disturbances at a local scale. Because of the fragility of soil and vegetation, human disturbance by trampling edges and by climbing may be particularly destructive.

MEMBERSHIP

Associations:

- *Hudsonia montana* - *Leiophyllum buxifolium* Dwarf-shrubland (CEGL003948, GH)
- *Saxifraga michauxii* - *Carex misera* - *Calamagrostis cainii* Herbaceous Vegetation (CEGL004278, G1)
- *Saxifraga michauxii* - *Carex misera* - *Danthonia spicata* - *Krigia montana* Herbaceous Vegetation (CEGL004279, G2)
- *Saxifraga michauxii* - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Herbaceous Vegetation (CEGL004277, G1)
- *Saxifraga michauxii* - *Cheilanthes lanosa* - *Hylotelephium telephioides* Herbaceous Vegetation (CEGL004989, G1)
- *Saxifraga michauxii* Herbaceous Vegetation (CEGL004524, G3?)
- *Schizachyrium scoparium* - *Saxifraga michauxii* - *Coreopsis major* Herbaceous Vegetation (CEGL004074, G1)

Alliances:

- *Leiophyllum buxifolium* Dwarf-shrubland Alliance (A.1063)
- *Saxifraga michauxii* Herbaceous Alliance (A.1621)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

DISTRIBUTION

Range: This system is found at a variety of elevations in the southern Appalachian Mountains, primarily in western North Carolina and eastern Tennessee.

Divisions: 202:C

Nations: US

Subnations: GA, NC, SC, TN

Map Zones: 57:C

TNC Ecoregions: 51:C

SOURCES

References: Comer et al. 2003, Schafale and Weakley 1990, Wisser and White 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723176#references

Description Author: M. Schafale, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: M. Schafale

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN SPRAY CLIFF (CES202.288)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate)

National Mapping Codes: ESLF 3145

CONCEPT

Summary: This system consists of rock outcrops that are kept wet by spray from waterfalls, primarily in the Southern Blue Ridge, and possibly elsewhere in the southern Appalachians region. The rocks are often densely or moderately covered with bryophytes or algae. The sparse vascular vegetation is limited to plants growing on bare rock, small ledges and crevices.

Classification Comments: This system is distinguished from all others in its range by its being kept wet by spray. Other outcrop systems, especially Southern Appalachian Montane Cliff and Talus (CES202.330), may have local wet areas created by seepage but will be dominated by dry microsites. Other interpretations of this system are that it could be combined with other cliff systems of the Appalachians.

Similar Ecological Systems:

- Southern Appalachian Montane Cliff and Talus (CES202.330)

Related Concepts:

- Moist Sandstone Cliff (Evans 1991) Broader

DESCRIPTION

Environment: Occurs on rock outcrops adjacent to waterfalls, where spray from the falls keeps the rock wet for long periods. Outcrops are usually near vertical, but horizontal surfaces at the base, boulder piles, and grottos are also common. The rock may be of any type, and the substrate may occasionally be saprolite rather than hard rock. Soil is limited to accumulations in crevices and on ledges. The rock may be permanently wet or may be wet seasonally when stream flow is high. Wetness is constant enough that this system may be considered a wetland, though some of the impacts of soil saturation do not occur. Seepage often makes portions of the rock wetter than areas covered just by spray. The typical topographic setting, in narrow gorges or enclosed valleys, makes for high local humidity and moderated temperature fluctuations.

Vegetation: Vegetation is usually a mix of growth forms and may be very patchy. Bryophytes, both mosses and liverworts, are often dense. Vascular vegetation may be sparse, but some examples are dense. Characteristic rock outcrop herbs such as *Saxifraga michauxii*, *Asplenium montanum*, and *Heuchera* spp. are usually present, along with some herbs of moist forests and seeps, such as *Galax urceolata*, *Thalictrum clavatum*, *Houstonia serpyllifolia*, *Circaea alpina*, and *Impatiens capensis*. A few examples are grassy. Examples on basic rock or with basic seepage have additional calciphilic herbs. A number of rare species, especially mosses, liverworts, and ferns but also including some forbs, grasses, and sedges, may be present. Shrubs and trees are usually present, at least on edges and often also rooted in crevices and ledges. *Rhododendron maximum*, *Kalmia latifolia*, and *Tsuga canadensis* are among the most frequent. Woody vines may also be prominent.

Dynamics: The dynamics of this system have received little study. The spray cliff environment is probably unusually stable, with its sheltered topographic position limiting wind influence, dryness, and extreme temperatures. Most individual plants are probably long-lived. The presence of tropical disjunct bryophytes and ferns at some spray cliffs supports the idea of a very stable, moderate environment. Droughts affect streamflow and must affect moisture levels, but most streams large enough to support spray cliffs will probably never dry up. Occasional rock falls and scouring related to flash floods represent catastrophic disturbances to all or part of occurrences. Because of the fragility of the vegetation and soil, along with the attractiveness of waterfalls, human disturbance can be very significant.

MEMBERSHIP

Associations:

- *Trichophorum caespitosum* - *Osmunda regalis* - *Rhynchospora capitellata* - *Oxypolis rigidior* Herbaceous Vegetation (CEGL008490, G1Q)
- *Vittaria appalachiana* - *Heuchera parviflora* var. *parviflora* - *Houstonia serpyllifolia* / *Plagiochila* spp. Herbaceous Vegetation (CEGL004302, G2)

Alliances:

- *Trichophorum caespitosum* Saturated Herbaceous Alliance (A.1915)
- *Vittaria appalachiana* - *Heuchera parviflora* Saturated Herbaceous Alliance (A.1696)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering less than one acre. Examples tend to occur as isolated small patches.

Size: Most examples naturally cover well less than one acre, and well-developed and diverse examples may be as small as 100 square meters. Complexes of multiple patches are almost never found. Size is somewhat ambiguous for this system, in that vertical surfaces

may be as extensive as horizontal surfaces.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Montane Cliff and Talus (CES202.330)

Adjacent Ecological System Comments: This system is usually surrounded by mesic forest systems, including Southern and Central Appalachian Cove Forest (CES202.373). Some may be associated with Southern Appalachian Montane Cliff and Talus (CES202.330) on drier rock exposures.

DISTRIBUTION

Range: This system occurs scattered throughout the southern Appalachians and incidentally into adjacent ecoregions, from northern Alabama and Georgia through Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, NC, SC, TN, VA, WV?

Map Zones: 48:?, 53:C, 57:C, 61:C

TNC Ecoregions: 50:?, 51:C, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723200#references

Description Author: M. Schafale and R. Evans

Version: 12 Oct 2004

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN FLORIDA BEACH (CES203.535)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

National Mapping Codes: ESLF 3181

CONCEPT

Summary: This beach system is found along the Atlantic Coast from the St. Johns River in northeastern Florida to approximately Cape Canaveral. Unlike Southern Atlantic Coastal Plain Sea Island Beach (CES203.383) north of the St. Johns River, this system is subject to higher wave energy and a greater component of sand. Vegetation of this area is distinct from that farther south along the coast of Florida, lacking the tropical element found south of Cape Canaveral (Johnson and Muller 1993a).

Classification Comments: Apparently few, if any, associations have currently been described in the NVC for this system. More information is needed.

Similar Ecological Systems:

- Southern Atlantic Coastal Plain Sea Island Beach (CES203.383)--dovetails this system to the north.

