DEPARTMENT OF
ECOLOGY
State of Washington

WASHINGTON STATE WETLAND RATING SYSTEM

for

EASTERN WASHINGTON

Update – 2014

DRAFT FOR REVIEW

Ecology Publication # 14-06-002

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Washington State Department of Ecology

2014

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Publication and Contact Information

This report is available on the Department of Ecology's website at
https://fortress.wa.gov/ecy/publications/SummaryPages/1406002.html

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This publication should be cited as: Hruby, T. (2014) Washington State Wetland Rating System for Eastern Washington: Update – 2014 Draft for Review. Department of Ecology Publication #14-06-002.

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PREFACE

This document is an update of the "Washington State Wetland Rating System for Eastern Washington," published by the Department of Ecology in 2004. This is the fourth edition of the rating system since the Department of Ecology published the first one in 1991. The original document was published with the understanding that modifications would be incorporated as we increase our understanding of wetland systems, and as the rating system is used by many different people.

The need to update the previous version became apparent as we have learned more about how wetlands function and what is needed to protect them in the last decade. Furthermore, statistical analyses of the data collected during the use of the previous version indicated that scoring functions from 0-100 was overly optimistic. The method can accurately document the levels at which wetlands function only to three qualitative ratings of High, Medium or Low.

We are calling this version an update of the 2004 edition rather than a revision because the changes made are not as significant as those made between the 1993 and the 2004 version. Much of the information and text remain the same and changes were made only if new scientific information indicated changes were needed.

ACKNOWLEDGEMENTS

To be written after public and peer review….

1. INTRODUCTION

The wetlands in Washington State differ widely in their functions and values. Some wetland types are common, while others are rare. Some are heavily disturbed while others are still relatively undisturbed. All, however, provide some functions and resources that are valued. These may be ecological, economic, recreational, or aesthetic. Managers, planners, and citizens need tools to understand the resource value of individual wetlands in order to protect them effectively.

Many tools have been developed to understand the functions and values of wetlands. The methods range from detailed scientific analyses that may require many years to complete, to the judgments of individual resource experts done during one visit to the wetland. Managers of our wetland resources, however, are faced with a dilemma. Scientific rigor is often time consuming and costly. Tools are needed to provide information on the functions and values of wetlands in a time- and cost-effective way. One way to accomplish this is to categorize wetlands by their important attributes or characteristics based on the collective judgment of regional experts. Such methods are relatively rapid but still provide some scientific rigor (Hruby 1999).

> The Washington State Wetland Rating System categorizes wetlands based on specific attributes such as rarity, sensitivity to disturbance, and the functions they provide. In the earlier editions of this tool, the term "rating" was not used in a manner that is consistent with its definition in the dictionary, and this has caused some confusion. By definition*, a wetland rating system should only group wetlands based on a qualitative scale (e.g. high, medium, low). The Washington State Rating System, however, categorizes wetlands based on several criteria such as rarity, sensitivity, as well as level of function. These measures are not comparable and thus not on the same scale. Only the functions are actually rated on a qualitative scale. The term "rating", however, is being kept in the title to maintain consistency with the previous editions. .
>
> * rating – A position assigned on a scale; a standing. (American Heritage® Dictionary on Yahoo.com accessed August 2, 2004)

This rating system was designed to differentiate between wetlands based on their sensitivity to disturbance, their significance, their rarity, our ability to replace them, and the functions they provide. The rating system, however, does not replace a full assessment of wetland functions that may be necessary to plan and monitor a project of compensatory mitigation.

The intent of the "rating" categories is to provide a basis for developing standards for protecting and managing the wetlands. Some decisions that can be made based on the rating include the width of buffers needed to protect the wetland from adjacent development and permitted uses in, and around, the wetland. Many local jurisdictions have included language on buffers in their critical areas ordinances based on the 2005 guidance. For the 2015-2019 critical areas ordinance update cycle, we are not proposing any changes to the buffer widths recommended in the 2005 guidance. The update of the rating systems will provide a more accurate rating of the functions and values of a wetland but keeps the same four wetland categories used in the 2005 guidance.

The rating system is primarily intended for use with vegetated, freshwater, wetlands as identified using the Federal Wetland Delineation Manual and the appropriate regional supplements. It also categorizes estuarine wetlands but does not rate their functions. The rating system also does not characterize streambeds, riparian areas, and other valuable aquatic resources.

A companion document, "Washington State Wetland Rating System for Western Washington – Update" is also available for review (Ecology publication #14-06-007).

Changes made to the 2004 Rating System in this update

Chapters 2-4, 6, and the scoring for the site potentials in Chapter 5 are carried over from the 2004 version of the rating system. Some changes in these sections were made to reflect the annotations added in 2006 and to include current definitions used by the Washington State Department of Fish and Wildlife and the Natural Heritage Program at the Department of Natural Resources.

The substantive differences between this version of the rating system and the 2004 version are the conversion of scores for each function to ratings of High, Medium, or Low, and the replacement of the "Opportunity" section with two new sections (Landscape Potential and the Value). Only the ratings of functions are assigned a score rather than using the "raw" scores of the indicators (see box below). The range of possible scores for a function was reduced to 9 – 27 (from 1 – 100) to better reflect the accuracy of the method.

The questions on Site Potential are the same as in the 2004 version of the rating system. The new sections on Landscape Potential and Value in Chapter 5 are the same as in the Credit-Debit Method developed by Ecology in 2012 (Ecology publication #10-06-015). Also, we have added interdunal wetlands with very high habitat scores to the list of Category I wetlands based on our field work during the last decade on barrier beaches along the coast (see Chapter 2).

The Credit-Debit Method underwent extensive peer and public review and the new sections on Landscape Potential and Value were field tested for one year prior to publication in 2012. Over 40 individuals and groups provided comments on the Credit Debit Method. These comments and our responses can be found at https://fortress.wa.gov/ecy/publications/SummaryPages/1206005.html .

The rating system is based on the best information available at this time and meets the needs of "best available science" under the Growth Management Act. *NOTE: A statement will be added here to describe the review that was done on this document.*

We anticipate that the method will be further modified over time as we keep increasing our understanding of our wetland resources.

The distribution categories of reference wetlands in the updated rating system

Data were collected at 90 wetlands to calibrate the rating system in 2004. Data from 86 of these could be used to re-calibrate the scoring for this update. Some wetlands were lost through natural and human alterations and some could not be re-located.

The range of scores for functions in this update is between 9 – 27 rather than the 0 – 100 possible in the 2004 version. This change was necessary because a statistical analysis of data collected in the last decade indicates that rapid methods such as these are not scientifically accurate beyond a qualitative rating of High, Medium, or Low (unpublished data).

Choosing the score at which we separate levels of functioning is a decision that is based on best professional judgment in rapid methods such as these. For example, in the 2004 rating system we chose to call wetlands with a very high level of function (Category I) those with a score of 70 or more, while those with a high level of function (Category II) scored between 51 – 69, and those with a low level of function (Category IV) scored less than 30 points. These divisions were based on the judgment of the teams of wetland experts that developed the rating system in 2004. It reflects the teams' scientific consensus on what is meant by very high, high, moderate, and low levels of functions after visiting the reference sites. The divisions also reflected the teams' observations that most wetlands function at high or moderate levels and there are fewer that function at very high or low levels.

The divisions between levels of function in this update were chosen to match as closely as possible the distribution of ratings found for the 86 reference sites when rated using the 2004 method. However, given that the range of possible scores was reduced by more a factor of 5, it was not possible to get the exact same distribution. We do however, consider that the scores used to place a wetland in a category were very close (see the first page of the field form in Appendix A for the scores of the different categories) .

Number of Reference Wetlands in Each Category Based on Their Score for Functions

Category	2004 Rating System	Updated Rating System
I	13	11
II	36	36
III	35	33
IV	6	6

2. RATIONALE FOR THE CATEGORIES

This rating system is designed to differentiate between wetlands based on their sensitivity to disturbance, rarity, the functions they provide, and whether we can replace them or not. The emphasis is on identifying those wetlands:

- Where our ability to replace them is low,
- That are sensitive to adjacent disturbance,
- That are rare in the landscape,
- That perform many functions well,
- That are important in maintaining biodiversity.

The following description summarizes the rationale for including different wetland types in each category. As a general principle, it is important to note that wetlands of all categories have valuable functions in the landscape, and all are worthy of inclusion in programs for wetland protection.

2.1 CATEGORY I

Category I wetlands are those that 1) represent a unique or rare wetland type; <u>or</u> 2) are more sensitive to disturbance than most wetlands; <u>or</u> 3) are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; <u>or</u> 4) provide a high level of functions. We cannot afford the risk of any degradation to these wetlands because their functions and values are too difficult to replace. Generally, these wetlands are not common and make up a small percentage of the wetlands in the region. Of the 86 wetlands used to field test the current rating system only 11 (13%) were rated as a Category I.

In eastern Washington the following types of wetlands are Category I.

<u>Alkali wetlands</u> - Alkali wetlands are characterized by the occurrence of shallow saline water. In eastern Washington these wetlands contain surface water with specific conductance that exceeds 3000 micromhos/cm. These wetlands provide the primary habitat for several species of migrant shorebirds and are also heavily used by migrant waterfowl. They also have unique plants and animals that are not found anywhere else in eastern Washington. For example, the small alkali bee that is used to pollinate alfalfa and onion for seed production lives in alkali systems. It is a valuable natural resource for agriculture in the western U.S. and especially in eastern Washington (Delaplane and Mayer, 2000). (Note: The “regular” bees used to pollinate fruits and vegetables are generally too large to pollinate the small flowers of these commercially important plants).

The salt concentrations in these wetlands have resulted from a relatively long-term process of groundwater surfacing and evaporating. These conditions cannot be easily reproduced through compensatory mitigation because the balance of salts, evaporation, and water inflows are hard to reproduce, and to our knowledge has never been tried. Alkali wetlands are also rare in the landscape of eastern Washington. Of the several hundred wetlands that were surveyed and visited as part of the function assessment project and the revisions to the rating system, only nine could be classified as alkali.

Alkali wetlands are placed into Category I because they probably cannot be reproduced through compensatory mitigation and are relatively rare in the landscape. No information was found on any attempts to create or restore alkali wetlands. Any impacts to alkali wetlands will, therefore, probably result in a net loss of their functions and values.

Wetlands With a High Conservation Value (formerly called Natural Heritage Wetlands) – These Category I wetlands have been identified by scientists from the Washington Natural Heritage Program as important ecosystems for maintaining plant diversity in our state.

Wetlands that represent rare plant communities or provide habitat for rare plants are uncommon in eastern Washington. As of 2013, there were only about 575 wetlands in western Washington that are characterized as wetlands with a high conservation value by the Natural Heritage Program (Rocchio and others 2013). For comparison, the Washington State Department of Fish and Wildlife mapped over 27,000 wetlands in only three watersheds in the Puget Sound area. The inventory of wetlands with a high conservation value in eastern Washington has not yet been completed as of winter 2013. However, the ratio between such wetlands and the total number will probably be similar. The total number of wetlands in eastern Washington is lower than in the western part of the state, but the numbers are surprisingly high for an arid region. The U.S. fish and Wildlife Service mapped 3124 wetlands in Lincoln County alone (Tiner and others, 2002).

By categorizing wetlands with a high conservation value as Category I, we are trying to provide a high level of protection to these important but rare wetlands. "These natural systems and species will survive in Washington only if we give them special attention and protection. By focusing on species at risk and maintaining the diversity of natural ecosystems and native species, we can help assure our state's continued environmental and economic health." (DNR http://www.wa.gov/dnr/htdocs/fr/nhp/wanhp.html , accessed October 1, 2002)

Bogs - Bogs are Category I wetlands because they are sensitive to disturbance and impossible to re-create through compensatory mitigation.

Bogs are low nutrient, acidic wetlands that have organic soils. The chemistry of bogs is such that changes to the water regime or water quality of the wetland can easily alter its ecosystem. The plants and animals that grow in bogs are specifically adapted to such conditions and do not tolerate changes well. Immediate changes in the composition of the plant community often occur after the water regime changes. Minor changes in the water regime or nutrient levels in these systems can have major adverse impacts on the plant and animal communities (e.g. Grigal and Brooks, 1997).

In addition to being sensitive to disturbance, bogs are not easy to re-create through compensatory mitigation. Researchers in northern Europe and Canada have found that restoring bogs is difficult, specifically in regard to plant communities (Bolscher 1995, Grosvermier et al. 1995, Schouwenaars 1995, Schrautzer et al. 1996, Mazerolle and others 2006), water regime (Grootjans and van Diggelen 1995, Schouwenaars 1995) and/or water chemistry (Wind-Mulder and Vitt 2000). In fact, restoration may be impossible because of changes to the biotic and abiotic properties preclude the re-establishment of bogs (Shouwenaars 1995, Schrautzer et al. 1996) although one study (Lucchese and others 2010) did find that a sphagnum layer did become re-established after 17 year. Furthermore, bogs form extremely slowly, with organic soils forming at a rate of about one inch per 40 years in western Washington (Rigg 1958).

Nutrient poor wetlands, such as bogs, have a higher species richness, many more rare species, and a greater range of plant communities than nutrient rich wetlands (review in Adamus and Brandt 1990). They are, therefore, more important than would be accounted for using a simple assessment of wetland functions (Moore et al. 1989).

Mature and Old-growth Forested Wetlands with Slow Growing Trees – Mature and old-growth forested wetlands over ¼ acre in size dominated by slow growing native trees are Category I because these wetlands cannot be easily replaced through compensatory mitigation. A mature forest of slow growing trees may require a century or more to develop, and the full range of functions performed by these wetlands may take even longer (see review in Sheldon and others, 2005).

These forested wetlands are also important because they represent a second "priority habitat" as defined by the state department of Fish and Wildlife. "*Priority habitats* are those habitat types or elements with unique or significant value to a diverse assemblage of species." (Washington State Department of Fish and Wildlife (WDFW), http://wdfw.wa.gov/hab/phshabs.htm, accessed October 15, 2002). NOTE: All wetlands are categorized as a priority habitat by the WDFW. Forested wetlands, therefore, represent two priority habitats that coincide.

Wetland species considered to be "slow-growing" and native in eastern Washington are western red cedar (*Thuja plicata*), Alaska yellow cedar (*Chamaecyparis nootkatensis*), pine spp. mostly "white" pine (*Pinus monticola*), western hemlock (*Tsuga heterophylla*), Oregon white oak (*Quercus garryana*) and Englemann spruce (*Picea engelmannii*).

Forests with stands of Aspen – Aspen stands in a forested area are Category I because their contribution as habitat far exceeds the small acreage of these stands and relatively small number of stems (Hadfield and Magelssen 2004). Furthermore a mature stand of aspen and its underground root system may be difficult to reproduce. Regeneration of aspen stands by sexually produced seeds is an unusual phenomenon (Romme et al. 1997).

Aspen stands are also important because they represent a second "priority habitat" as defined by the state department of Fish and Wildlife. "*Priority habitats* are those habitat types or elements with unique or significant value to a diverse assemblage of species." (Washington State Department of Fish and Wildlife (WDFW), http://wdfw.wa.gov/publications/00165/wdfw00165.pdf accessed December 3, 2013). NOTE: All wetlands are categorized as a priority habitat by the WDFW. Wetlands with aspen stands, therefore, represent two priority habitats that coincide.