Related Concepts:

- Unconsolidated Substrate (FNAI 1990) Broader

MEMBERSHIP

Associations:

- *Cakile edentula ssp. harperi* Sparse Vegetation (CEGL004401, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)

DISTRIBUTION

Range: This system is found along the Atlantic Coast from the St. Johns River in northeastern Florida to approximately Cape Canaveral.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

USFS Ecomap Regions: 232G:CC

TNC Ecoregions: 55:C, 56:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723067#references

Description Author: R. Evans, mod. C.W. Nordman

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN SEA ISLAND BEACH (CES203.383)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Coastal plain

National Mapping Codes: ESLF 3150

CONCEPT

Summary: This system represents beaches and overwash flats in the Sea Island region of South Carolina and Georgia. The entire region is distinctive on the Atlantic Coast, and wave energy is generally lower here than any other point along the Atlantic Coast (Tanner 1960). Huge quantities of fine-textured sediments are deposited by alluvial rivers in the region, many of which drain relatively large interior areas of the Piedmont, where clay is an abundant by-product of weathering and erosion. Thus, as opposed to other beaches of the Atlantic Coast, these beaches are characterized by the prevalence of fine-textured sediments. In addition, the extensive Continental Shelf coupled with low wave energy contribute to a paucity of shell components of the beach substrates.

Similar Ecological Systems:

- Southern Atlantic Coastal Plain Florida Beach (CES203.535)--dovetails this system to the south.

DESCRIPTION

Environment: Sea island beaches are found on the true barrier islands present in the region. Low wave energy and high tidal range contribute relatively short barrier islands (as opposed to long narrow islands of North Carolina and the Gulf).

Vegetation: See descriptions in Hillestad et al. (1975) from Cumberland Island.

MEMBERSHIP

Associations:

- *Cakile edentula ssp. harperi* Sparse Vegetation (CEGL004401, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)

DISTRIBUTION

Range: This system is found in the Sea Island region of South Carolina and Georgia, extending to the St. Johns River in northern Florida.

Divisions: 203:C

Nations: US

Subnations: FL, GA, SC

Map Zones: 55:C, 58:C

USFS Ecomap Regions: 232C:CC

TNC Ecoregions: 56:C

SOURCES

References: Comer et al. 2003, Hillestad et al. 1975, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723133#references

Description Author: R. Evans

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1388 SOUTHERN ATLANTIC COASTAL PLAIN XERIC RIVER DUNE (CES203.497)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Dune (Substrate)

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2388; ESLF 5319; ESP 1388

CONCEPT

Summary: This system encompasses a range of vegetation present on inland sand dunes of the Coastal Plain of Georgia. These dunes are associated with certain rivers such as the Ohoopsee and Canoochee (Wharton 1978) and are apparently eolian in origin, formed of riverine alluvial sands. The sandy soils are deep, coarse, and xeric in nature. The vegetation consists of an assemblage of xeric communities that also occur in other xeric habitats in the Coastal Plain. These include *Pinus palustris* - *Quercus laevis* communities and a scrub community akin to Inland Florida Scrub, but lacking *Pinus clausa*. This system is distinguished from more typical xeric sandhills of the Coastal Plain by its occurrence on the deep sands of river dunes. In addition this environment is naturally topographically isolated and consequently has a lower fire-return interval than other upland systems of which *Pinus palustris* is a component.

Related Concepts:

- Dwarf oak-evergreen shrub forest (Wharton 1978) Equivalent

DESCRIPTION

Environment: These dunes are apparently eolian in origin, formed of reworked riverine alluvial sands. The sandy soils are deep, coarse, and xeric in nature.

Vegetation: Upland plant communities include longleaf - turkey oak, dwarf oak, oak hammock, and rosemary scrub (Wharton 1978).

MEMBERSHIP

Associations:

- *Ceratiola ericoides* - (*Chrysoma pauciflosculosa*) / *Polygonella polygama* / *Cladonia leporina* Shrubland (CEGL003864, G2?)
- *Chrysoma pauciflosculosa* - (*Clinopodium coccineum*) Dwarf-shrubland (CEGL003946, G1G2)
- *Pinus palustris* / *Quercus laevis* - *Quercus geminata* / *Ceratiola ericoides* Woodland (CEGL004491, G1G2)
- *Quercus myrtifolia* - *Quercus geminata* - *Hamamelis virginiana* - (*Elliottia racemosa*) Shrubland (CEGL004715, G1Q)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Chrysoma pauciflosculosa* Dwarf-shrubland Alliance (A.1061)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)

DISTRIBUTION

Range: This system is endemic to river-associated dunes in the Coastal Plain of Georgia, such as along the Ohoopsee and Canoochee rivers.

Divisions: 203:C

Nations: US

Subnations: GA

Map Zones: 55:C

USFS Ecomap Regions: 232J:CC

TNC Ecoregions: 56:C

SOURCES

References: Ambrose pers. comm., Comer et al. 2003, Schafale pers. comm., Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723089#references

Description Author: R. Evans, mod. C.W. Nordman

Version: 04 Feb 2009

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN CALIFORNIA COAST RANGES CLIFF AND CANYON (CES206.904)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Canyon Mosaic; Mediterranean [Mediterranean Xeric-Oceanic]; Xeric; Landslide

Non-Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Lowland [Lowland]; Shrubland (Shrub-dominated); Moss/Lichen (Nonvascular); Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Very Shallow Soil; Canyon; Cliff (Landform)

National Mapping Codes: ESLF 3168

CONCEPT

Summary: Found from foothill and montane elevations of California's Transverse and Peninsular ranges, these are barren and sparsely vegetated areas (<10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock type. This system also includes unstable scree and talus slopes typically occurring below cliff faces. Scattered vegetation may include shrub species from surrounding coastal chaparral, such as *Ceanothus megacarpus*, *Ceanothus leucodermis*, *Cercocarpus montanus var. minutiflorus* (= *Cercocarpus minutiflorus*), *Arctostaphylos glauca*, and *Xylococcus bicolor*. Soil development is limited as is herbaceous cover.

DISTRIBUTION

Range: Found from foothill and montane elevations of California's Transverse and Peninsular ranges.

Divisions: 206:C

Nations: MX, US

Subnations: CA, MXBC(MX)

Map Zones: 4:C

USFS Ecomap Regions: 261B:PP, 262A:PP, 322C:PP

TNC Ecoregions: 16:C

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722777#references

Description Author: P. Comer, T. Keeler-Wolf

Version: 17 Mar 2003

Concept Author: P. Comer, T. Keeler-Wolf

Stakeholders: Latin America, West
ClassifResp: West

SOUTHERN COASTAL PLAIN SINKHOLE (CES203.495)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

Non-Diagnostic Classifiers: Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 3184

CONCEPT

Summary: This system consists of deep sinkhole depressions with steep vertical walls of exposed limestone in the Gulf Coastal Plain of Florida and Georgia (other depressions formed in karstic regions that are shallow and lacking in steep vertical walls with exposed rock are accommodated by other systems). These cylindrical- or conical-shaped depressions form in karstic environments where cavities have been eroded in underlying limestone. As cavities enlarge, cavern roofs eventually collapse forming these steep-sided depressions. Some examples drain readily and contain standing water for short periods of time, while others contain permanent lakes. The steep-sided limestone walls are typically sparsely vegetated with mosses, liverworts, and ferns, with occasional herbs and shrubs in crevices where organic soils have developed (FNAI 1990). The steepness and depth of these depressions help create a generally moist microclimate which is often enhanced by seepage from surrounding uplands, and the presence of standing water.