Wetlands That Perform Functions at High Levels - Wetlands scoring 22 points or more (out of 27) from the rating of functions are Category I wetlands.

Not all wetlands function equally well, especially across the suite of functions performed. The field questionnaire was developed to provide a method by which wetlands can be categorized based on their relative performance of different functions. Wetlands scoring 22 points or more were judged to have the highest levels of function. Wetlands that provide high levels of all three types of functions (improving water quality, hydrologic functions, and habitat) are also relatively rare. Of the 86 wetlands used to calibrate the rating system in eastern Washington, only 11 (13%) scored 22 points or higher based on their functions.

2.2 CATEGORY II

Category II wetlands are difficult, though not impossible, to replace, and provide high levels of some functions. These wetlands occur more commonly than Category I wetlands, but still need a relatively high level of protection. Category II wetlands in eastern Washington include:

Forested Wetlands in the Floodplains of Rivers

Forested wetlands are an important resource in the floodplains of rivers, especially in the areas through which the river may flow regularly (often called the channel migration zone). These wetlands are rated Category II, at a minimum, because the questionnaire on functions does not adequately capture their unique role in the ecosystem. Trees in the floodplains are critical to the proper functioning and the dynamic natural processes of rivers. Please note, however, that many forested wetlands in floodplains that have structurally complex habitats may actually be a Category I based on the functions.

Trees in floodplains influence channel form, create pools, riffles and side channels that are essential habitat for many fish and other aquatic species. They also create localized rearing and flood refuge areas, and contribute to the stabilization of the main river channel. (National Research Council 2002b).

Mature and Old-growth Forested Wetlands with Fast Growing Trees

Mature and old-growth forested wetlands with over ¼ acre of forest dominated by fast growing native trees are rated as Category II because they are hard to replace within the time-frame of most regulatory activities. The time needed to replace them is shorter than for forests with slow growing trees, but still significant. These forested wetlands are also important because they represent a second "priority habitat" as defined by the Washington state Department of Fish and Wildlife. NOTE: All wetlands are categorized as a priority habitat by the WDFW. Forested wetlands, therefore, represent two priority habitats that coincide.

Native fast-growing wetland trees include:

Alders – Red (*Alnus rubra*), Thin-leaf (*A. tenuifolia*);

Cottonwoods – Narrow-leaf (*Populus angustifolia*), Black (*P. balsamifera*);

Willows- Peach-leaf (*Salix amygdaloides*), Sitka (*S. sitchensis*), Pacific (*S. lasiandra*); and Aspen - (*Populus tremuloides*)

Water Birch (*Betula occidentalis*)

Vernal Pools – Vernal pools, or "rainpools," located in a landscape with other wetlands and that are relatively undisturbed during the early spring are rated Category II because the questionnaire on functions does not adequately capture their unique role in the ecosystem.

Vernal pool ecosystems are formed when small depressions in the scabrock or in shallow soils fill with snowmelt or spring rains. They retain water until the late spring when reduced precipitation and increased evapotranspiration lead to a complete drying out. The wetlands hold water long enough throughout the year to allow some strictly aquatic organisms to flourish, but not long enough for the development of a typical wetland environment (Zedler 1987).

The Washington Natural Heritage Program (WNHP) has recognized the vernal pool ecosystem as an important component of Washington's Natural Area System. Vernal pools in the scablands are the first to melt in the early spring. This open water provides areas where migrating waterfowl can find food while other, larger, bodies of water are still frozen. Furthermore, the open water provides areas for pair bonding in the waterfowl (R. Friesz, WDFW, personal communication). Thus, vernal pools in a landscape with other wetlands provide an important habitat function for waterfowl that requires a relatively high level of protection. This is the reason why relatively undisturbed vernal pools in a mosaic of other wetlands are Category II, and isolated undisturbed vernal pools are Category III.

Wetlands That Perform Functions Well - Wetlands scoring between 19 - 21 points (out of 27) on the questions related to the functions present are Category II wetlands. These wetlands were judged to perform most functions relatively well, or performed one group of functions very well and the other two moderately well.

2.3 CATEGORY III

Category III wetlands are 1) wetlands with a moderate level of functions (scores between 16 -18 points). Wetlands scoring between 16 -19 points generally have been disturbed in some ways, and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands.

2.4 CATEGORY IV

Category IV wetlands have the lowest levels of functions (scores less than 16 points) and are often heavily disturbed. These are wetlands that we should be able to replace, and in some cases be able to improve. However, experience has shown that replacement cannot be guaranteed in any specific case. These wetlands may provide some important functions, and also need to be protected.

3. OVERVIEW FOR USERS

3.1 When to Use the Wetland Rating System

The rating system is designed as a rapid screening tool to categorize wetlands for use by agencies and local governments in protecting and managing wetlands. It should be used only on vegetated wetlands as defined using the delineation procedures in WAC 173-22-80. The rating system does not try to establish the economic values present in a wetland; it only helps to identify its sensitivity, rarity, and functions.

Two versions of the rating system have been developed, one for western Washington and one for eastern. This broad division of the state into east and west may not reflect all regional differences in the importance of wetlands. Developing special measures to protect locally unique wetlands is recommended where local governments need to provide a level of protection that would not be otherwise provided by the rating system.

3.2 How the Wetland Rating System Works

The Wetland Rating Form attached at the end of this document asks the user to collect information about the wetland in a step-by-step process. We recommend careful reading of the guidance before filling out the form. A wetland may be rated in two different categories based on the different criteria used in this method. It is important, therefore, to fill out the entire rating form. If two categories can be applied to a wetland, it is the "highest" that applies. "Highest" here is defined as the most protective.

If you are interested in learning more about how the rating system was developed Appendix C discusses rapid methods for characterizing functions and how this rating system was calibrated.

3.3 General Guidance for Using the Wetland Rating Form

Land-owner's Permission

It is important to obtain permission from the land owner(s) before going on their property.

Time Involved

The time necessary to rate wetlands will vary from as little as fifteen minutes to several hours. Larger sites with dense brush may involve strenuous effort. Several of the questions are best answered by using aerial photographs, topographic maps, other documents, or a combination of these resources with field observations. In some cases, however, it may be necessary to visit the wetland more than once. Some of the questions cannot be answered if the ground is covered with snow or the surface water is frozen. If this is the case at the time a wetland is being rated, it may be necessary to revisit the site later.

Experience and Qualifications Needed

It is important that the person completing the rating have experience in the identification of natural wetland features, indicators of wetland function, vegetation classes, and some ability to distinguish between different plant species.   We recommend that qualified wetland consultants or wetland experts be used to rate most sites, particularly the larger and more complex ones. This will help ensure that results are repeatable.

In addition, we highly recommend that users of this method take the training provided by the Department of Ecology on this method.

Users of this method who have not taken the training can expect that, **on the average**, their scores for each function will be off by at least 1 point. This is based on data collected during the calibration of the 2004 wetland rating systems and subsequent training sessions. Untrained users will underestimate, or over estimate, the scores for functions by 15%. This is an average, and actual differences may be as high as 40%.

Rating the Wetland

Each wetland can have several ratings: one resulting from its score for the functions and one or more resulting from special characteristics it may have. The first page of the rating form contains a box for recording each rating. This box should be filled out after completing the form. Pick the "highest" category (i.e. the lowest Category) when assigning an overall category for the wetland being rated.

4. IDENTIFYING WETLAND BOUNDARIES FOR RATING

To begin, determine the location and approximate boundaries of all wetlands at the site you are investigating. A surveyed delineation of the wetland, however, is not necessary to rate the wetland, unless this information is required for another part of your project. The boundary, however, will need to be verified in the field. Boundaries that are not verified by a field survey may cause problems in the scoring of the indicators. This is especially true in forested wetlands where the boundaries are difficult to determine from aerial photographs.

It is also highly recommended that you obtain aerial photos of the site. The field form identifies the information that needs to be included on aerial photos or maps and submitted with the form.

The entire wetland unit has to be scored. Usually it is the entire delineated wetland that is scored. Small areas within a wetland unit (such as the footprint of an impact) cannot be rated separately. The method is not sensitive enough, or complex enough, to allow division of a wetland unit into smaller units based on level of disturbance, property lines, or plant communities. DO NOT SCORE ONLY THE PART BEING ALTERED OR MITIGATED (Figure 1).

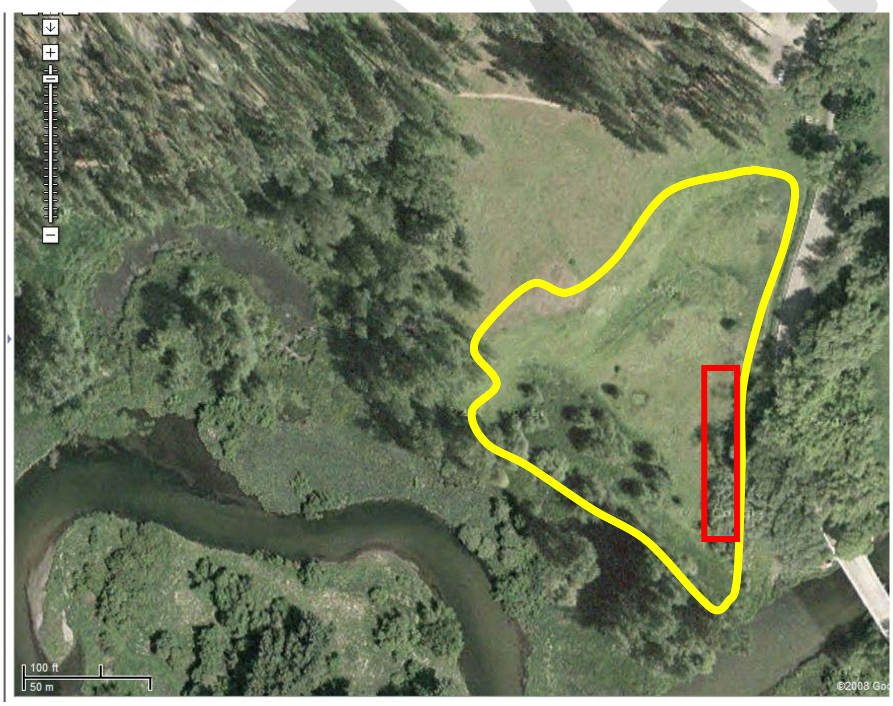


Figure 1: Footprint of the impact is the red rectangle , but the unit for rating is the entire wetland (yellow line).

Furthermore, you do not subdivide a wetland unit into different hydrogeomorphic classes if more than one is present. A wetland unit with several wetland classes within its boundary is treated as one class (Figure 2). The second page of the classification key in The classification key in Appendix A provides guidance on how to classify wetlands having several HGM classes within its boundary.

Figure 2: A wetland with two HGM classes within the delineated boundary. This wetland is rated as Lake-fringe wetland.

There are, however, ecological criteria that can be used to separate very large wetlands into smaller units for scoring. These criteria are described below.

If you do not have access to the entire unit you should do the best you can to answer the questions from aerial photos, using binoculars, or any other additional information. Note your lack of access on the data form and record which questions are based on incomplete data.

> The rating of an entire wetland unit rather than just the part of it being mitigated or impacted is a trade-off made between scientific rigor and the need for a "rapid" method. None of the rapid methods developed by Ecology (the rating systems and function assessment methods) are rigorous enough to adequately assess the functions of only a small area within a wetland unit. We did numerous tests of this question, and both methods gave us invalid results when applied to small areas within a wetland. More detailed data are needed to adequately assess functions in only a part of a wetland unit. This would require monitoring and measuring the actual processes taking place in different parts of a wetland rather than characterizing the structural indicators present, and will certainly require monthly sampling for at least one year.

4.1 Identifying Boundaries of Large Contiguous Wetlands in Valleys (Depressional and Riverine)

Wetlands can often form large contiguous areas that extend over hundreds of acres. This is especially true in river valleys where there is some surface water connection between all areas of the floodplain. In these situations the initial task is to identify the wetland "unit" that will be rated. A large contiguous area of wetland can be divided into smaller units using the criteria described below.

The guiding principles for separating a wetland in a valley into different units are the changes in the water regime or a lack of wetland plants. Boundaries between different units should be set at the point where the volume, flow, or velocity of the water changes abruptly. These changes in water regime can be either natural or human-made (anthropogenic). The following sections describe some common situations that might occur. The criteria for separating wetlands into different units are based on the observations made during the calibration of the rating systems and the methods for assessing wetland functions. They reflect the collective judgment of the teams of wetland experts that developed and calibrated the methods.

Examples of Changes in Water Regime

- Berms, dikes, cascades, rapids, falls, and culverts.
- Features that change flow, volume, or velocity of water over short distances.
- The presence of drainage ditches that significantly reduce water detention in one area of a wetland.

Wetlands in a Series of Depressions in a Valley

Wetlands that form ponded depressions in river corridors may contain constrictions where the wetland narrows between two or more depressions. The key consideration is the direction of flow through the constriction. If the water moves back and forth freely it is **not** a separate unit. If the flow between depressions is unidirectional, down-gradient, and has a change in elevation from one part to the other, then a separate unit should be created. The justification for separating wetlands increases as the flow between two areas becomes more unidirectional and has a higher velocity. Constrictions can be natural or man-made (e.g. culverts) (Figure 3). Generally, if the high water mark in the lower wetland is 6 inches or more lower than the high water mark in the upper wetland, then the two should be considered as separate units for rating.

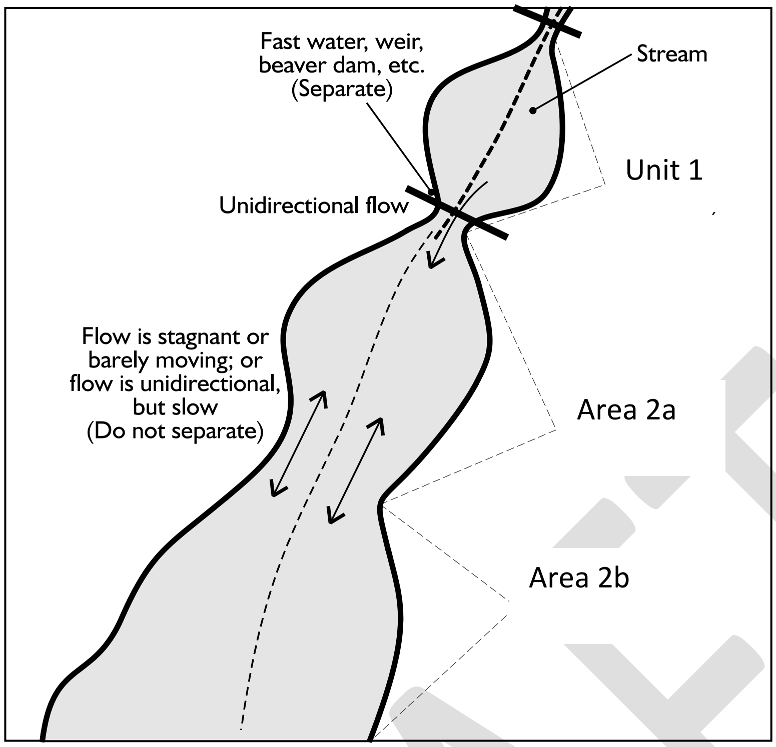


Figure 3: Determining depressional wetland units along a stream corridor with constrictions. Areas 2a and 2b should be rated as one unit.

4.2 Wetlands Along the Banks of Streams or Rivers

In eastern Washington, linear wetlands contiguous with a stream or river may be broken into units using criteria based on either hydrologic factors or the distribution plants. Figure 4 presents a diagram of how wetland units might be separated along a stream corridor based on change in the water regime. Three changes in water regime are illustrated: 1) a weir or dam, 2) a series of rapids, and 3) a tributary coming into the main stream that increases the flow significantly (generally > 25%).

> **NOTE**: Unit 1 in Figure 4 should be classified as a depressional wetland. Units 2, 3, and 4 would probably be riverine or slope, depending on the area of overbank flooding.

Figure 5 illustrates how units can be separated based on the distribution of plants. Units can be separated when: 1) wetland plants disappear and are replaced with unvegetated bars or banks for at least 100 ft (40m) along the stream, and 2) the wetland plant community is less than 5 ft wide along the shore for at least 100 feet.

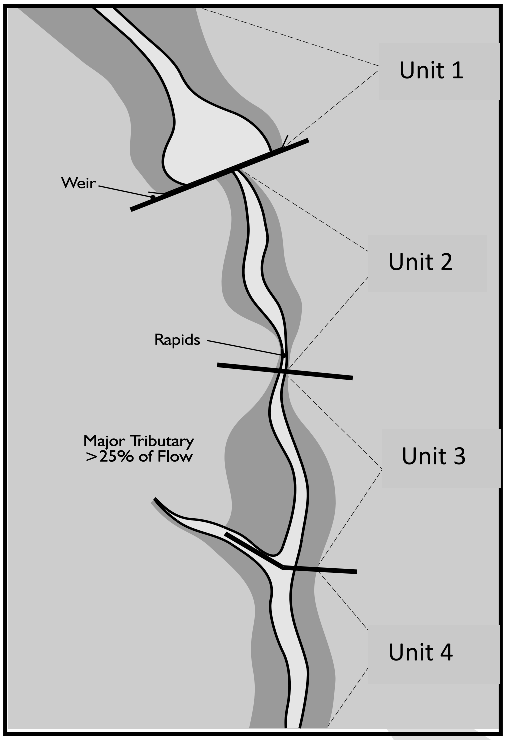


Figure 4: Determining wetland units in a riverine system based on changes in water regime.

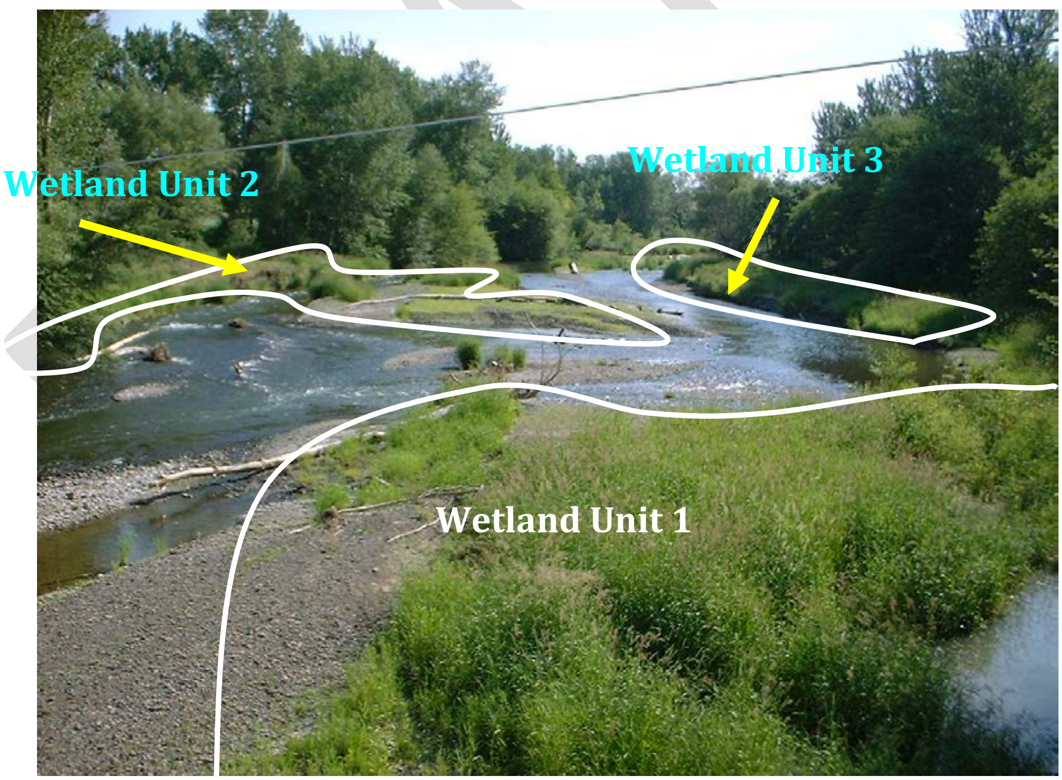


Figure 5: Determining wetland units in a riverine setting based on reduced plant cover. In this case the river is wider than 17ft. and the vegetated wetlands on either side are rated separately.

In cases when a wetland contains a stream or river, you must also decide if the stream or river is a part of the wetland. Use the following guidelines to make your decision:

- Wetland on one side only — If the vegetated wetland unit is contiguous to, but only on one side of, a river or stream, **do not** include the river as a characteristic of the wetland unit for rating.
- Wetland on both sides of a wide stream or river — If the river or stream has an unvegetated channel that is more than 17 ft (5 m) wide, and there are contiguous wetland areas on both sides, treat **each side as a separate unit** for rating. **Do not** include the river as a characteristic of the wetland unit for rating.
- Wetland on both sides of a narrow river or stream — If the river or stream has an unvegetated channel less than 17 ft (5 m) wide, and there are contiguous vegetated wetlands on both sides, treat **both sides together** as one unit, and **include** the river as a characteristic of the wetland.

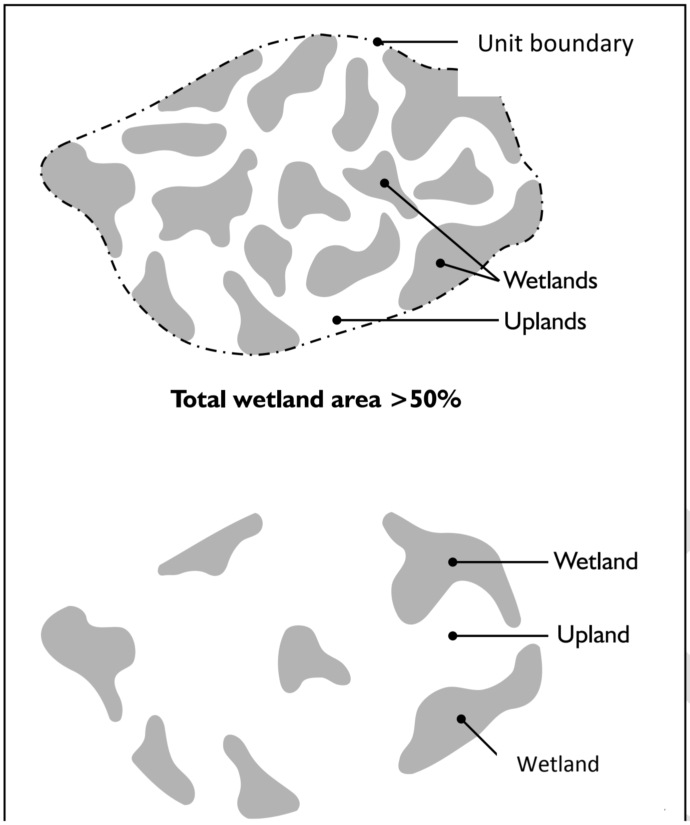
4.3 Identifying Wetlands in a Patchwork on the Landscape (Mosaic)

If the wetland area being scored contains a mosaic of wetlands and uplands, the entire mosaic **should be considered one unit** for rating when:

- Each patch of wetland is less than 1 acre (0.4 hectares), AND
- Each patch is less than 100 ft (30 m) away from the nearest wetland, AND
- The total area delineated as vegetated wetland is more than 50% of the total area of wetlands and uplands, open water, and river bars around which you can draw a polygon (see Figure 6), AND
- There are at least three patches of wetland that meet the size and distance thresholds.

If these criteria are not met, each wetland area should be considered as a separate unit for this method (see Figure 6).

NOTE: One of the most common “patchwork” landscapes in eastern Washington is one formed by riparian wetlands in the floodplains of rivers and streams. In this landscape, vegetated wetlands, as defined by the delineation manual, are interspersed with “uplands” of cottonwood or willow. In this case use the criteria above. Treat the entire area as a wetland if the areas that meet the criteria for wetlands are greater than 50% of the total area. In this landscape the cottonwoods growing outside the wetland patches should be included as features of the wetland.



Total wetland area < 50% of polygon – each wetland is a separate unit

Figure 6: Determining unit boundaries when wetlands are in small patches. Each wetland polygon should be scored separately when the total area is less than 50% wetland.

4.4 Identifying Unit Boundaries Along the Shores of Lakes or Reservoirs (Lake-fringe Wetlands Only)

Lakes or reservoirs will often have a fringe of wetland plants along their shores. Different areas of this vegetated fringe can be separated into different units if there are gaps where the width of plants narrows or they disappear completely. Use the following criteria for separating units along a lakeshore.

Only the vegetated areas along the lake shore are considered part of the wetland unit for rating. Open water within areas of plants are considered to be part of the wetland, but open water that separates patches of plants along a shore is not considered to be part of the wetland (Figure 7).

If only some parts of the lakeshore are vegetated with wetland plants, separate the vegetated parts into different units at the points where the wetland plants thin out to less than a foot in width for at least 33ft (10m) (Figure 8).

> **NOTE**: If the open water is less than 20 acres, the entire area (open water and any other vegetated areas) is considered as <u>one</u> wetland unit, and is a depressional or riverine wetland.

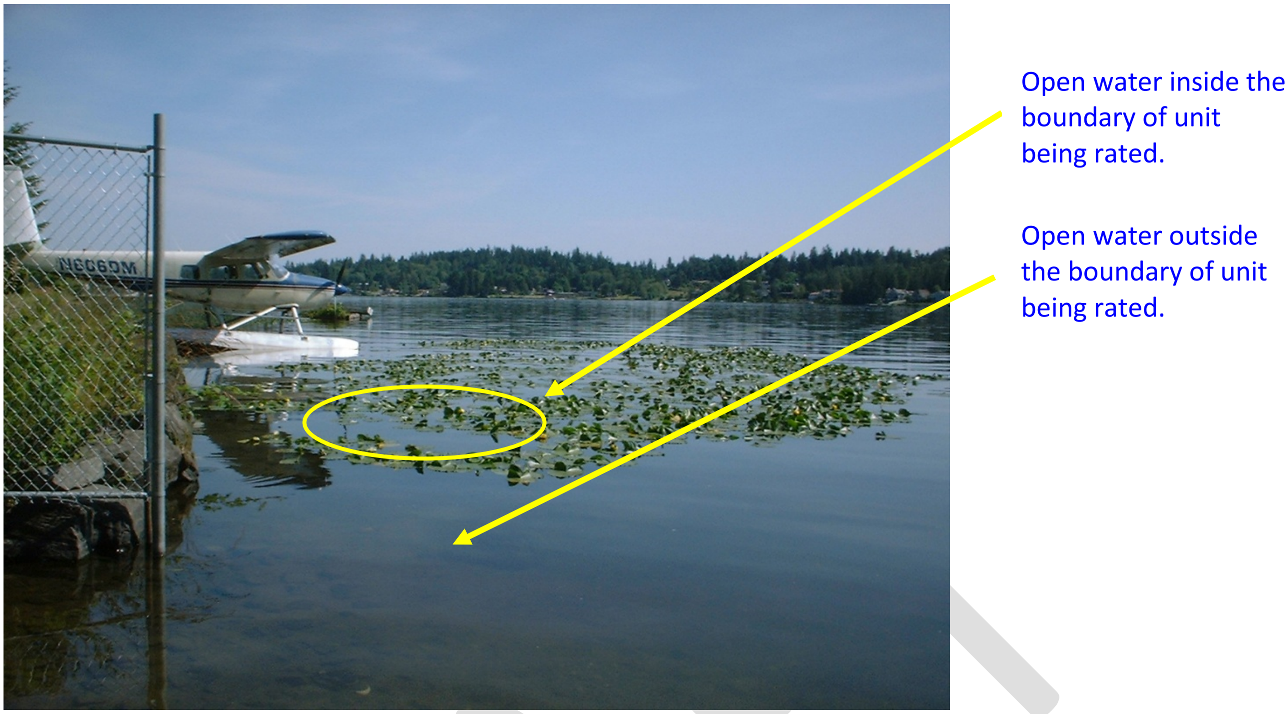


Figure 7: Lake-fringe wetland showing open water that is included within the wetland boundary

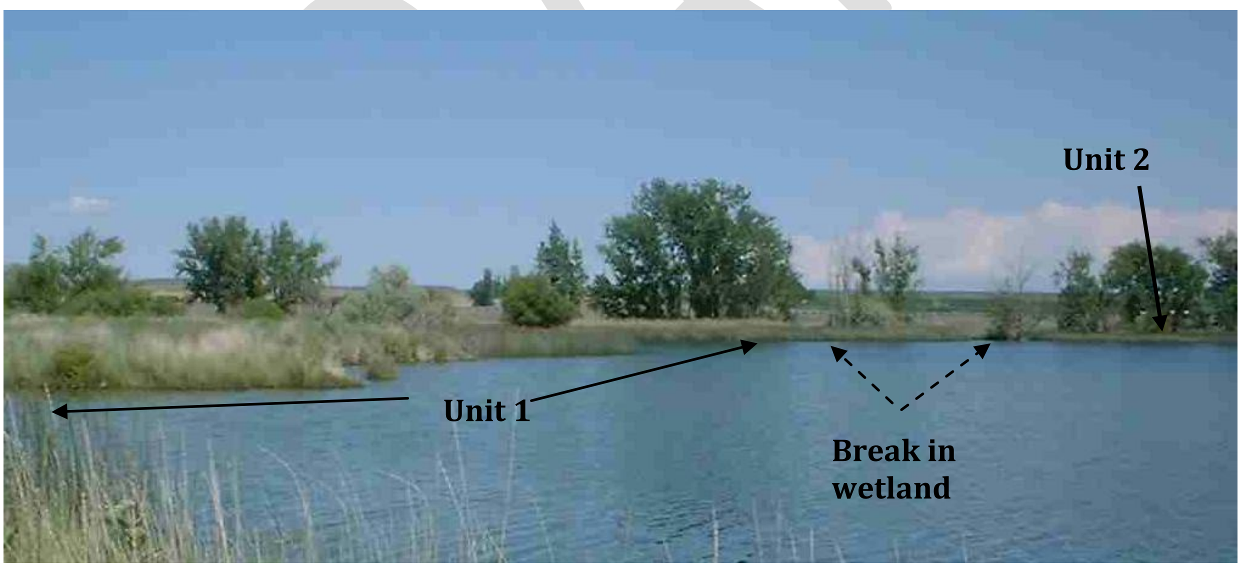


Figure 8: Absence of wetland plants along the shore of a lake that separates the wetlands into two units for rating.