Classification Comments: Excluded from this system are sinkholes of extreme southern Florida and the Mid-Atlantic Coastal Plain of the Carolinas which do not develop such extreme depth and microclimatic features.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- East Gulf Coastal Plain Sandhill Lakeshore Depression (CES203.292)

Related Concepts:

- Sinkhole (FNAI 1990) Equivalent

MEMBERSHIP

Associations:

- *Adiantum capillus-veneris* - *Thelypteris kunthii* / *Dumortiera hirsuta* Herbaceous Vegetation (CEGL004717, G3?)
- *Adiantum tenerum* - *Parietaria praetermissa* - *Arenaria lanuginosa* Herbaceous Vegetation (CEGL004469, G2?)
- *Nyssa ogeche* - (*Nyssa biflora*) Forest (CEGL004718, G2?)

Alliances:

- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Adiantum tenerum* Herbaceous Alliance (A.1613)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)

DISTRIBUTION

Range: Gulf Coastal Plain of Florida and Georgia.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, FNAI 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723091#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN INTERIOR CALCAREOUS CLIFF (CES202.356)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate)

National Mapping Codes: ESLF 3185

CONCEPT

Summary: This system encompasses calcareous cliffs of the Southern Ridge and Valley and adjacent areas of the Cumberland Plateau with a few disjunct localities in the southern Appalachians. This system includes vertical to near-vertical rock faces of limestone and dolomite. These cliffs are typically dry but may contain relatively small embedded seepage patches. Both wet and, more commonly, dry expressions are included. Due to harsh edaphic conditions, including verticality, these cliffs are nearly unvegetated, however, *Asplenium ruta-muraria* and *Pellaea atropurpurea* may be characteristic plants. Some cliffs have scattered *Thuja occidentalis* trees which may be very old (>800 years) and genetically diverse. This system also covers a narrow zone of vegetation, often herbaceous, at the horizontal clifftop where growing conditions are harsh and often gladelike.

Similar Ecological Systems:

- Central Interior Calcareous Cliff and Talus (CES202.690)
- North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)

Related Concepts:

- Dry Limestone Cliff (Evans 1991) Intersecting
- Moist Limestone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: This system includes vertical to near-vertical rock faces of limestone and dolomite. These cliffs are typically dry but may contain relatively small embedded seepage patches. Both wet and, more commonly, dry expressions are included. Disjunct examples in the southern Appalachians attributed to this system include Hot Springs and Linville Caverns area. It presumably includes both the Bull Cave and Calf Cave area in the Smokies.

Vegetation: Due to harsh edaphic conditions, including verticality, these cliffs are nearly unvegetated, however, *Asplenium ruta-muraria* and *Pellaea atropurpurea* may be characteristic plants. Some cliffs have scattered *Thuja occidentalis* trees which may be very old (>800 years) and genetically diverse. This system also covers a narrow zone of vegetation, often herbaceous, at the horizontal clifftop where growing conditions are harsh and often gladelike.

MEMBERSHIP

Associations:

- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparse Vegetation (CEGL004476, G3G4)
- *Carex leptalea* - *Parnassia grandifolia* - *Juncus coriaceus* - *Solidago patula* Ridge and Valley Herbaceous Vegetation (CEGL004944, G2G3)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)
- *Schizachyrium scoparium* - *Sporobolus compositus* var. *compositus* - *Rudbeckia fulgida* var. *fulgida* Wooded Herbaceous Vegetation (CEGL004078, G2)
- *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596, G2G3)
- *Thuja occidentalis* Limestone Seepage Woodland (CEGL003675, G2G3Q)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparsely Vegetated Alliance (A.1832)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Thuja occidentalis* Saturated Woodland Alliance (A.583)
- *Thuja occidentalis* Woodland Alliance (A.544)

DISTRIBUTION

Range: This system is found in the Southern Ridge and Valley and adjacent areas of the Cumberland Plateau with a few disjunct localities in the southern Appalachians.

Divisions: 202:C

Nations: US

Subnations: AL, KY, NC, TN, VA

Map Zones: 48:C, 53:C, 57:C

TNC Ecoregions: 50:C, 51:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723156#references

Description Author: R. Evans, C. Nordman, M. Pyne

Version: 18 Apr 2006

Concept Author: R. Evans, C. Nordman, M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN INTERIOR SINKHOLE WALL (CES202.357)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Alkaline Soil

National Mapping Codes: ESLF 3163

CONCEPT

Summary: This system represents vertical shaft sinkholes and the characteristic vegetation associated with their steep walls in the southern Ridge and Valley and adjacent Interior Low Plateau regions of the southeastern United States. Related examples in the Southern Blue Ridge are also covered here. Examples are normally dominated by *Cystopteris bulbifera* and *Asplenium rhizophyllum* or the liverwort *Dumortiera hirsuta*.

Similar Ecological Systems:

- Central Interior Calcareous Cliff and Talus (CES202.690)--may be in effect a subset of CES202.690.

Related Concepts:

- Moist Limestone Cliff (Evans 1991) Broader

MEMBERSHIP

Associations:

- *Cystopteris bulbifera* - (*Asplenium rhizophyllum*) Sparse Vegetation (CEGL004394, G3G4)
- *Cystopteris bulbifera* / *Dumortiera hirsuta* Sinkhole Wall Sparse Vegetation (CEGL004988, G1)

Alliances:

- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Sparsely Vegetated Alliance (A.1834)

DISTRIBUTION

Range: This system is found in the Southern Ridge and Valley and adjacent Interior Low Plateau regions of the southeastern United States and the Southern Blue Ridge, with rare and limited occurrences in the Upper East Gulf Coastal Plain.

Divisions: 202:C

Nations: US

Subnations: AL, KY, MS, NC, TN

Map Zones: 46:P, 47:C, 48:C, 53:C, 57:C

TNC Ecoregions: 43:C, 44:C, 50:C, 51:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723155#references

Description Author: R. Evans and C. Nordman

Version: 13 Dec 2002

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT CLIFF (CES202.386)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate)

National Mapping Codes: ESLF 3156

CONCEPT

Summary: This system consists of steep to vertical or overhanging rock outcrops in the Piedmont, with occasional examples in the inner Coastal Plain. They occur on lower to mid slopes, usually in river gorges or bluffs. The sparse vegetation is limited to plants growing on bare rock, small ledges, and crevices. Vegetation is primarily bryophytes, lichens, and herbs, with sparse trees and shrubs rooted in deeper soil pockets and crevices.

Classification Comments: More information is needed on the associations that belong to this system.

This system is distinguished from other rock outcrops by a combination of low topographic position, vertical orientation, large amount of bare rock, and absence of specialized environments such as exfoliated granite, limestone or dolomite, and spray from waterfalls. In contrast, Southern Appalachian Rocky Summit (CES202.327) occurs in high topographic positions; they have more horizontal rock but may have some substantial vertical surfaces. Southern Piedmont Glade and Barrens (CES202.328) is more horizontally oriented and have much more vegetation cover. The division of rock outcrop systems may be too fine and warrant combining some; however, each system has distinctive characteristics of structure and some distinctive flora.

This system is distinguished from Southern Appalachian Montane Cliff and Talus (CES202.330) by floristic differences. Southern Appalachian Montane Cliff and Talus (CES202.330) has a number of species absent or scarce in the Piedmont, differences that may be related to elevation, regional climate, or to biogeography. However, upper Piedmont cliffs that have Appalachian flora are included in that system (CES202.330).