4.5 Wetlands Bisected by Human-Made Features

When a depressional wetland is divided by a human-made feature, such as a road embankment, the wetland should not be divided into different units if there is a level surface-water connection between the two parts of the wetland. Water should be able to flow equally well between the two areas. For example, if there is a wetland on either side or a road with a culvert connecting the two, and both sides of the culvert are partially or completely underwater for most of the year, the wetland should be treated as one unit. Make the down gradient wetland a separate unit, however, if the bottom of the culvert is above the high water marks in the receiving wetland, or the high water marks on either side of the road or dike differ by more than 6 inches in elevation.

4.6 Cases When a Wetland Should Not be Divided

Differences in land use within a wetland should not be used to define units unless they coincide with the circumstances described above. Many functions that wetlands perform are independent of the land use in the wetland. For example, a depressional wetland has approximately the same amount of live storage whether the surface is a shrub community or a pasture.

Furthermore, the rating system used in this method is not robust enough to capture slight differences in habitat functions within different portions of the same wetland unit. Attempts were made during the calibration of the 2004 wetland rating system to score different portions of a wetland unit based on differences in land use, but the results did not provide an accurate representation of the system. This compromise is necessary in order to make the tool rapid and easy to use. For example, if half a wetland has been recently cleared for farming and the other half left intact, the entire area functions as, and should be categorized as, one unit. Figure 9 shows a wetland that is a lawn along one side and a wetland plant community on the other side. In this case, the entire wetland should be rated as one unit.

Figure 9: A wetland with two land uses and separated by a fence. The entire wetland should be treated as one unit.

4.7 Freshwater Wetlands Where Only Part of the Wetland is a Forest or a Bog

Freshwater wetlands may be rated as Category I because they contain a smaller area of bogs or mature or old-growth forest. If the entire wetland (including the bog and forested areas) scores between 16 and 21 points for its functions, it may be possible to assign a dual rating to the wetland (Category I/II, Category I/III).

Table 1: Situations where dual ratings may be possible.

Rating Based on Special Characteristics	Score for Functions >= 22	Score for Functions 19-21	Score for Functions 16-18
Cat. I bog	Not possible – Cat. I	I/II	I/III
Cat. I forest	Not possible – Cat. I	I/II	I/III

To develop a dual rating you will need to establish a boundary within the wetland that clearly establishes the area that is the Category I bog or forest. If you are unable to clearly map the boundaries between the forest or bog and the rest of the wetland it may be impossible to assign a dual rating.

<u>Dual ratings are acceptable only when a wetland contains a small area of bog or forest.</u>
Wetlands that are Category I wetlands with a High Conservation Value and Alkali

wetlands cannot be assigned a dual rating**.**

The criteria to be used in establishing the boundary between the Category I part of a wetland and those that are either Category II or III are as follows:

1. For wetland areas that are Category I as a result of the presence of a forest, the boundary between categories should be set at the edge of the forest.
2. For wetland areas that are Category I because they are bogs, the boundary between categories should be set where the characteristic bog vegetation changes (i.e. most of the plants that are specifically adapted to bogs are replaced with more common wetland species) and/or where the organic soils become shallow (less than 16 inches).

4.8 Very Small Wetlands

Users often question the effectiveness of using rapid methods in wetlands that are ¼ acre or less. One tree or shrub may be all that is needed in a small wetland to score points on the Rating Form for certain questions. The data collected during the calibration of the rating systems, however, indicate that wetlands smaller than a ¼ acre can be rated accurately. The smallest wetlands rated during the calibration were about 1/10 acre in size (see Figure 10 for an example of a small wetland that is about 1/10 acre in size), and all were judged by the field teams to be adequately characterized.

Figure 10: A slope wetland near Padilla Bay that is approximately 1/10 acre in size.

At present, the accuracy of the scoring has not been tested for wetlands smaller than 1/10 acre, but the method may be applicable to even smaller wetlands because the scoring of water quality and hydrologic functions is not dependent on the size or the habitat niches in the wetland.

For example, the ability of a square yard of organic soil in a wetland to remove nitrogen is not dependent on the size of the wetland. A square yard of soil in a wetland of 1/10 acre can be just as effective at performing a function as a square yard in a large wetland. The same is true for the hydrologic functions. A small wetland that stores 3 ft of water during a flooding event is more effective, on a per acre basis, than a large wetland that stores only 1 ft. The larger wetland may store a larger volume overall, but it is the volume per unit area that needs to be characterized. Impacts to wetlands are usually calculated by area. For example, an impact to 1/10 acre of a wetland that stores 3 ft of water needs to be mitigated by replacing a similar amount of storage (i.e. 3 ft over 1/10 acre). It makes no difference if the size of the wetland impacted is ¼ acre, 10 acres, or 100 acres.

The field testing, however, indicated that the method will not work well for scoring habitat functions in wetlands smaller than 1/10 acre (4000 ft^2). For example, one large tree may cover 400 square feet of a 4000 square foot wetland and this would give it a "forested" class. It is not expected however that the tree will provide functions to the same level as a forested class in a larger wetland. On the other hand, wetlands that are larger than 1/10 acre are adequately characterized. This is based on the consensus of the different teams (function assessment and rating) that went out into the field when we were developing the methods.

Also, very small wetlands may not provide good habitat for some of the larger wildlife species such as otter or beaver, but they are known to provide critical habitat for many smaller species. For example, amphibians were found using and breeding in wetlands as small as 270 ft^2 in the Palouse region of northern Idaho (Monello and Wright 1999).

Thus, very small wetlands may be less important for large wildlife but more important for smaller wildlife. Since the methods were judged to be accurate for wetlands as small as a 1/10 of an acre, the review team and the Department of Ecology staff decided not to develop additional questions for very small wetlands less than 1/10 acre in size. Very small wetlands can be rated with the understanding that the results are not as robust as in larger wetlands.

CHAPTER 5

Detailed Guidance for the Rating Form – Rating Functions

This chapter provides detailed guidance for answering the questions on the rating form. The questions are listed in the order they appear on the form. Results from each section should be summarized on the first page of the form. More than three fourths of the questions are the same, or similar, to those used in the previous version of the Washington State Wetland Rating System for Western Washington (Ecology publication #04-06-15).

A correctly filled out wetland rating form requires six maps or figures for depressional wetlands, eight for riverine, seven for lake-fringe and five for slope wetlands. Most of these maps are needed to estimate the area covered by different environmental indicators. **However, do not estimate area visually without a graphic aid such as gridded overlay.** Visual estimates of area can be off by 30-40% and this will change the results.

> An analysis of data collected during training sessions and field tests suggest that untrained users of this method can expect that, **on the average**, their scores will be off by at least four points out 27. One-third of untrained users will have errors of 8 points or more.

5.1 Classifying the Wetland

Scientists have come to understand that wetlands can perform functions in different ways. The way wetlands function depends to a large degree on hydrologic and geomorphic conditions (Brinson 1993). As a result, we group wetlands into categories based on the geomorphic and hydrologic characteristics that control many functions. This classification system is called the Hydrogeomorphic (HGM) Classification.

The Rating System described here uses only the highest grouping in the HGM classification (i.e., wetland class). The more detailed methods for assessing wetland functions developed for eastern and western Washington (Hruby and others 1999, Hruby and others 2000) refine this classification and subdivide some of the classes further. This method, however, does not require such a level of detail.

A classification key is provided with the Rating Form to help you identify whether the wetland is lake-fringe, slope, riverine, or depressional. The key contains five questions that need to be answered sequentially. Each question is described below in more detail than found on the key.

Question 1: Lake-fringe Wetlands

Lake-fringe wetlands are on the water side of the Ordinary High Water Mark (OHWM) of larger bodies of water. Lake-fringe wetlands are separated from other wetlands based on the area and depth of open water adjacent to them. If the area of open water (without vegetation) next to a vegetated wetland is larger than 20 acres (8 hectares), and more than 10 feet deep (3m) over 30% of the open water areas, the wetland is considered to be "lake-fringe." If the water levels fluctuate, the depth criterion has to be met for at least 9 months of the year in an "average rainfall" year. This definition of lakes is different than in the Shoreline Management Act. The Act requires that there are 20 acres within Ordinary High Water Mark. Thus a 20 acre shallow pond that is completely vegetated would be a lake under the Act but a depressional wetland for the purpose of this method.

Figure 11: Lake-fringe wetland along the shores of a reservoir on the Snake River with a narrow band of wetland shrubs along the shore.

The definition of lakes is based on limnological characteristics. Lakes have different environmental processes than small ponds (e.g. stratification, spring turnover, etc.). In general these processes occur in eastern Washington only in aquatic systems that have at least 20 acres of open water that is deeper than 3 meters.

Wetlands found along the shores of large reservoirs such as those found behind the dams are considered to be lake-fringe. Figure 11 shows a Lake-fringe wetland along the shores of a reservoir on the Snake River with a narrow band of wetland shrubs along the shore. Although the area was once a river valley, these wetlands function more like “lake” wetlands rather than “river” wetlands. The technical teams developing the wetland rating systems (Hruby 2004 a, b) decided to include wetlands along the shores of reservoirs as lake-fringe if they meet the thresholds for open water and depth.

Question 2: Slope Wetlands

Slope wetlands occur on slopes where groundwater “daylights” and begins running along the surface, or immediately below the surface. Water in these wetlands flows only in one direction (down the slope) and the gradient is steep enough that the water is not impounded. The “downhill” side of the wetland is always the point of lowest elevation in the wetland. Figure 12 shows a slope wetland along the Columbia River that formed where the slope of the hillside changed and caused groundwater to come to the surface.

Figure 12: Slope wetland along the Columbia River identified by the presence of wetland plants (*Carex* sp. *Juncus* sp.) Wetland occurs where there is a major break in this slope of the hillside.

Some slope wetlands can only be identified by their vegetation. For example, in the Palouse region, you may find a small swale that collects groundwater percolating through the loess (windblown) soils. The only indication that a wetland is present is the stand of cattails growing in the swale (Figure 13). Such swales are not considered to be “riverine” wetlands because there are no indications of a channel with defined banks nor indications of “overbank” flooding.

Figure 13: Slope wetland in Pullman identified by cattails in a swale.

Slope wetlands are distinguished from riverine wetlands by the lack of a defined stream bed with banks. Slope wetlands may develop small rivulets along the surface, but they serve only to convey water away from the wetland. Also, slope wetlands do not impound water except in very small depressions that may form on the surface. These are only a few inches in diameter and a few inches deep.

Question 3: Riverine Wetlands

Riverine wetlands occur in valleys associated with stream or river channels. They lie in the active floodplain, and have important hydrologic links to the water dynamics of the river or stream. The distinguishing characteristic of riverine wetlands in eastern Washington is that they are flooded by overbank flow from the stream or river at least once every ten years. Riverine wetlands, however, may also receive significant amounts of water from other sources such as groundwater and discharges from slopes.

Wetlands that lie in floodplains but are not flooded at least once every 10 years by the stream are **not** classified as riverine. Also, wetlands behind dikes are usually disconnected from the active floodplain and are no longer regularly flooded. In cases where wetlands in the floodplains are not frequently flooded they should be classified as depressional or slope.

In eastern Washington the technical committee developing the rating system decided that the frequency of overbank flooding needed to call a wetland "riverine" is at least once in 10 years (10 yr. "return" frequency). This is in contrast to western Washington where a wetland has to be flooded at least once every two years to be considered "riverine." The decision to reduce the flooding frequency for riverine wetlands is based on the observations that the region is often subject to periods of drought that may last several years. In periods of drought, wetlands that are an integral part of the river system may not get flooded. Even during periods of drought, however, they still function as an integral part of the river system because they are connected to the underground flows in the valley (hyporheic flows).

Most riverine wetlands in eastern Washington are relatively easy to identify because they lie directly within the channel as vegetated bars (Figure 14), vegetated channels (Figure 15), or are old oxbows within the floodplain (Figure 16). The riverine wetlands in the northeastern part of the state (Ferry, Stevens, Pend Oreille Counties) may be harder to identify because the broad valleys there were formed by glaciers rather than the existing rivers. The valley around Colville for example, is, or used to be, all wetland. These wetlands, however, are mostly slope wetlands rather than riverine. The floodplain of the Colville River is a narrow band within the much larger valley created by the glaciers.

Many riverine wetlands are associated with rivers that are very dynamic. Their proximity to the river facilitates the rapid transfer of floodwaters in and out of the wetland, and the import and export of sediments. Riverine wetlands are often replaced by depressional or slope wetlands near the headwaters of streams and rivers, where the channel (bed) and bank disappear, and overbank flooding grades into surface or groundwater inundation. In headwaters, the dominant source of water becomes surface runoff or groundwater seepage. For the purposes of classification, wetlands that show evidence of frequent overbank flooding, even if from an intermittent stream, are considered riverine.

Figure 14: Vegetated river bars on the Touchet River that are classified as Riverine wetlands because the depressions in them get flooded at least once every 10 years.

Wetlands that are created in a stream channel by impounded water from an obstruction such as a beaver dam, weir, or debris dam are considered to be depressional rather than riverine. The major hydrologic factor that maintains and provides the structures in these systems is the ongoing flow that is impounded. The overbank flooding is not as important a factor. A wetland would be considered riverine, however, if the dam or weir impounds water for only a short time, such as a single storm. The impounded water must be present for at least two months every year to be considered depressional. However, a riverine wetland may have depressions where water is maintained by high levels of groundwater (hyporheic waters). If it is flooded at least once every 10 years it still should be classified as riverine. The difference between a depressional and riverine wetland is such cases may be subtle. The wetland is depressional if the impounded water is maintained by a physical feature (dam, weir, or log jam) that raises the water level in the floodplain. If the water is impounded in a depression that is below the general surface then it would be riverine.

Figure 15: Riverine wetland in the Palouse where the entire channel is vegetated between the banks and is a wetland. This channel has only seasonal flow. It is dry by late summer.

Figure 16: Oxbow wetland on the Colville River that is classified as Riverine.

Question 4: Depressional Wetlands

Depressional wetlands occur in topographic depressions where the elevation of the soil surface within the wetland is lower than in the surrounding landscape. The shapes of depressional wetlands vary, but in all cases, the movement of surface water and shallow subsurface water is toward the lowest point in the depression. The depression may have an outlet, but the lowest point in the wetland is somewhere within the boundary, not at the outlet.

Depressional wetlands can sometimes be hard to identify because the depression in which they are found are not very evident. By working through the key it may not be necessary to look at topographic maps, or try to identify that the lowest point of the wetland is in the middle. If a wetland has surface ponding, even if only for a short time, and does not meet the criteria for lake-fringe or riverine wetlands, it can be classified as depressional. Vernal pools and the alkali wetlands are also classified as depressional wetlands.

A wetland where there is no surface ponding, such as a bog without any open water, would also be classified as depressional. Such wetlands may be difficult to differentiate from slope wetlands, but are probably rare in eastern Washington. All of the depressional wetlands visited as part of the function assessment project and the calibration of the rating system have had some surface water ponding during part of the year.