The primary variation within this system, which could be the basis for further subdivision, is the distinction between mafic and felsic rock, with the rare sedimentary rock examples a third category. Sedimentary rock examples in the Piedmont and Coastal Plain resemble other Piedmont Cliffs more than they resemble cliffs of sedimentary rocks in the interior ecoregions.

Similar Ecological Systems:

- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

DESCRIPTION

Environment: Occurs on steep rock outcrops on lower slopes, occasionally higher in topographically sheltered sites. River bluffs are the primary setting. Cliffs may have any aspect, but north-facing cliffs seem to be more common. The substrate is mostly bare bedrock, which is steep to vertical or overhanging. Most examples are on felsic metamorphic rock such as gneiss or schist, a smaller number on mafic metamorphic rock, felsic or mafic igneous rock, or sedimentary rock. The physical structure of most cliffs in the Piedmont is irregular, with some ledges and crevices, and with steep, vertical, and even overhanging portions intermixed. Moisture levels vary drastically over short distances. Seepage of ground water from adjacent soils or through rock fractures often creates permanently or seasonally flooded microsites, while lack of soil makes other portions extremely dry. In less sheltered topography, slope aspect affects overall moisture levels to some degree. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system.

Vegetation: No plant associations have yet been defined for this system. Vegetation is sparse. Bryophytes and lichens may cover portions of the open rock. Vascular plants are limited to sparse rooting sites in soil pockets, ledges, and crevices. Some of these microsites may be deep enough to support shrubs or even trees, while most support only herbs. The woody plants are usually species from surrounding forests, and may be mesophytic or xerophytic. The herbs include a variety of species of open dry habitats, such as *Schizachyrium scoparium*, *Danthonia spicata*, *Houstonia purpurea*, and *Coreopsis major*, along with a few rock outcrop specialists such as *Polypodium virginianum*, *Saxifraga virginianensis*, and *Heuchera* spp. A number of bryophyte species may be present. Mafic rock outcrops have an additional suite of specialist herbs, including *Aquilegia canadensis*, *Arabis lyrata*, *Anemone berlandieri*, and *Sedum glaucophyllum*. Herbs from the surrounding forest are often also present and may make up a significant fraction of the flora.

Dynamics: The dynamics of this system have received little study. Most cliff communities are probably stable over long periods of time, with fine-scale disturbances affecting microsites. Rock falls, slides, and other mass movement are rare, but represent catastrophic disturbance to part or all of a cliff, and may be important in the long term for keeping cliffs open. Animal movements may be locally important. Fire probably has little effect on cliffs, which have too little vegetation to carry fire and which tend to occur in topography that is not conducive to fire spread. Because of the limited natural disturbance and the fragility of soil and vegetation, human disturbance by trampling edges and by climbing may be particularly destructive.

MEMBERSHIP

Associations:

- *Cystopteris bulbifera* - (*Asplenium rhizophyllum*) Sparse Vegetation (CEGL004394, G3G4)
- *Lasallia papulosa* - *Lasallia pensylvanica* Nonvascular Vegetation (CEGL004385, G2?)
- Piedmont Acidic Cliff Sparse Vegetation (CEGL003979, G2?)
- Piedmont Mafic Cliff Sparse Vegetation (CEGL003982, G2?)

Alliances:

- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Sparsely Vegetated Alliance (A.1834)
- *Lasallia (papulosa, pensylvanica)* Nonvascular Alliance (A.1824)
- Open Cliff Sparsely Vegetated Alliance (A.1836)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering less than one acre. Examples tend to occur as isolated small patches, occasionally as small clusters.

Size: Most examples naturally cover an acre or less. A few occur as complexes of closely associated patches, but the aggregate size is still small. Size is somewhat ambiguous for this system, in that vertical surfaces may be as extensive as horizontal surfaces.

Adjacent Ecological Systems:

- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Mesic Forest (CES202.342)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) above and Southern Piedmont Large Floodplain Forest (CES202.324) or Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) below.

DISTRIBUTION

Range: Scattered throughout the Piedmont and incidentally into the Coastal Plain, from northern Alabama and Georgia north into Virginia.

Divisions: 202:C; 203:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 58:C, 59:C, 61:C

TNC Ecoregions: 52:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723130#references

Description Author: M. Schafale

Version: 08 Jan 2003

Concept Author: M. Schafale

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT GRANITE FLATROCK AND OUTCROP (CES202.329)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

Non-Diagnostic Classifiers: Seepage-Fed Sloping; Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 3175

CONCEPT

Summary: This system consists of smooth, exfoliated outcrops of massive granite and related rocks in the eastern and central Piedmont of the southeastern United States, and rarely in the adjacent Atlantic Coastal Plain (confined to the fall-line where erosion has exposed underlying rocks). Examples occur from Virginia south to Alabama but are found most abundant in the upper Piedmont of Georgia. Some noteworthy examples in central Georgia include Stone Mountain, Panola Mountain, and Arabia Mountain in DeKalb, Henry, and Rockdale counties. Depending upon the location, examples may rise above the surrounding landscape by as much as 200 m, or lie flush with the surrounding land surface. The vegetation is a complex of small-patch communities of different species and structure occupying different microhabitats present on the outcrops, ranging from moss and lichens to herbs to shrubs and trees. In some areas, these microhabitats include solution pits or depressions that retain water and form a distinctive wetland community. This outcrop system supports a relatively high degree of endemic plants.

Classification Comments: Granitic domes are clearly related to other rock outcrop systems in the Piedmont but are distinct in their flora and vegetation mat succession. The smooth rock surface is crucial to their development. More fractured granitic rocks do not form this distinct system. In contrast, Southern Piedmont Cliff (CES202.386) has vertically oriented rock outcrops that tend to have fractures and ledges. Southern Piedmont Glade and Barrens (CES202.328) is similarly horizontally oriented but has denser vegetation and rather different flora. Southern Appalachian Rocky Summit (CES202.327), which barely overlaps the range of this system, has fractured rock and occurs in topographically high settings in rugged topography.

This system is closely related to Southern Appalachian Granitic Dome (CES202.297), with which it shares the distinctive structure and vegetation mat dynamics of exfoliated outcrops. The flat orientation of the flatrocks makes pools more important in them. Climatic and biogeographic differences lead to floristic differences between the two systems. The massive Piedmont outcrops in the Atlanta vicinity (Wharton 1978) are included here, the distinction between "dome" (CES202.297) and "flatrock" (CES202.329) perhaps being an overly specific use of vague and conceptual terminology.

Similar Ecological Systems:

- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Glade and Barrens (CES202.328)

Related Concepts:

- Rock Outcrops (Wharton 1978) Broader

DESCRIPTION

Environment: This system occurs on exfoliated granitic outcrops; these are Precambrian metamorphic rocks generally found in the Piedmont Plateau (McVaugh 1943). Outcrops are level or gently sloped, occurring as low domes up to 200 m above the surrounding landscape or as flatrocks varying considerably in size (Shure 1999). Smooth rock without crevices is the primary factor in the distinctive ecological character of this system. Granite, granitic gneiss, and related rocks without many internal joints tend to fracture into thin sheets parallel to the surface, forming outcrops with smooth surfaces largely lacking crevices. The outcrop surface is largely bare rock but has thin soil mats around the edges and in patches throughout. Mats vary in depth with age and level of development. Distinct microenvironments are created by small irregularities in the rock surface and by areas of seepage at the edge. Some examples (e.g., in central Georgia) may have prominent seepage-related features, where areas of perennial herbaceous vegetation are very wet in the winter and spring. In these cases, the only vegetated areas on the granite outcrop are seepage-related. One possible substrate is the Lilesville granite.

Vegetation: Most of the rock surface is bare or has only crustose or foliose lichen cover. Vegetation occurs as a series of small patches in the thin soil mats, or seasonal pools, with the community type dependent on the nature of the depression and depth of the soil mat (if any). Bare rock may have moss patches. The thinnest soils usually have a set of fine forbs, many of them annual. Slightly deeper soils often have grasses dominating. Deeper soils support shrubs or small trees. A distinctive woodland of pines or pines and oaks occurs on the continuous shallow soils surrounding the outcrop. The flora shares some species with other rock outcrops of the Piedmont, but has some distinctive species and different dominance of species.

Dynamics: Large numbers of soil island depression may be scattered across the surface of granite outcrops and occasional pools of shallow water may stand in certain depressions which trap rainfall (McVaugh 1943, Shure 1999). Where soil accumulates in depressions formed by exfoliating surface rock, a distinctive and fairly predictable pattern of successional changes occurs [see

references in Shure (1999)]. Soil mats appear and deepen over time in a process that links vegetational and soil development, but are eventually destroyed by wind throw, drought, other natural disturbances. The result is a mosaic with mats of different levels of development at any given time. Mat dynamics are different in different parts of the rock, with older mats and more permanent patterns near the edges and sparser and younger mats in the interior. The dynamics are further modified by microtopography and the presence of seepage. The larger vegetation patterns such the relative amount of different stages likely respond to climatic cycles and natural disturbance events. The thin soils make these communities sensitive to drought, especially the long-lived woody species. Fire is probably rare in the interior, given the sparse fuel, but may be important in determining the size of the open area and may affect the dynamics of the bordering woodlands.

MEMBERSHIP

Associations:

- *Amphianthus pusillus* - *Isoetes melanospora* - *Isoetes tegetiformans* Herbaceous Vegetation (CEGL004342, G1)
- *Diamorpha smallii* - *Minuartia glabra* - *Minuartia uniflora* - *Cyperus granitophilus* Herbaceous Vegetation (CEGL004344, G3)
- *Packera tomentosa* - *Croton willdenowii* - *Schizachyrium scoparium* - (*Selaginella rupestris*) Herbaceous Vegetation (CEGL004298, G3)
- *Pinus virginiana* / *Juniperus virginiana* - *Chionanthus virginicus* Granitic Flatrock Border Forest (CEGL003993, G3?)
- *Talinum teretifolium* - *Minuartia glabra* - *Diodia teres* - *Croton willdenowii* Herbaceous Vegetation (CEGL003857, G2G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Amphianthus pusillus* - *Isoetes* spp. Seasonally Flooded Herbaceous Alliance (A.1817)
- *Minuartia glabra* - *Talinum* spp. - *Diamorpha smallii* Saturated Herbaceous Alliance (A.1819)
- *Pinus virginiana* Forest Alliance (A.131)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering one to a relatively few acres.

Size: Most examples naturally cover one to a few acres, some less than one acre. A few examples exceed 10 acres. Most examples occur in a few clusters where geology is particularly suitable, such as central Georgia and northeastern North Carolina. A few examples are more isolated. Individual flatrocks may occur in complexes, separated by small patches of forest.

Adjacent Ecological Systems:

- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Piedmont Dry Oak-(Pine) Forest (CES202.339).

DISTRIBUTION

Range: This system is found scattered in the eastern and central Piedmont, from Alabama to Virginia. Rare examples occur in the upper Piedmont. A few, occurring surrounded by Tertiary sediments in the Fall Zone, may be considered to be in the Coastal Plain.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 61:C

TNC Ecoregions: 52:C, 57:P

SOURCES

References: Baker 1956, Coffey 1964, Comer et al. 2003, McVaugh 1943, Nelson 1986, Quarterman et al. 1993, Shure 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723174#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHWEST FLORIDA BEACH (CES411.276)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Coast

Non-Diagnostic Classifiers: Graminoid

National Mapping Codes: ESLF 3151

CONCEPT

Summary: This system ranges from Anclote Key southward to Cape Romano, Florida (Johnson and Barbour 1990). Within the northern Gulf of Mexico region, these beaches are distinguished by the highest species richness, greatest cover of succulents, and high cover of *Iva imbricata* and several tropical species (Barbour et al. 1987). Sands are relatively coarse and, unlike other beach systems of the northern Gulf of Mexico, are extremely rich in calcium from an abundance of calcareous shell fragments.

Classification Comments: Apparently, few associations have currently been described in the NVC for this system. More information is needed.

Similar Ecological Systems:

- Southeast Florida Beach (CES411.272)

Related Concepts:

- Beach Dune (FNAI 1990) Broader
- Unconsolidated Substrate (FNAI 1990) Broader

DESCRIPTION

Vegetation: These beaches are dominated by *Uniola*, but less so than other beach systems of the northern Gulf of Mexico. Other important species are *Iva imbricata*, *Oenothera humifusa*, *Scaevola plumieri*, and *Sesuvium portulacastrum*.

MEMBERSHIP

Associations:

- *Ipomoea pes-caprae* - *Cakile lanceolata* Herbaceous Vegetation (CEGL004403, G3G4)
- *Scaevola plumieri* / *Uniola paniculata* - *Iva imbricata* - *Cenchrus spinifex* Herbaceous Vegetation (CEGL003897, G3?)

Alliances:

- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)
- *Uniola paniculata* Subtropical Herbaceous Alliance (A.1153)

DISTRIBUTION

Range: This system ranges from Anclote Key (border of Pasco and Pinellas counties) southward to Cape Romano, Florida (Collier County).

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Barbour et al. 1987, Comer et al. 2003, Johnson and Barbour 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723210#references

Description Author: R. Evans

Version: 24 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHWESTERN GREAT PLAINS CANYON (CES303.664)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Canyon

Non-Diagnostic Classifiers: Very Shallow Soil; Flood Scouring

National Mapping Codes: ESLF 3176

CONCEPT

Summary: This ecological system occurs in both perennial and intermittent stream canyons of the southwestern Great Plains. Soils can range from deep loams to alluvial to sandy. The mosaic of soil types which have developed from sandstone, limestone, basalt, and shale parent materials creates a complex mosaic of grasslands, shrublands and woodlands within the canyon system (Shaw et al. 1989). Although the system combines many elements from Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834), Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822), Western Great Plains Shortgrass Prairie (CES303.672), and other shrublands, the varied geology, diverse soil types, and topographic dynamics together form a distinct ecological system characteristic of the canyons and dissected mesas of the southwestern Great Plains.