Question 5: Wetland Is Hard to Classify

Sometimes it is hard to determine if the wetland meets the criteria for a specific wetland class. You may find characteristics of several different hydrogeomorphic classes within one wetland boundary. For example, seeps at the base of a slope often grade into a riverine wetland, or a small stream within a depressional wetland has a zone of flooding along its sides that would be classified as riverine.

If you have a wetland with the characteristics of several HGM classes present within its boundaries use Table 1 to identify the appropriate class to use for scoring. Use this table only if the area encompassed by the “recommended” class is at least 10% of the total area of wetland being rated. For example, if a slope wetland grades into a riverine wetland and the area of the riverine wetland is ¼ of the total wetland unit you are rating, use the questions for riverine wetlands. However, if the area that would be classified as riverine is less than 10% (e.g. ½ acre of a 10 acre unit is frequently flooded) use the questions for the slope wetlands. The same applies for other combinations of classes. A unit in which the depressional area is only 5% of the entire unit that is otherwise a slope wetland should be rated as a slope wetland. If, however, the area classified as depressional is 15% of the area of the unit it should be rated as depressional.

Table 1: Classification of wetland units if two hydrogeomorphic classes are present.

HGM classes found within one wetland unit	HGM Class to use for scoring if area of this class > 10% total area of unit
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine	Depressional
Depressional + Lake-fringe	Depressional
Riverine + Lake-fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or you have more than two HGM classes within a wetland boundary, classify the wetland as depressional. Hydrologically complex wetlands found in eastern Washington during the calibration of the methods have always had features of depressional wetlands, and thus, could be classified as depressional.

Once you have classified the wetland, you will need to answer only the questions that pertain to the HGM class of the wetland being rated. The first letter of the question on the scoring form identifies the wetland class for which the question is intended:

D = Depressional of Flats

R = Riverine or Freshwater Tidal Fringe

L = Lake-fringe

S = Slope

The guidance in the following sections is divided according to the HGM class of the wetland being rated. Each question on the scoring form is addressed in turn.

NOTE: The questions for scoring habitat functions are labeled [H] and apply to all HGM classes of wetlands.

5.2 Classifying the Plant Communities

There are several questions on the data sheet that ask you to classify the plant communities found within the wetland unit. This should not be confused with classifying the wetland unit as described earlier. The Rating System uses several different classification schemes for plant communities; only one of which is the commonly used "Cowardin" classification.

The Cowardin classification is the most complex one and is described in more detail below. You will need to carefully read the description of each question to insure that you use the classification scheme appropriate for that question. **Use caution in filling out the Rating Form because the thresholds for scoring differ among the questions as well as the way in which plants are classified.**

The Cowardin Classification

"Cowardin" plant classes are distinguished by the uppermost layer of plants (forest, shrub, etc.) that provides more than 30% surface cover within part or all of a wetland. This area is often called a Cowardin "polygon" when mapping the distribution of plants. If the total cover of plants is less than 30% the area does not have a plant class. Areas with less than 30% plant cover should be categorized as open water or sand/mud flats. If the plants are deciduous and you are rating the wetland during periods when leaves have fallen, try to reconstruct what the cover would be when the plants are fully leafed out. A deciduous forest of cottonwoods would still be considered a forest using the Cowardin classification even in winter when there are no leaves present and the cover may be less than 30%.

This method uses only four of the major Cowardin plant classes to map the plant communities in a wetland. These are:

1. **Forested class:** An area (polygon) in the wetland unit where the canopy of woody plants over 20 ft. (6 m) tall (such as cottonwood, aspen, cedar, etc.) covers at least 30% of the ground. Trees need to be partially rooted in the wetland in order to be counted towards the estimates of cover (unless the unit is a mosaic of small wetlands as described in Section 4.2 and the trees are on hummocks between the wetlands). Some small wetlands may have a canopy over the unit but the trees are not rooted within the wetland. In this case the wetland does not have a forested class.
2. **Scrub/shrub class**: An area (polygon) in the wetland unit where woody plants less than 20 ft. (6 m) tall are the top layer of plants. To count, the woody plants must provide at least 30% cover and be the uppermost layer. Examples of common shrubs in eastern Washington wetlands include the native rose, young alder, young cottonwoods, hardhack (*Spiraea)*, willows, and red-osier dogwood.
3. **Emergent class:** An area (polygon) in the wetland unit covered by erect, rooted herbaceous plants excluding mosses and lichens, and where total cover of shrubs and trees is less than 30%. These plants have stalks that will support the plant vertically in the absence of surface water during the growing season. These plants are present for most of the growing season in most years. To count, the emergent plants must provide at least 30% cover of the ground and be the uppermost layer. Cattails and bulrushes are good examples of plants in the "emergent" plant category.

> Herbaceous plants are defined as seed-producing species that do not develop persistent woody tissue (stems and branches). Most species die back at the end of the growing season.

4. **Aquatic bed class:** An area (polygon) in the wetland unit where rooted aquatic plants, such as lily pads, pondweed, etc., cover more than 30% of the surface of the standing water. These plants grow principally on or below the surface of the water for most of the growing season in most years. This is in contrast to the emergent plants described above that have stems and leaves that extend above the water most of the time. Aquatic bed plants are found only in areas where there is seasonal or permanent ponding or inundation. *Lemna sp.* (duckweed) is not considered an aquatic bed species because it is not rooted. Aquatic bed plants do not always reach the surface and care must be taken to look into the water.

NOTE: Sometimes it is difficult to determine if a plant found in the water is "aquatic bed" or "emergent." A simple criterion to separate emergent and aquatic bed plants most of the time is--If the stalk will support the plant vertically in the absence of water, it is emergent. If, however, the stalk is not strong enough to support the plant when water is removed, it is aquatic bed.

NOTE: The definition of emergent plants used by Cowardin is different than the one used in delineation for determining the boundaries between "vegetated wetlands" and "vegetated shallows."

Examples of how different areas might be classified are given below.

- An area (polygon) of trees within the wetland unit having a 50% cover of trees and with an understory of shrubs that have a 60% cover would be classified as a "forest." The trees are the highest layer of plants and meet the minimum requirement of 30% cover.
- An area with 20% cover of trees overlying a shrub layer with 60% cover would be classified as a "shrub." The trees do not meet the requirement for minimum cover.
- An area where trees or shrubs each cover less than 30%, but together have a cover greater than 30% is classified as "shrub."
- When trees and shrubs together cover less than 30% of an area, the polygon is classified based on the next highest plant class that has a 30% cover. This would either "emergent" or "aquatic bed."

Each polygon with a wetland unit can only have one Cowardin class. For this reason, it is useful to map the Cowardin classes on an aerial photo. This will avoid the common mistake of counting emergent plants under a canopy of trees or shrubs as a separate class.

5.3 Water Quality and Hydrologic Functions in Depressional Wetlands (*Questions starting with 'D' on the Rating Form)*

D 1.0 Does the Site have the Potential to Improve Water Quality?

D 1.1 Characteristics of surface water outflows from the wetland: (This indicator is used for both the water quality and the hydrologic functions.)

Rationale for indicator: Pollutants that are in the form of particulates (e.g., sediment, or phosphorus that is bound to sediment) will be retained in a wetland with no outlet. Wetlands with no outlet are scored the highest for this indicator. An outlet that flows only seasonally is usually better at trapping particulates than one that is flowing all the time because there is no chance for a downstream release of particulates for most of the year (a review of the scientific literature on the "trapping" potential of wetlands is found in Adamus et. al. 1991).

As you walk around the edge of the depressional wetland note carefully if there are any indications that surface water leaves the wetland and flows further downgradient. The question is relatively easy to answer if you find a channel. Many depressional wetlands in eastern Washington, however, have outflows only during the wet season or during summer thunderstorms (seasonally or intermittently flowing). These are harder to locate and identify because they have no banks. Some indicators of seasonal outflows are as follows:

- A swale at one end of a depression that has a gradient away from the wetland and that has wetland vegetation in it (Figure 17).
- A section along the circumference of the wetland where the herbaceous vegetation is all lying in one direction and perpendicular to the circumference (last year's reed canary grass in Figure 17 is oriented in the direction of the outflow).
- A ditch that has been dug to drain the wetland

You are asked to characterize the surface outlet in one of three ways for the scoring, and these are:

- Wetland unit has no surface water outlet - You find no evidence that water leaves the wetland on the surface. The wetland lies in a depression in which the water never goes above the edge (Figure 18).

- Unit has an intermittently flowing OR highly constricted, outlet. Intermittently flowing means that surface water flows out of the wetland during the "wet" season (seasonal outflow) or during heavy thunderstorms. A depressional wetland with occasional outflow resulting from stormwater runoff from an adjacent developed area is considered to have intermittent flow as well. Highly constricted outlets are those that are small or heavily incised, narrow channels anchored in steep slopes. In general, you will find marks of flooding or inundation three feet or more above the bottom of the outlet if the outlet is severely constricted. Another indicator of a severely constricted outlet is evidence of erosion of the down gradient side of the outlet.

- Unit has a permanently flowing surface outlet - This means that the wetland is a depression along a permanently flowing stream or is the point of groundwater discharge that does not dry out. This includes depressional wetlands where ditches act as the outlet and where the water level fluctuations are less than three feet. One can expect that some “permanent” flows dry up during periods of drought. In general, water should be flowing all year in 8 years out of 10 to be considered “permanent.”

NOTE: If you cannot find an outlet, or do not have access to it, in the depressional unit, assume it is intermittently flowing when rating it.

Figure 17: The seasonal outflow of a depressional wetland. The swale is dry for most of the year, but is filled with reed canary grass. The arrow points in the direction of the outflow.

Figure 18: A depressional wetland on a basalt plateau with no surface water outlet.

D 1.2 The soil 2 inches below the surface is a true clay, or true organic soil.

> **Rationale for indicator**: Clay soils and organic soils are good indicators that a wetland can remove a wide range of pollutants from surface water. The uptake of dissolved phosphorus and toxic compounds through adsorption to soil particles is highest when soils are high in clay or organic content (Mitsch and Gosselink 1993). We only consider the type of soil near the surface because this is where the soil actually has contact with the surface waters carrying the pollutants. This is where most of the chemical and biological reactions occur.

If the unit is found within an area that is mapped as an organic or clay soil by the NRCS in their county soil maps you do not need to do any further investigations. Consider the unit to have clay or organic soils. If it is not mapped as an organic or clay soil you will need to take at least one sample at the site.

To look at the soil, dig a small hole within the unit boundary and pick a sample from the area that is about 2-3 inches below the duff layer. Usually it is best to sample the soil toward the middle of the wetland rather than at the edge. <u>Do not, however, sample the soil under areas of permanent ponding.</u> Avoid picking up any of the "duff" or recent plant material that lies on the surface. Determine if the soil is organic or clay. See the NRCS web page on soil taxonomy for more descriptions on how to identify soils. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050915.pdf

Appendix B also provides a field key for identifying clay soils.

> **NOTE:** The presence of organic or clay soils anywhere outside the area of permanent ponding counts. There is no scaling for this question based on the size of the patch of soil. This simplification is necessary because it is not possible to develop a

reproducible map of different soils in wetland unit within the time frame for doing a rating.

D 1.3 Characteristics of persistent plants (emergent, shrub, and/or forest classes):

This indicator requires a figure be included with the field form.

Rationale for indicator: Plants enhance sedimentation by acting like a filter, and cause sediment particles to drop to the wetland surface (review in Adamus and others 1991). Plants in wetlands can take on different forms and structures. The intent of this question is to characterize how much of the wetland is covered with plants that persist throughout the year and provide a vertical structure to trap or filter out pollutants. It is assumed, however, that the effectiveness at trapping sediments and pollutants is severely reduced if the plants are grazed.

Use the Cowardin classification of plants for this question. You are looking for the areas that would be classified as "Emergent", "Scrub/shrub," or "Forested" (see Section 5.2). These are all "persistent" types of plants; those species that normally remain standing at least until the beginning of the next growing season (Cowardin and others. 1979). Emergent plants do not have to be alive at the time of the site visit to qualify as persistent. The dead stalks of emergent species will provide a vertical structure to trap pollutants as well as live stalks.

You are asked to characterize the plants in terms of how much area within the wetland unit is covered by persistent, ungrazed plants. There are three size thresholds used to score this characteristic – more than 1/10 of the wetland unit is covered in persistent plants; more than 1/2 of the wetland unit is covered; or more than 95% of the wetland unit is covered. You will need to draw the area of persistent plants on a map or aerial photo before you can feel confident that your estimates are accurate. **NOTE: this question applies only to persistent plants that are not grazed or mowed** (or if grazed or mowed, the plants are taller than 6 inches).

An easy way to estimate the amount of persistent plants is to map the areas that are open water, covered with aquatic bed plants, mudflats or rock on an aerial photograph. Also include areas that are grazed. The remaining area is then by default the area of persistent plants. Figure 19 shows a depressional wetland in which persistent vegetation is between 1/10 and 1/3 the area of the wetland.

NOTE 1: To meet the "class" requirement for Cowardin, a polygon of plants within the wetland unit needs at least 30% cover of the specified plants type (forest, shrub, etc.). However, to count the Cowardin polygon as a "plants structure" in the rating system the "Cowardin" polygon itself has to represent at least 10% of the wetland unit in units that are smaller than 2.5 acres, or at least 1/4 acre in units that are larger. A plant class does not have to cover 30% of the entire wetland unit to be counted, just 10% or ¼ acre.

NOTE 2: If the unit has just been mowed or grazed, but you suspect this occurs infrequently, you will need to determine if the plants in the wetland are 6 inches or less at the time when the wetland is receiving surface waters that transport sediment and pollutants. The same question can be asked of seasonal mowing or haying.

Figure 19: A depressional wetland where persistent vegetation is between 1/10 and 1/3 the area of the wetland.

D 1.4 Characteristics of seasonal ponding or inundation:

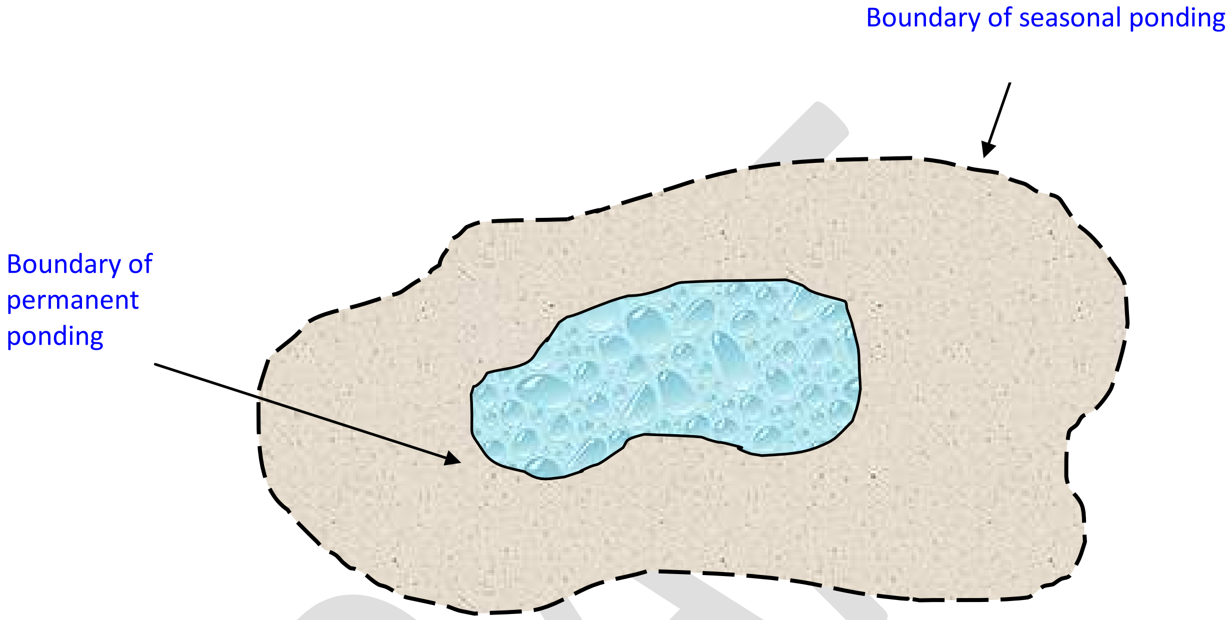
This indicator requires a figure be included with the field form.