Vegetation varies both regionally and locally depending on latitude, aspect, slope position and substrate and can range from riparian vegetation to xeric or mesic woodlands and shrublands. Rock outcrops with sparse vegetation are also common. Open to moderately dense pinyon-juniper woodlands occupy most of the canyonland slopes. Scattered *Pinus edulis* may occur within these community types but are never dominant. Woodlands may be floristically similar to and intergrade with Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834) but are distributed along rocky outcrops, canyon slopes and mesas. *Juniperus monosperma* is the most common tree species and forms extensive woodlands with a grassy understory of *Bouteloua eriopoda*, *Bouteloua gracilis*, *Bouteloua hirsuta*, *Bouteloua curtipendula*, and *Pleuraphis jamesii*, or sometimes with an open shrub layer dominated by *Cercocarpus montanus*. In Kansas, *Juniperus virginiana* can become more dominant and replace *Juniperus monosperma*. Isolated patches of *Pinus ponderosa* or *Populus tremuloides* are found in some locations. Shrublands occur on canyon bottoms, in narrow side canyons, and integrate with woodlands on upper slopes. A mosaic of shrub species is characteristic of canyon walls and slopes and varies with substrate and moisture availability. Common species include *Artemisia bigelovii*, *Cercocarpus montanus*, *Rhus trilobata*, *Ribes* spp., *Prosopis glandulosa* (in Texas), *Ptelea trifoliata*, *Philadelphus microphyllus*, and *Yucca glauca*. *Frankenia jamesii* and *Glossopetalon spinescens* var. *meionandrum* form a community restricted to gypsiferous and calciferous soils. Canyon floors often support a degraded shrubby grassland of *Ericameria nauseosa* and *Opuntia imbricata* with a grassy understory.

Because of the varied topography, relatively permanent water along streambeds and southern location, these canyonlands have a rich herpetofauna (Mackessy 1998). This system provides good habitat for a number of snake species that are otherwise uncommon in the Central Shortgrass Prairie ecoregion. Occasional seeps and springs of the canyon walls provide habitat for rare ferns.

Similar Ecological Systems:

- Northwestern Great Plains Shrubland (CES303.662)
- Western Great Plains Cliff and Outcrop (CES303.665)

MEMBERSHIP

Associations:

- *Artemisia bigelovii* / *Achnatherum hymenoides* Shrubland (CEGL000990, G3Q)
- *Cercocarpus montanus* - *Rhus trilobata* / *Andropogon gerardii* Shrubland (CEGL002912, G2G3)
- *Cercocarpus montanus* / *Achnatherum scribneri* Shrubland (CEGL002913, G3)
- *Cercocarpus montanus* / *Bouteloua curtipendula* Shrubland (CEGL001086, G5)
- *Cercocarpus montanus* / *Hesperostipa comata* Shrubland (CEGL001092, G2)
- *Cercocarpus montanus* / *Hesperostipa neomexicana* Shrubland (CEGL002911, G2G3)
- *Juniperus monosperma* / *Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma* / *Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma* / *Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma* / *Cercocarpus montanus* - *Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma* / *Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma* / *Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland (CEGL001117, G5)
- *Rhus trilobata* Rocky Mountain Shrub Herbaceous Vegetation (CEGL002910, G2)

Alliances:

- *Artemisia bigelovii* Shrubland Alliance (A.1103)
- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Juniperus monosperma* Woodland Alliance (A.504)

- *Quercus gambelii* Shrubland Alliance (A.920)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: This system can grade into in areas dominated by *Pinus* spp.

DISTRIBUTION

Range: This system occurs in dry canyons and mesas in the southwestern portion of the Western Great Plains, ranging from Palo Duro Canyon on the Red River in the Texas Panhandle north to Purgatoire and Apishipa canyons, tributaries of the Arkansas River.

Divisions: 303:C

Nations: US

Subnations: CO, KS, OK, TX

Map Zones: 26:P, 27:C, 33:C, 34:C, 35:?

USFS Ecomap Regions: 315A:CC, 315B:CC, 331B:CC, 331I:CC, M313B:PP

TNC Ecoregions: 27:C, 28:C

SOURCES

References: Comer et al. 2003, CONHP 1999, Mackessy 1998, Shaw et al. 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722994#references

Description Author: S. Menard and K. Kindscher

Version: 27 May 2004

Concept Author: K. Decker, K. Schulz, S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

TEMPERATE PACIFIC FRESHWATER MUDFLAT (CES200.878)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Temperate [Temperate Oceanic]; Extensive Wet Flat

Non-Diagnostic Classifiers: Lowland [Lowland]

National Mapping Codes: ESLF 3122

CONCEPT

Summary: Freshwater mudflats are found scattered throughout the temperate regions of the Pacific Coast of North America. In the Pacific Northwest, they occur primarily in seasonally flooded shallow lakebeds on floodplains, especially along the lower Columbia River. During any one year, they may be absent because of year-to-year variation in river water levels. Mudflats must be exposed before the vegetation develops from the seedbank. They are dominated mainly by low-stature annual plants. They range in physiognomy from sparsely vegetated mud to extensive sods of herbaceous vegetation. The predominant species include *Eleocharis obtusa*, *Lilaeopsis occidentalis*, *Crassula aquatica*, *Limosella aquatica*, *Gnaphalium palustre*, *Eragrostis hypnoides*, and *Ludwigia palustris*.

Classification Comments: Revised to eliminate overlap with North Pacific Intertidal Freshwater Wetland (CES204.875) and to better clarify the type, with input from John Christy.

MEMBERSHIP

Associations:

- *Bidens cernua* Herbaceous Vegetation [Provisional] (CEGL003324, G3)
- *Eleocharis obtusa* Herbaceous Vegetation [Provisional] (CEGL003326, G4)
- *Eragrostis hypnoides* - *Gnaphalium palustre* Herbaceous Vegetation [Provisional] (CEGL003327, G2)
- *Euthamia occidentalis* Herbaceous Vegetation [Provisional] (CEGL003328, G3)
- *Ludwigia palustris* - *Polygonum hydropiperoides* Herbaceous Vegetation [Provisional] (CEGL003330, G2)
- *Myriophyllum hippuroides* Herbaceous Vegetation [Provisional] (CEGL003331, G3)

DISTRIBUTION

Range: This system is found throughout the temperate regions of the Pacific Coast of North America.

Divisions: 204:C; 206:C

Nations: US

Subnations: CA, OR, WA

Map Zones: 1:C, 2:P, 3:C, 4:C, 7:C, 8:C, 9:C

USFS Ecomap Regions: 242A:CC, 242B:CC, M242A:CC, M242C:CP, M242D:CP

TNC Ecoregions: 2:C, 14:C, 15:C, 16:C

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722797#references

Description Author: C. Chappell

Version: 07 Feb 2005

Concept Author: C. Chappell

Stakeholders: West

ClassifResp: West

1669 TEMPERATE PACIFIC INTERTIDAL FLAT (CES204.879)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Wetland

Diagnostic Classifiers: Saline Water Chemistry; Temperate [Temperate Hyperoceanic]; Temperate [Temperate Oceanic]; Tidal / Estuarine [Haline]; Tidal / Estuarine [Oligohaline]

National Mapping Codes: EVT 2669; ESLF 3116; ESP 1669

CONCEPT

Summary: Coastal flats are found along the north Pacific Coast from Kodiak Island and Cook Inlet, Alaska, south to central California. Tidal flats form a narrow band along oceanic inlets and are more extensive at the mouths of larger rivers. Algae are the dominant vegetation on mud or gravel flats where little vascular vegetation is present due to the daily (in some cases twice daily) tidal flooding of salt or brackish water. Characteristic species include *Vaucheria longicaulis* and *Enteromorpha* spp. Vascular species are sparse, if present, and may include salt-tolerant species such as *Eleocharis palustris*, *Salicornia* spp., *Plantago maritima*, *Glaux maritima*, and other plants common to lower salt marshes; cover is less than 10%. The dominant processes are tectonic uplift or subsidence, isostatic rebound, and sediment deposition.

Similar Ecological Systems:

- Alaska Arctic Tidal Flat (CES102.208)

Related Concepts:

- III.B.3.d - Halophytic herb wet meadow (Vioreck et al. 1992) Intersecting
- III.D.2.a - Four-leaf marestalk (Vioreck et al. 1992) Intersecting

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Temperate Pacific Tidal Salt and Brackish Marsh (CES200.091)

DISTRIBUTION

Range: Along the north Pacific Coast from Kodiak Island and Cook Inlet, Alaska, south to central California.

Divisions: 105:P; 204:C

Nations: CA, US

Subnations: AK, BC, CA, OR, WA

Map Zones: 1:C, 2:C, 3:C, 4:?, 75:C, 76:C, 77:C, 78:C

USFS Ecomap Regions: 242A:CC, 261B:CC, 263A:CC, M242A:CC

TNC Ecoregions: 1:C, 2:C, 69:C, 70:C, 71:C

SOURCES

References: Boggs 2002, Comer et al. 2003, Holland and Keil 1995, Vioreck et al. 1992, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722796#references

Description Author: K. Boggs and G. Kittel, mod. M.S. Reid

Version: 21 Aug 2008

Concept Author: K. Boggs and G. Kittel

Stakeholders: Canada, West

ClassifResp: West

TEXAS COASTAL BEND BEACH (CES203.463)

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Barren**Spatial Scale & Pattern:** Linear**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland**Non-Diagnostic Classifiers:** Forest and Woodland (Treed)**National Mapping Codes:** ESLF 3192**CONCEPT**

Summary: This system includes sparsely vegetated ocean beaches constituting the outermost zone of coastal vegetation ranging from and including Matagorda Island south to include Padre Island in Texas. These beaches are located on accretionary barrier islands, and they are generally well-developed with a stable dune system behind them. Examples generally extend seaward from foredunes but may include flats behind breached foredunes. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by wind and salt spray and may be flooded by storm surges. Characteristic dominants are xerophytes and include the perennials *Ipomoea pes-caprae* and *Ipomoea imperati* and the annual *Cakile geniculata*.

MEMBERSHIP**Associations:**

- *Ipomoea pes-caprae* - *Ipomoea imperati* - (*Cakile geniculata*) Herbaceous Vegetation (CEGL004402, G3?)

Alliances:

- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)

DISTRIBUTION**Range:** Outermost zone of coastal vegetation ranging from and including Matagorda Island south to include Padre Island in Texas.**Divisions:** 203:C; 301:C**Nations:** US**Subnations:** TX**Map Zones:** 36:C**TNC Ecoregions:** 31:C**SOURCES****References:** Comer et al. 2003**Full References:**See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723123#references**Description Author:** J. Teague**Version:** 13 Jan 2003**Concept Author:** J. Teague**Stakeholders:** Southeast**ClassifResp:** Southeast

UPPER TEXAS COAST BEACH (CES203.544)

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Barren**Spatial Scale & Pattern:** Linear**Required Classifiers:** Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland**National Mapping Codes:** ESLF 3125**CONCEPT**

Summary: This system includes sparsely vegetated ocean beaches of the upper Texas Coast. These beaches are generally eroding and narrow. It constitutes the outermost zone of coastal vegetation ranging from mainland shores of the Chenier Plain of Louisiana to the barrier islands and spits of central Texas north of Matagorda Island. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by waves and may be flooded by storm surges. Dynamic disturbance regimes largely limit vegetation to pioneering, salt-tolerant, succulent annuals. These beaches are generally unstable and highly impacted by attempts to limit the natural erosional processes. Accumulation is limited by the lack of sediments entering the gulf because most rivers in this area enter bays with their sediments not reaching the gulf.

MEMBERSHIP**Associations:**

- *Ipomoea pes-caprae* - *Ipomoea imperati* - (*Cakile geniculata*) Herbaceous Vegetation (CEGL004402, G3?)
- *Spartina patens* - *Panicum amarum* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004971, G2?)

Alliances:

- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)

DISTRIBUTION

Range: Outermost zone of coastal vegetation ranging from mainland shores of the Chenier Plain of Louisiana to the barrier islands and spits of central Texas north of Matagorda Island.

Divisions: 203:C**Nations:** US**Subnations:** LA, TX**Map Zones:** 37:C**TNC Ecoregions:** 31:C**SOURCES****References:** Comer et al. 2003**Full References:**See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723058#references**Description Author:** J. Teague**Version:** 06 Feb 2003**Concept Author:** J. Teague**Stakeholders:** Southeast**ClassifResp:** Southeast

WESTERN GREAT PLAINS BADLANDS (CES303.663)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Badland; Badlands

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Ustic; Flood Scouring; W-Patch/High Intensity

National Mapping Codes: ESLF 3114

CONCEPT

Summary: This ecological system is found within the northern Great Plains region of the United States and Canada with some of the better known and extensive examples in North and South Dakota. In contrast to Western Great Plains Cliff and Outcrop (CES303.665), this system is typified by extremely dry and easily eroded, consolidated clay soils with bands of sandstone or isolated consolidates and little to no cover of vegetation (usually less than 10% but can be as high as 20%). Vegetated patches within the badlands system may have cover higher than 20%. In north-central Montana, badlands often are a mosaic of bare substrate with small patches of grasses and/or shrubs that may exceed 10% cover. In those areas with vegetation, species can include scattered individuals of many dryland shrubs or herbaceous taxa, including *Grindelia squarrosa*, *Gutierrezia sarothrae* (especially with overuse and grazing), *Sarcobatus vermiculatus*, *Atriplex gardneri*, *Artemisia pedatifida*, *Eriogonum* spp., *Muhlenbergia cuspidata*, *Pseudoroegneria spicata*, and *Arenaria hookeri*. Patches of *Artemisia* spp. can also occur. This system can occur where the land lies well above its local base level or below and is created by several factors, including elevation, rainfall, carving action of streams, and parent material.

Classification Comments: It has been proposed to change the name of this system to include "shale barrens." As with all predominantly "barren" systems, there will be patches of vegetated areas within the overall system. Small areas of "badlands" or "shale barrens" can also occur without major erosional processes actively taking place. An example location is Bitter Creek Area of Environmental Concern (BLM designation), which is much like a badland but not so eroded. The vegetation is sparse with *Juniperus horizontalis* and much bare ground; there is some grass cover as well. The driving process is erosion. Exactly where this transitions to Inter-Mountain Basins Shale Badland (CES304.789) in central Wyoming needs to be clarified.

Similar Ecological Systems:

- Western Great Plains Cliff and Outcrop (CES303.665)

DESCRIPTION

Environment: A combination of factors such as elevation, rainfall, carving action of streams and parent material can contribute to the development of this system. This system is primarily a type of mature dissection with finely textured drainage pattern and steep slopes. This system contains extremely dry and easily erodible, consolidated clayey soils with bands of sandstone or isolated consolidates. This system is found within an arid to semi-arid climate with infrequent, but torrential, rains that cause erosion.

Vegetation: Vegetation in this system is limited by climate and soils and often is less than 10% cover. Scattered individuals of *Grindelia squarrosa*, *Gutierrezia sarothrae*, or *Eriogonum* spp. and/or patches of *Artemisia* spp. may occur.

Dynamics: This system contains highly erodible soils that can be strongly influenced by infrequent, but often torrential, rains.