Rationale for indicator: The area of the wetland that is seasonally ponded is an important characteristic in understanding how well it will remove nutrients, specifically nitrogen. The highest levels of nitrogen transformation occur in areas of the wetland that undergo a cyclic change between oxic (oxygen present) and anoxic (oxygen absent) conditions. The oxic regime (oxygen present) is needed so certain types of bacteria will change nitrogen that is in the form of ammonium ion (NH_4^+) to nitrate, and the anoxic regime is needed for denitrification (changing nitrate to nitrogen gas) (Mitsch and Gosselink 1993). The area that is seasonally ponded is used as an indicator of the area in the wetland that undergoes this seasonal cycling. The soils are oxygenated when dry but become anoxic during the time they are flooded.

To answer this question you will need to estimate how much of the wetland unit is seasonally ponded with water. This is the area that gets flooded at some time of the year; the water remains on the surface for 2 consecutive months or more; and then it dries out again.

One way to estimate this area is to make a rough sketch of the boundary of the wetland unit, and on this diagram draw the outside edge of the area you believe has surface water during the wet season. If the unit also has permanent surface water you will have to draw this and subtract it when making your estimate (see Figure 20).

Figure 20: Sketch showing the boundaries of areas that are seasonally ponded and permanently ponded. The answer to question D 1.4 for this wetland is that the area seasonally ponded is more than ½ the total area of the wetland.



The boundary of seasonal ponding will usually coincide with the delineated boundary of the wetland in depressional wetlands of eastern Washington. This edge is often very distinct in the Columbia Basin.

There may be periods of time when a depressional wetland is flooded very briefly during exceptionally heavy rainfall or snowmelt. This area of "brief ponding" should not be counted as "seasonal ponding." For example, if a site is visited during the wet season and wetland vegetation is inside the area of ponding then the area outside of the wetland vegetation line is probably only ponded for a short time (intermittently ponded).

During the dry season, the boundary of areas ponded for several months (*seasonal ponding*) will have to be estimated by using one or more of the following indicators.

- Marks on trees and shrubs of water/sediment/debris (Figure 21). The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.
- Water stained vegetation lying on wetland surface. For example, downed fragments of bulrushes and cattails that are dark gray or near black in color.
- Dried algae left on the stems of emergent vegetation and shrubs and on the wetland surface (Figures 22, 23).

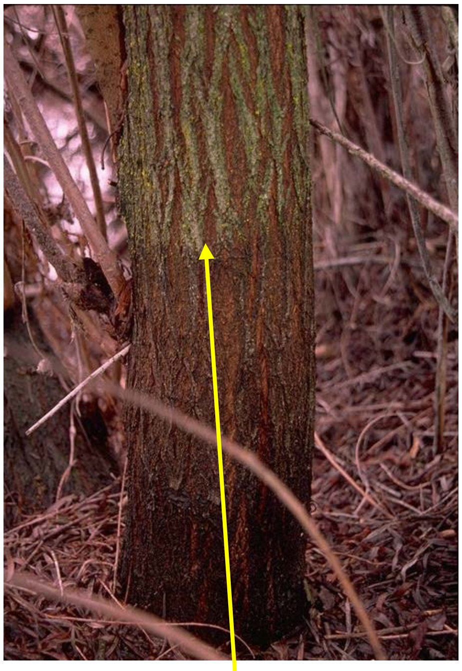


Figure 21: Water mark on tree showing vertical extent of seasonal ponding.

Figure 22: Small depressional wetland covered with algae. The edge of the algae marks the area that is seasonally ponded.

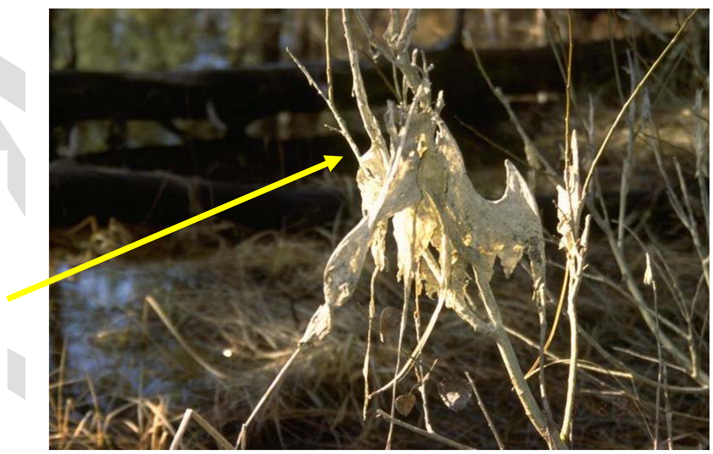


Figure 23: Algae left hanging on vegetation as wetland dried out. The top of the algae marks the vertical extent of seasonal ponding. The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.

NOTE: Avoid making visual estimates of area covered by seasonal ponding when standing at the wetland edge. These estimates can be very inaccurate. Drawing the boundary on an aerial photograph and then using a graphic tool such as a grid to calculate area is a more accurate way to estimate area. A Global Positioning System (GPS) that has been corrected for positional inaccuracies can also be used to locate the boundaries and estimate area.

D 2.0 Does the Landscape Have the Potential to Support the Water Quality Function of the Site?

Wetlands can remove many pollutants coming into them. It is the removal of this excess pollution that is considered to be a valuable function for society. The landscape surrounding the wetland will to some degree determine how well a wetland improves water quality. If the wetland receives a heavy load of pollutants from the surrounding areas it will function to its maximum capacity. However, if, there are no pollutants coming in, the wetland cannot remove them, even if it has the necessary physical and chemical characteristics. Thus, the "landscape potential" for the function is related to the amount of pollutants that come into the wetland from the surrounding areas. Qualitatively, the level of pollutants can be correlated with the level of disturbance, development, and intensity of agriculture in the landscape. For example, relatively undisturbed watersheds will carry much lower sediment and nutrient loads than those that have been impacted by development, agriculture, or logging practices (Hartmann and others 1996, Reinelt and Horner 1995).

D 2.1 Does the wetland unit receive stormwater discharges?

Rationale for indicator: Stormwater coming from residential or developed areas is often discharged into wetlands. Untreated stormwater is a source of many different pollutants (reviewed in Sheldon and others 2005). Furthermore, stormwater ponds do not remove all pollutants leaving them, even those constructed recently (Mallin and others 2002). Thus, any stormwater discharge into a wetland increases the pollutants coming into it.

Answer "YES" to the question if you see any pipes coming into the wetland from the surrounding land. These are usually stormwater discharges. Also, look on the aerial photograph of the wetland and its surroundings for stormwater ponds. If you see any ponds, determine if their discharges can get into the wetland. Stormwater may come into the unit by way of a stream or ditch as well as a pipe. Stormwater can also come into a depressional wetland in runoff from parking lots or roads even if no pipes are present. If you see evidence that such runoff comes into the wetland answer "yes" to this question.

D 2.2 Is more than 10% of the area within 150 ft of the wetland unit in agricultural, pasture, residential, commercial, or urban land uses?

Rationale for indicator: Farming, grazing, residential areas, commercial land uses, and urban areas in general are major sources of pollutants (reviewed in Sheldon and others 2005). The review also found that a well vegetated buffer of 150 ft will only remove 60-80% of some pollutants from surface runoff into a wetland. Thus, pollutants from such land uses will probably reach the wetland unit if they are within 150 ft of the wetland.

Use your aerial photo and draw a line around the unit that is 150 ft from the edge of the unit you have mapped for rating. Answer "YES" to this question if you find the listed uses within 150 ft of the wetland and they cover more than 10% of the "donut" polygon around the unit. Use a graphic aid, such as an acetate overlay with a grid or dots, to estimate area. Visual estimates are not accurate enough and may result in significant errors.

D 2.3 Are there septic systems within 250 ft of the wetland unit?

Rationale for indicator: Septic systems can pollute groundwater because nitrogen is not removed underground. Plumes of nitrogen from septic systems can be traced at least 250 ft in the groundwater (Aravena and others 1993).

Use the aerial photograph of the unit to determine if there are any residences within 250 ft of the unit. Septic systems are still in common use in many areas of eastern Washington that are outside city boundaries. If your unit is within a city limit you will need to check with the local planning office to determine if the area has sewers serving the houses or if they are still on septic systems. If you are outside city limits in areas with lots of 1/2 acre or larger you can assume the houses are on septic systems.

D 2.4 Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 – D 2.3?

Rationale for indicator: The three sources of pollutants listed in questions D 2.1-D 2.3 may not be the only sources coming into the wetland unit from the surrounding landscape. In addition, sources of pollutants can be within the wetland unit itself. For example, pollutants are discharged within the wetland if it is used for grazing.

Answer "YES" to the question if you can identify any source of pollutants in the groundwater or surface water coming into the wetland caused by human activities. Identify the source of the pollution on the Rating Form. Wetlands can receive polluted waters even if they have well vegetated and large buffers. For example, a stream that drains areas where pollutants are released far from the unit can pass through the wetland. Also, silt fences often do not prevent all the sediment from reaching the wetland during construction. Other sources of pollutants may be pesticide spraying on golf courses, particulates in exhausts from airplanes or motor vehicles and pesticides used in mosquito control.

Activities that generate pollutants within the wetland itself, such as grazing, also count for a "yes" for this question. Cattle, sheep or large native herbivores such as elk grazing within the wetland are a source of pollutants. Also answer yes to this question if the wetland has a larger pond that is commonly used by migrating waterfowl. Waterfowl droppings are a source of both excess nutrients and bacteria.

D 3.0 Is the Water Quality Improvement Provided by the Site Valuable to Society?

D 3.1 Does the unit discharge directly to a stream, river, or lake that is on the 303(d) list?

Rationale for indicator: The term "303(d) list" is short for the list of impaired waters (stream segments, lakes) that the Clean Water Act requires all states to submit to the Environmental Protection Agency (EPA) every two years. In Washington, we identify all waters where pollution controls are not sufficient to attain or maintain applicable water quality standards. Wetlands that discharge directly to these polluted waters are judged to be more valuable than those that discharge to unpolluted bodies of water because their role at cleaning up the pollution is critical for reducing further degradation of water quality.

To answer this question you will need to access the Department of Ecology's web site that lists all the bodies of water that do not meet water quality standards http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html . Use the "Map Tool" to locate your site. Determine from the aerial photograph or the map on the Ecology web site if the wetland unit you are rating is within at least 1 mile up-gradient of any aquatic resource mapped as not meeting water quality standards for Category 5 and has a surface water channel, ditch, or other discharge to it (red lines or polygons on the map).

D 3.2 Is the unit in a basin or sub-basin where water quality is an issue in some aquatic resource? *(i.e. There is an aquatic resource in the basin that is on the 303(d) list.)*

Rationale for indicator: Wetlands can mitigate the impacts of pollution even if they do not discharge directly to a polluted body of water. Wetlands can remove nitrogen from groundwater as well as surface water. They can also trap airborne pollutants. Thus, wetlands can provide an ecosystem service and value to our society in any basin and sub-basin that has pollution problems. The removal of pollutants by wetlands is judged to be more valuable in basins where other aquatic resources are already polluted or have problems with eutrophication. Any further degradation of these resources by destroying the wetland could result in irreparable damage to the ecosystem.

To answer this question you will need to access the Department of Ecology's web site that lists all the bodies of water that do not meet water quality standards http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html . Determine from the aerial photo if the wetland unit you are rating is in the contributing basin of any aquatic resource mapped as not meeting water quality standards for Category 5. To find the boundaries of contributing basins in the area consult with the planning department of the local jurisdiction. If this information is not available, use the guidance for mapping contributing basin described in question D 4.3. The map tool on the Ecology web site provides a quick way to identify Category 5 waters.

D 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality?

Rationale for indicator: Not all pollution and water quality problems are identified by Ecology's water quality monitoring program. Local and watershed planning efforts sometimes identify wetlands that are important in maintaining existing water quality. These wetlands provide a value to society at the local level that needs to be replaced if they are impacted.

To answer this question you will need to seek information from the planning department of the local jurisdiction where the site is located. Information on regional or local plans can often be found on the web site of the city or county in which the site is found. Useful "search" phrases include: "watershed plan," "water quality," or "wetland protection." If the basin in which the wetland is found has a TMDL plan (also called a Water Clean Up Plan) developed for it, then you should answer "YES" for this question. It is assumed that all wetlands are valuable in a basin where water quality is poor enough to require a TMDL. The Department of Ecology's web site lists all the bodies of water that have TMDL's: http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html .

D 4.0 Does the Site Have the Potential to Reduce Flooding and Stream Erosion?

D 4.1 Characteristics of surface water outflows from the wetland:

Rationale for indicator: Wetlands with no outflow are more likely to reduce flooding than those with outlets, and those with a constricted outlet will more likely reduce flooding than those with an unconstricted outlet (review in Adamus and others. 1991). In wetlands with no outflow, all waters coming in are permanently stored and do not enter any streams or rivers. Constricted outlets will hold back flood waters and release them slowly to reduce flooding downstream. Wetlands with intermittent flow also provide a higher level of protection than those with unconstricted permanently flowing discharges because they can hold back flash floods that can occur during storms.

See the description for question D 1.1. This question is answered the same way as question D1.1. The difference between D 1.1 and D 3.1, however, is in the scores assigned each type of outflow. Differences in scores are based on the difference in importance of the outflow characteristics to the two functions.

D 4.2 Depth of storage during wet periods:

> **Rationale for indicator**: The amount of water a wetland stores is an important indicator of how well it functions to reduce flooding and erosion. Retention time of flood waters is increased as the volume of storage is increased for any given inflow (Fennessey et al. 1994). It is too difficult to estimate the actual amount of water stored for a rapid tool such as the rating system, and we use an estimate of the maximum depth of storage as a surrogate. This is only an approximation because depressional wetlands may have slightly different shapes and therefore the volume of water they can store is not exactly correlated to the maximum depth of storage.

The depth of the water stored during can be estimated as the difference in elevation between the upper edge of seasonal ponding/inundation and the low point of the wetland (see figure 24). For eastern Washington, we use the total storage (dead + live) rather than just the live storage that is used in the Western Washington Rating System.