MEMBERSHIP

Associations:

- *Arenaria hookeri* Barrens Herbaceous Vegetation (CEGL001951, GU)
- *Artemisia longifolia* Badlands Sparse Vegetation (CEGL002195, GNR)
- *Artemisia pedatifida* - *Atriplex gardneri* Shrubland (CEGL001525, G3?)
- *Atriplex gardneri* - *Picrothamnus desertorum* Dwarf-shrubland (CEGL001439, G2G3)
- *Atriplex gardneri* / *Artemisia tridentata* Dwarf-shrubland (CEGL001440, G3)
- *Atriplex gardneri* / *Monolepis nuttalliana* Dwarf-shrubland (CEGL001443, G3?)
- *Atriplex gardneri* / *Pascopyrum smithii* Dwarf-shrubland (CEGL001445, G3)
- *Eriogonum pauciflorum* - *Gutierrezia sarothrae* Badlands Sparse Vegetation (CEGL005270, G4G5)
- Eroding Great Plains Badlands Sparse Vegetation (CEGL002050, G4G5)
- *Panicum virgatum* - (*Pascopyrum smithii*) Herbaceous Vegetation (CEGL001484, G2Q)
- *Sarcobatus vermiculatus* / *Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus* / *Pseudoroegneria spicata* Shrubland (CEGL001367, G3)
- *Shepherdia argentea* Shrubland (CEGL001128, G3G4)

Alliances:

- *Arenaria hookeri* Barrens Herbaceous Alliance (A.1642)
- *Artemisia longifolia* Sparsely Vegetated Alliance (A.1874)
- *Artemisia pedatifida* Shrubland Alliance (A.1127)
- *Atriplex gardneri* Dwarf-shrubland Alliance (A.1110)

- *Eriogonum pauciflorum* Sparsely Vegetated Alliance (A.3565)
- Large Eroding Bluffs Sparsely Vegetated Alliance (A.1875)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Shrubland Alliance (A.1041)
- *Shepherdia argentea* Temporarily Flooded Shrubland Alliance (A.960)

DISTRIBUTION

Range: This system ranges throughout the northern Great Plains region of the United States and Canada. Some of the best and well-known examples occur in North and South Dakota. Its western-most occurrence in Wyoming needs to be clarified, but it does occur in the eastern portion of that state.

Divisions: 303:C

Nations: CA?, US

Subnations: MB?, MT, ND, NE, SD, WY

Map Zones: 20:C, 21:?, 22:?, 29:C, 30:C, 31:C, 33:?, 40:P

USFS Ecomap Regions: 331E:C?, 331F:CC, 331G:CC, 331H:C?, 331K:CP, 331L:CP, 331M:CC, 342A:CC, 342F:C?, 342G:C?, M331B:CC, M331I:CP, M334A:CC

TNC Ecoregions: 26:C, 34:P, 66:?, 67:P

SOURCES

References: Comer et al. 2003, Knight et al. 1987, Von Loh et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722995#references

Description Author: S. Menard and K. Kindscher, mod. G. Kittel and M.S. Reid

Version: 29 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, West
ClassifResp: Midwest

WESTERN GREAT PLAINS CLIFF AND OUTCROP (CES303.665)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Very Shallow Soil; Ustic; Flood Scouring; W-Patch/High Intensity; Cliff (Landform)

National Mapping Codes: ESLF 3142

CONCEPT

Summary: This system includes cliffs and outcrops throughout the Western Great Plains Division. Substrate can range from sandstone and limestone, which can often form bands in the examples of this system. Vegetation is restricted to shelves, cracks and crevices in the rock. However, this system differs from Western Great Plains Badlands (CES303.663) in that often the soil is slightly developed and less erodible, and some grass and shrub species can occur at greater than 10%. Common species in this system include short shrubs such as *Rhus trilobata* and *Artemisia longifolia* and mixedgrass species such as *Bouteloua curtipendula* and *Bouteloua gracilis* and *Calamovilfa longifolia*. Drought and wind erosion are the most common natural dynamics affecting this system.

Classification Comments: The granite glades and rock outcrops of the Llano Uplift of Texas have been reclassified to Llano Uplift Acidic Forest, Woodland and Glade (CES303.657). The carbonate glades, barrens, and cliffs of the Edwards Plateau of Texas have been reclassified to Edwards Plateau Carbonate Glade and Barrens (CES303.655) and Edwards Plateau Cliff (CES303.653), respectively.

Similar Ecological Systems:

- Southwestern Great Plains Canyon (CES303.664)
- Western Great Plains Badlands (CES303.663)

DESCRIPTION

Environment: This system includes cliff and outcrops throughout the Western Great Plains Division with substrate ranging from sandstone to limestone. Areas of shelves, cracks, and crevices accumulated materials and allow soils to develop enough to support more vegetation.

Vegetation: Short shrubs and mixedgrass species dominate the vegetation of this system. Common species include *Rhus trilobata*, *Artemisia longifolia*, *Bouteloua curtipendula*, *Bouteloua gracilis*, and *Calamovilfa longifolia*, although species can vary somewhat with substrate and exposure.

Dynamics: Drought and wind erosion are the major influences affecting this system.

MEMBERSHIP

Associations:

- *Arenaria hookeri* Barrens Herbaceous Vegetation (CEGL001951, GU)
- *Artemisia longifolia* - *Calamovilfa longifolia* Sparse Vegetation (CEGL001521, G3G4)
- *Lesquerella (gordonii, ovalifolia)* - *Schizachyrium scoparium* Herbaceous Vegetation (CEGL004917, G2G3)
- Limestone Butte Sparse Vegetation (CEGL002296, GNR)
- Sandstone Butte Sparse Vegetation (CEGL002297, GNR)
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045, G4G5)
- Sandstone Great Plains Dry Cliff Sparse Vegetation (CEGL005257, G4G5)
- Sandstone Great Plains Xeric Butte - Bluff Sparse Vegetation (CEGL002290, GNR)
- Shale Barren Slopes Sparse Vegetation (CEGL002294, GNR)
- Siltstone - Sandstone Rock Outcrop Sparse Vegetation (CEGL002047, G4?)

Alliances:

- *Arenaria hookeri* Barrens Herbaceous Alliance (A.1642)
- *Artemisia longifolia* Sparsely Vegetated Alliance (A.1874)
- *Lesquerella (gordonii, ovalifolia)* Herbaceous Alliance (A.1619)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- Rock Outcrop Sparsely Vegetated Alliance (A.1838)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Canyon (CES303.658)

DISTRIBUTION

Range: This system ranges throughout the Western Great Plains Division from northern Texas to southern Canada.

Divisions: 303:C

Nations: CA, US

Subnations: CO, KS, MB, MT, ND, NE, NM, OK, TX, WY

Map Zones: 20:?, 22:?, 25:P, 26:C, 27:C, 28:P, 29:C, 30:C, 31:C, 33:C, 34:C, 35:C, 38:C, 39:?, 43:P

USFS Ecomap Regions: 251G:P?, 251H:PP, 315A:CC, 315B:CC, 315F:CC, 321A:CC, 331B:CC, 331C:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331K:CP, 331L:CP, 332B:CP, 332C:CC, 332D:CC, 332E:C?, 342F:PP, M313B:CC, M331B:CC, M331F:CC, M331I:CC

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C, 37:P, 66:P, 67:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722993#references

Description Author: S. Menard and K. Kindscher

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Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, Southeast, West

ClassifResp: Midwest