For wetlands that have areas of permanent ponding, the lowest point is the surface of the permanent ponding (as measured at its lowest point, typically in late summer and fall). See Figure 25 for an example. You should estimate the height of seasonal ponding above that. For wetlands that have no areas of permanent ponding, locate the lowest point in the wetland and measure the depth of the ponding above that.

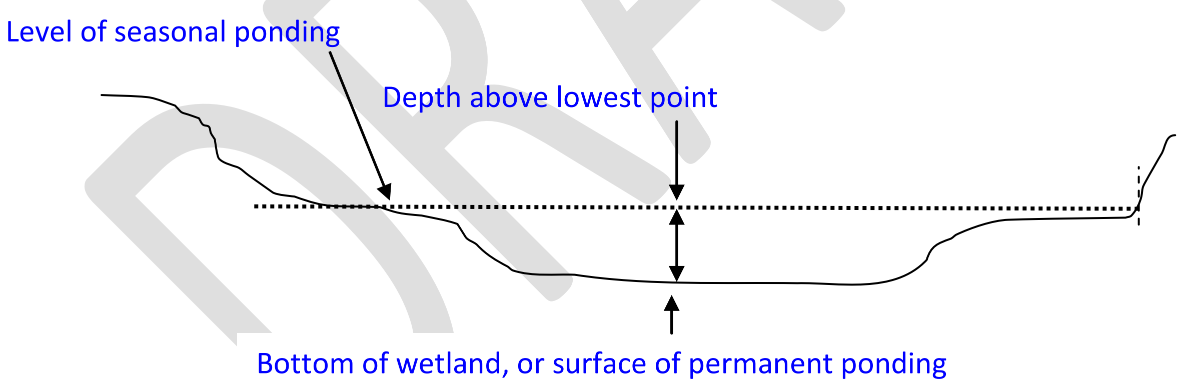
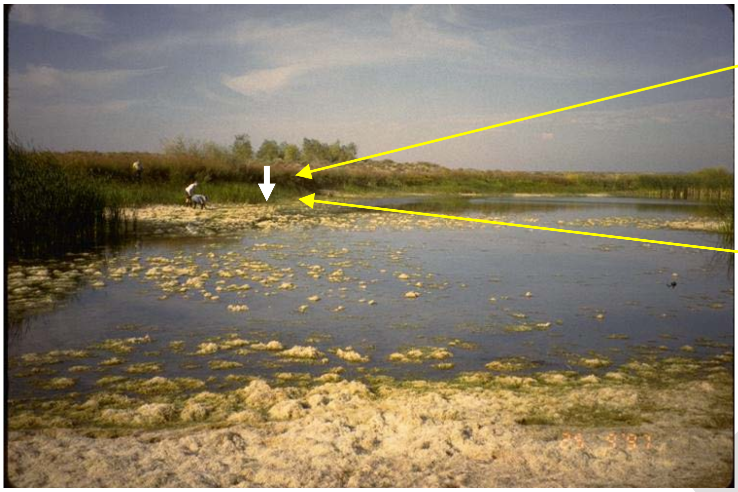


Figure 24: Measuring maximum depth of seasonal ponding.

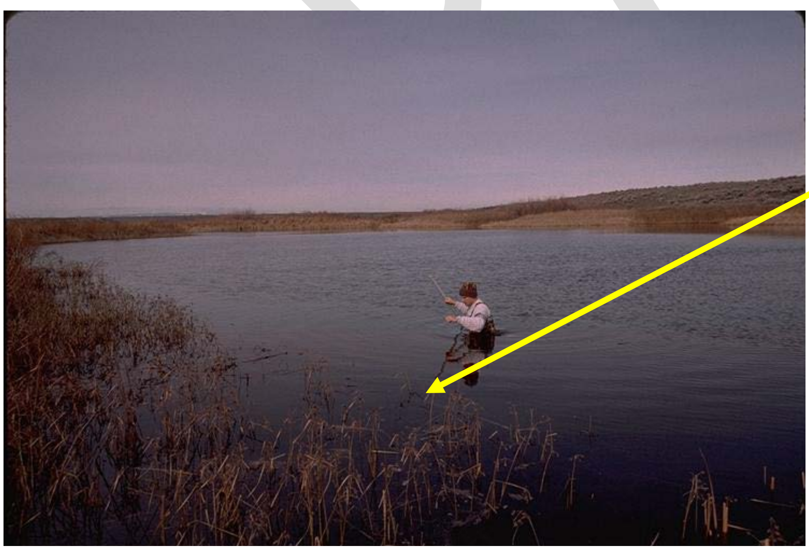


There are marks on the shore left behind by the "high water" during the seasonal

The difference in elevation between the mark on the shore and the level of the permanent ponding is the depth of seasonal

Figure 25: A depressional wetland with permanent water present. This is the maximum extent of summer "drawdown" in the wetland. The difference between this level and the seasonal high water mark is more than three feet.

NOTE: During the winter and spring it may be difficult to identify the level to which the water drops during the summer. In general, the level will usually be at the edge of the area dominated by large, obligate, emergent plants such as *Scirpus acutus* or *Typha latifolia* (Figure 26). Use the lower edge of this vegetation as the "bottom" from which to estimate the depth of seasonal ponding. Estimate the difference in elevation between the bottom of the plants and any marks of ponding or inundation along the shore to estimate the depth of seasonal ponding.



Use the depth of water along the inward edge of emergent plants (bulrushes in this case) to estimate the depth of seasonal ponding. In this case the depth of water is about 3.5 ft at the edge of the

Figure 26: A depressional wetland with water level close to its seasonal maximum. This is the same wetland as shown in Figure 25 but photographed in March rather than late September.

There are five thresholds used to score this characteristic: 3 ft. or more than of storage, 2 ft to <3 ft of storage, 1 ft to <2 ft, 6 inches to <1ft, and less than 6 in. Your measurements, therefore, do not need to be exact. These thresholds can usually be estimated without needing to use special equipment.

Headwater wetlands: This question also asks if the wetland being categorized is a "headwater" wetland. Depressional wetlands found in the headwaters of streams often do not store surface water to any great depth. They can, however, be important in reducing peak flows because they slow down and "desynchronize" the initial peak flows from a storm (Brassard and others 2000). A review of 169 papers worldwide of the role of wetland in the hydrologic cycle concluded that about ½ of the relevant studies showed that headwater wetlands have an important role in desynchronizing flood flows (Bullock and Acreman 2003). The depth of seasonal storage in headwater wetlands was judged to be an inadequate representation of the importance of these wetlands in the hydrologic functions. For this reason, headwater wetlands are scored 4 points, out of 8 possible, even if their storage is less than two feet.

To identify if the unit is a "headwater" wetland, use the information collected in question D 1.1. If the unit has a permanent or seasonal outflow through a defined channel but NO inflow from a permanent or seasonal channel, it is a headwater wetland for the purposes of this categorization. **NOTE:** One exception to this criterion is wetlands whose water regime is dominated by groundwater coming from water storage facilities. Depressional wetlands at the base of irrigation reservoirs, dams or the edge of irrigation canals are not headwater wetlands, even if they have surface water that flows out of them without an inflow.

D 5.0 Does the Landscape Have the Potential to Support the Hydrologic Functions of the Site?

Human changes in land use tend to de-stabilize the flows of water in a watershed. Generally, human activities reduce infiltration and increase the run-off during storm events and thus increase flooding problems (review in Sheldon and others 2005). A wetland located in areas where run-off has increased can provide more flood protection than one located in an undeveloped area. Thus, the "landscape potential" for the function is related to the increased amounts of water coming into the wetland from human sources. Qualitatively, the increase is modeled as the number of different new sources of water coming into the unit.

D 5.1 Does the unit receive any stormwater discharges?

Rationale for indicator: A depressional wetland that receives stormwater directly has a higher potential for providing hydrologic functions. It will receive more water during a rain event than under normal (no stormwater discharges) conditions.

This question is the same as D2.1. Answer "YES" to the question if you see any pipes coming into the wetland from the surrounding land. These are usually stormwater discharges. Also, look on the aerial photograph of the wetland and its surroundings for stormwater ponds. If you see any ponds, determine if their discharges can get into the wetland. Stormwater may come into the unit by way of a stream, road runoff, or ditch as well as a pipe.

D 5.2 Is more than 10% of the area within 150 ft of wetland unit in agricultural, pasture, residential, commercial, or urban?

Rationale for indicator: Water can also flow into the depression directly from surrounding land uses that prevent some or all water from infiltrating. For example, a lawn can reduce infiltration by as much as 65% relative to a forest (Kelling and Peterson 1975).

Use your aerial photo and draw a line that is 150 ft from the edge of the unit you have mapped for rating. Answer "YES" to this question if you find the listed uses within 150 ft of the wetland and they cover more than 10% of the "donut" polygon around the unit.

D 5.3 Is more than 25% of the contributing basin of the wetland unit covered with intensive human land uses (residential at >1 residence/acre, urban, commercial, agriculture, etc.)?

This question asks you first to map the geographic area that contributes surface water to the wetland unit you are rating. This is called the contributing basin of the unit. You will then need to estimate the relative area of intensive land uses within that contributing basin.

NOTE: You can use whatever means available to estimate the area of the upstream basin contributing surface water to a wetland. A topographic map works well if the landscape is not too confusing. If you have GIS with basin boundaries you will have to be careful to include only the areas upgradient of the wetland unit. If you are unfamiliar with the methods for mapping contributing basins, the procedure is described in a fact sheet by the NRCS "How to Read a Topographic Map and Delineate a Watershed" http://www.nh.nrcs.usda.gov/technical/Publications/Topowatershed.pdf .

NOTE: It is sometimes difficult to map the contributing basins of depressional wetlands on the Columbia Plateau in the areas that were eroded by the ice age floods. In general the contributing basin for surface waters of wetlands on the top of the plateau is very small and may extend only a few feet beyond the wetland boundary. However, the contributing basin for the depressional wetlands in the major coulees and channels will usually be very large.

D 6.0 Are the Hydrologic Functions Provided by the Site Valuable to Society?

D 6.1 Is the unit in a landscape that has flooding problems?

Rationale for indicator: The value of wetlands in reducing the impacts of flooding and erosion is based on the presence of human or natural resources that can be damaged by these disturbances. In general, the value of a wetland in reducing flood damage is judged to decrease with the distance downstream because the amount of water stored by the wetland relative to the overall flows decreases.

You will need to do some fact finding if you do not know whether floods have caused damage downstream of the unit. Your best sources of information on flooding problems are the emergency planning office in your local government and the local FEMA office (Federal Emergency Management Agency). You can search the web using the name of the location, town, or watershed and "flooding" or "flooding problems."

Choose the descriptions that best match conditions within the wetland unit being rated. Choose the description that generates the highest score on the Rating Form.

- The site has been identified as important for flood storage or flood conveyance in a regional flood control plan.
- The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., salmon redds).
  - Flooding occurs in sub-basin that is immediately down-gradient of unit.
  - Surface flooding problems are in a sub-basin further down-gradient.
- The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood.

NOTE 1: Many depressional wetlands with no surface water outflow can protect natural or human resources from flooding. They are performing the hydrologic functions at the highest levels possible. No surface water leaves the wetland to cause flooding or erosion. The water either infiltrates to groundwater or it evaporates. To answer the "value" question for a wetland with no outflow, try to picture the wetland as "filled" with a parking lot. Where would the surface water it normally stores flow? If it would flow into a swale, channel, or stream, there is a possibility that the flow would increase flooding or erosion.

NOTE 2: (a landscape constraint on function): When a depressional wetland is situated upslope of a road where water movement through the road is limited by ineffective culverts, the roadway typically acts as a levee, de-coupling upslope wetlands from downstream flooding. The roadway, rather than the wetland, delays storm flows, and acts like a flood-control dam. This indicates that the hydrologic connection between the floodway and the upslope area is impaired. If, however, the water impounded on the upslope side of the road recedes at the same rate as a flooding event, you can assume the connections through the road are not constrained. In this case, the storage provided by the wetland on the upslope side is important, and the wetland unit should be scored accordingly.

NOTE 3: (a landscape constraint on function): Depressional wetlands situated at the base of a hillside typically receive significant water inputs from groundwater. Generally, you can conclude that wetlands receiving less than 10% of their water from surface flows do not provide much protection from flooding because they are not connected to the major patterns of surface flows. If the only water inputs are from a spring or seep emerging from a hillslope, then the wetland unit likely does not provide much value in reducing flooding. If, however, there are indicators that the wetland receives surface runoff from further up the slope (e.g., small gullies, washes, etc.) as well as groundwater, then the wetland may be valuable if there are flooding problems further downstream. A wetland can be considered to have more than a 90% groundwater influence if there is no seasonal or permanent surface water inflow and a very small contributing basin.

NOTE 4: (a landscape constraint on function): A depressional wetland that receives only return flow from irrigation is not in a landscape position to perform the hydrologic functions. Since the inflow is controlled, there is little chance that the water coming into the wetland will cause downstream flooding or erosion.

5.4 Water Quality and Hydrologic Functions in Riverine Wetlands *(Questions Starting with 'R')*

R 1.0 Does the Site have the Potential to Improve Water Quality?

R 1.1 Total area of surface depressions within the wetland that can trap sediments and associated pollutants during a flooding event:

This indicator requires a figure be included with the field form.

Rationale for indicator: Depressions in riverine wetlands will tend to accumulate sediment and the pollutants associated with sediment (phosphorus and some toxics) because they reduce water velocities (Fennessey and others 1994) when the river floods. Wetlands where a larger part of the total area has depressions are relatively better at removing pollutants associated with sediments than those that have no such depressions.

For this question, you will need to estimate the fraction of the wetland that is covered by depressions. Make a simple sketch of the unit boundary, and on this superimpose the areas where depressions are found. From this you can make a rough estimate of the area that has depressions. Determine if this area is more than ¾ or more than ½ of the total area of the wetland unit. Standing or open water present in the wetland when the river is not flooding are good indicators of depressions. Figure 27 shows a riverine wetland that has a large depression filled with water.

NOTE: Generally you should count only depressions that hold water for more than a week after a flood recedes. If a depression is not flooded at the time of your site visit, look for the deposition of fine or mucky sediments in the bottom of the depression. Sediments in the depression usually have a finer texture than those in the immediate area and indicate the water was present in the depression for longer periods of time.

Figure 27: A riverine wetland with two depressions. In this wetland the depressions cover between 1/10 and 1/3 the area of the wetland.

R 1.2 Structural characteristics of the plants in the wetland:

This indicator requires a figure be included with the field form.

Rationale for indicator: Plants in a riverine wetland will improve water quality by acting as a filter to trap sediments and associated pollutants. The plants also slow the velocity of water which results in the deposition of sediments. Persistent, multi-stemmed plants enhance sedimentation by offering frictional resistance to water flow (review in Adamus and others 1991). Shrubs and trees are considered to be better at resisting water velocities in riverine systems than emergent plants during flooding and are scored higher. Aquatic bed species or grazed, herbaceous (non-woody) plants are not judged to provide much resistance to water flows and are not counted as "filters."

For this question you will need to group the plants found within the wetland into three categories: 1) forest or shrub, 2) ungrazed or unmowed emergent plants (> 6 inches high), and 3) neither forest, shrub, or ungrazed emergent plants.

NOTE: This indicator about plant cover is NOT based on the Cowardin classification. The polygons you draw of emergent and shrub plants must have a 90% cover of the ground when you look down from a person's height (5ft).

NOTE: You will need to judge if the plants in the unit are 6" high or more at the time when the stream floods and is actually transporting sediment. If grazing or mowing occurs in summer but the plants have time to grow again before the time when the riverine wetland is flooded, then the system is ungrazed. If, however, the grazing pressure is intense enough that the grass does not have time to recover during the flood season then it should be considered grazed.

There are several size thresholds used to score this indicator: 1) more than 2/3 of the wetland area is covered (>66% cover) in either emergent, forest, or shrubby plants, and 2) more than 1/3 is covered. These thresholds can usually be estimated visually in wetlands smaller than ½ acre. You will need to draw the area of plant types on a map or aerial photo and submit that as part of the field form.

R 2.0 Does the Landscape Have the Potential to Support the Water Quality Function of the Site?

Wetlands will remove many pollutants coming into them, and it is the removal of this excess pollution that is considered to be a valuable function for society. The landscape surrounding the wetland will to some degree determine how well a wetland improves water quality. If the wetland receives a heavy load of pollutants from the surrounding areas it will function to its maximum capacity. If, however, there are no pollutants coming in, the wetland cannot remove them, even if it has the necessary physical and chemical characteristics. Thus, the “landscape potential” for the function is related to the amount of pollutants that come into the wetland from the surrounding areas. Qualitatively, the level of pollutants can be correlated with the level of disturbance, development, and intensity of agriculture in the landscape. For example, relatively undisturbed watersheds will carry much lower sediment and nutrient loads than those that have been impacted by development, agriculture, or logging practices (Hartmann and others 1996, and Reinelt and Horner 1995).

R 2.1 Is the unit within an incorporated city or within its Urban Growth Area (UGA)?

R 2.2 Does the contributing basin to the unit include a UGA or incorporated area?

Rationale for indicators: Urban and suburban areas are a major source of pollutants to streams (review in Sheldon and others 2005). The presence of development adjacent and upstream of the wetland is a good indicator that there are pollutants in the water reaching the riverine unit from the stream.

For questions R2.2 and R2.3 you will need to identify the contributing basin to the stream that floods the wetland unit you are rating. This can be done using topographic maps or through web sites such as the USGS *http://water.usgs.gov/wsc/map_index.html.*

To begin, trace the stream or river to its source and determine if there are any urban areas or suburban areas adjacent to the stream that floods the unit. Answer “YES” to R2.1 if the site is in a city or UGA and yes to question R2.2 if there are any incorporated cities and towns or their Urban Growth Areas upstream of the unit but the unit is not within the boundaries. At the time of publication, maps of UGA and urban areas can be found at: http://www.ecy.wa.gov/programs/air/aginfo/ugamaps.htm.

R 2.3 Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years?

> **Rationale for indicator**: Tilled fields are a source of nutrients, pesticides, and sediment. Pastures are a source of nutrients and pathogenic bacteria, and clearcut areas are a source of sediment (reviews in Sheldon and others 2005). The presence of these conditions upstream of the wetland unit are a good indicator that there are pollutants in the river waters reaching the unit.

Define the boundaries of the contributing basin to the stream that floods the wetland unit as in question R 2.2. Answer "YES" to this question if at least 10% of the total area of the upstream contributing basin has at least one or a combination of pasture, tilled fields or clearcut logging. Land uses can be determined from aerial photographs of the area or by downloading land use maps from the USGS http://www.mrlc.gov/nlcd06_data.php

R 2.4 Is more than 10% of the area within 150 ft of wetland unit in agriculture, pasture, golf courses, residential, commercial, or urban land uses?

> **Rationale for indicator**: Farming, grazing, golf courses, residential areas, commercial land uses, and urban areas, in general, are major sources of pollutants (reviewed in Sheldon and others 2005). The review also found that a well vegetated buffer of 150 ft will only remove 60-80% of some pollutants from surface runoff into a wetland. Thus, pollutants from such land uses will probably reach the wetland unit if they are within 150 ft of the wetland.

Use your aerial photo and draw a line around the unit that is 150 ft from the edge of the unit you have mapped for rating. Answer "YES" to this question if you find the listed uses within 150 ft of the wetland and they cover more than 10% of the "donut" polygon around the unit.

R 2.5 Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1 – R 2.4?

> **Rationale for indicator**: The three sources of pollutants listed in questions R 2.1-R 2.4 may not be the only sources coming into the wetland unit from the surrounding landscape. In addition, sources of pollutants can be within the wetland unit itself. For example, pollutants are discharged within the wetland if it is used for grazing.

Answer "YES" to the question if you can identify any source of pollutants in the groundwater or surface water coming into the wetland caused by human activities. Identify the source of the pollution on the Rating Form. Wetlands can receive polluted waters even if they have well vegetated and large buffers. For example, a stream that drains areas where pollutants are released far from the unit can pass through the wetland. Also, silt fences often do not prevent all the sediment from reaching the wetland during construction. Other sources of pollutants may be pesticide spraying on golf courses, particulates in exhausts from airplanes or motor vehicles and pesticides used in mosquito control.

Activities that generate pollutants within the wetland itself, such as grazing, also count for a "yes" for this question. Cattle, sheep or large native herbivores such as elk grazing within the wetland are a source of pollutants. Also answer yes to this question if the wetland has a larger pond that is commonly used by migrating waterfowl. Waterfowl droppings are a source of both excess nutrients and bacteria.

R 3.0 Is the Water Quality Improvement Provided by the Site Valuable to Society?

R 3.1 Is the unit along a stream or river that is on the 303(d) list or on a tributary that drains to a stream on the 303(d) list?

Rationale for indicator: The term, "303(d) list," is short for the list of impaired waters (stream segments, lakes) that the Clean Water Act requires all states to submit to the Environmental Protection Agency (EPA) every two years. In Washington, we identify all waters where required pollution controls are not sufficient to attain or maintain water quality standards. Wetlands that discharge directly to these polluted waters are judged to be more valuable than those that discharge to unpolluted bodies of water because their role at cleaning up the pollution is critical for reducing further degradation of water quality.

To answer this question you will need to access the Department of Ecology's web site that lists the bodies of water that do not meet water quality standards http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html . Determine from the aerial photo if the wetland unit you are rating is flooded by a stream or river mapped as a Category 5 water, or is on a tributary to one. The map tool on the Ecology web site provides a quick way to identify Category 5 waters.

R 3.2 Does the drainage in which the unit is found have TMDL limits for nutrients, toxics, or pathogens?

Rationale for indicator: Total Maximum Daily Loads (TMDLs or Water Cleanup Plans) describe the type, amount and sources of water pollution in a particular water body. They analyze how much the pollution needs to be reduced or eliminated to meet water quality standards, and then provide targets and strategies to control the pollution. Wetlands that discharge directly to these polluted waters are judged to be more valuable because they function at a landscape scale to mitigate discharges of pollutants. TMDL's are based on models that estimate the natural decay and absorption of pollutants under current conditions. Wetlands are an important part of that "natural" decay and their destruction would require a recalibration of the models, and force polluters to further reduce their discharges.

To answer this question you will need to access the Department of Ecology's web site that lists all the bodies of water that have TMDL's: http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html. Determine if the wetland unit you are rating is flooded by a stream or river in a drainage for which a TMDL's have been developed or are being developed.

R 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality?

Rationale for indicator: Not all pollution and water quality problems are identified by Ecology's water quality monitoring program. Local and watershed planning efforts sometimes identify wetlands that are important in maintaining existing water quality. These wetlands provide a value to society that needs to be replaced if they are impacted.

To answer this question you will need to seek information from the planning department of the local jurisdiction where the site is located. Information on regional or local plans can often be found on the web site of the city or county in which the site is found. Useful "search" phrases include: "watershed plan," "water quality," or "wetland protection." If the drainage in which the wetland is found has a TMDL plan developed for it, then answer "YES" for this question. It is assumed that all wetlands are valuable in a basin where water quality is poor enough to require a TMDL. The Department of Ecology's web site lists all the bodies of water that have TMDL's (see above).

R 4.0 Does the Site Have the Potential to Reduce Flooding and Stream Erosion?

R 4.1 Characteristics of the "overbank" flood storage the wetland provides, based on the ratio between the channel width and the width of the wetland perpendicular to the flow.

This indicator requires a figure be included with the field form.

Rationale for indicator: The ratio of the width of the channel to the width of the wetland perpendicular to the flow is an indicator of the relative volume of storage available within the wetland. The width of the stream between banks is an indicator of the relative flows at that point in the watershed. Wider streams will usually have higher volumes of water than narrower streams. More storage is therefore needed in larger systems to lessen the impact of peak flows. The distance of the wetland perpendicular to the stream is used as an indicator of the amount of short-term storage available during a flood event. A wetland that is wide relative to the width of the stream is assumed to provide more storage during a flood event than a narrow one. The ratio of the two values provides an estimate that makes it possible to rank wetlands relative to each other in terms of their overall potential for storage.

You will need to estimate the average distance of the wetland perpendicular to the direction of the flow, and the width of the stream or river channel (distance between the top of the banks of the stream). Calculate this ratio by taking the width of the wetland and dividing by the width of the stream. There are five thresholds for scoring: a ratio more than 2, a ratio between 1 – 2, a ratio between ½ – 1, a ratio between ¼ - ½, and a ratio < ¼.

Riverine wetlands are found in different positions in the floodplain and it may sometimes be difficult to estimate this indicator. The following bullets describe some common types of riverine wetland and how to estimate this indicator.

- If the vegetated wetland lies within the banks of the stream or river, the ratio is estimated as the average width of the ["delineated" wetland / average distance between banks]. Figure 28 shows a wetland where vegetation fills the entire distance between the banks. In this case the ratio is 1. Figure 29 shows a small vegetated wetland on a gravel bar where the distance between banks is much greater than the width of the wetland. In this case the ratio is < ¼.

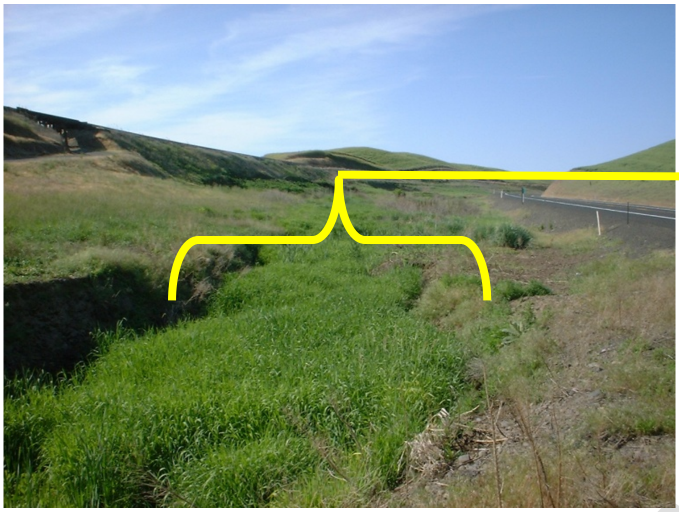


Figure 28. A riverine wetland where the width of the wetland is the same as the distance between banks.

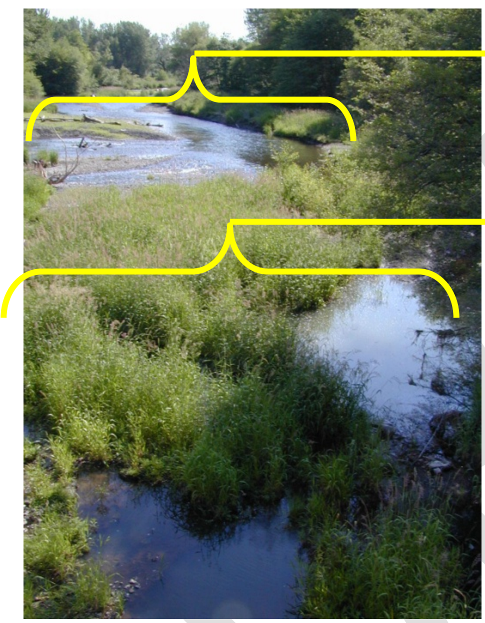


Figure 29: A riverine wetland where the ratio of the width of the wetland to the distance between banks is less than ¼ (30 ft / 150 ft = 0.2).

- If the wetland lies outside the existing banks of the river, you may need to estimate the distances using a map or aerial photograph. Riverine wetlands in old oxbows may be some distance away from the river banks. Instead of trying to estimate a width for the wetland and the distance between banks in feet or yards, it may be easier to estimate the ratio directly. Ask yourself if the average width of the wetland is more or less than the distance between banks. If it is more, is it more than twice as wide? If not, the ratio is between 1-2. If the width of the wetland is less than the distance between banks, use the same process: is it less than ¼, or is it less than ½? Figure 30 shows a riverine wetland in an old oxbow where the ratio was estimated to be between 1-2.

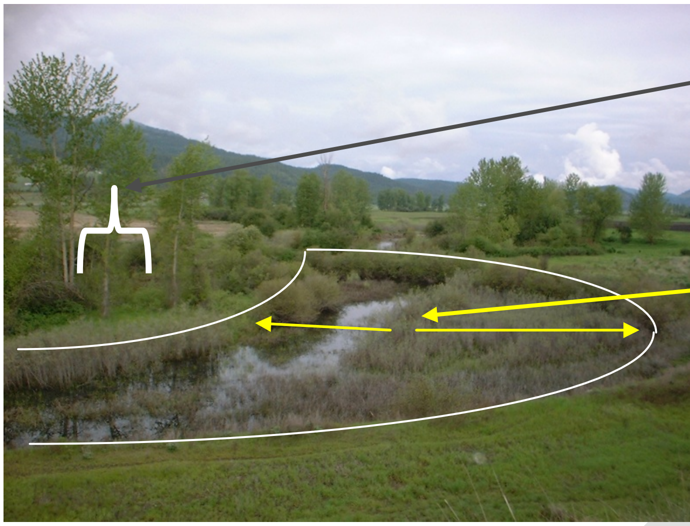


Figure 30: A riverine wetland in an old oxbow of the Colville River where the ratio of width of wetland to distance between banks is between 1 – 2.

- If you are including the river or stream as part of the wetland then the width of the stream is also included in the estimate of the width of the wetland.
- In braided channels: If the wetland is associated with only one braid you would still use the cumulative width of all channels to calculate the average width of the channel.

R 4.2 Characteristics of plants that slow down water velocities during floods

This indicator requires a figure be included with the field form.

Rationale for indicator: Riverine wetlands play an important role during floods because the plants act to slow water velocities and thereby erosive flows. This reduction in velocity also spreads out the time of peak flows, thereby reducing the maximum flows. The potential for reducing flows will be greatest where the density of wetland plants and other obstructions is greatest and where the obstructions are rigid enough to resist water velocities during floods (Adamus and others 1991). The indicator used combines both characteristics for the scoring. Shrubs and trees are considered to be better at resisting water velocities than emergent plants. Aquatic bed species are judged not to provide much resistance and are not counted. Wetlands with a dense cover of trees and shrubs are scored higher than those with only a cover of emergent species.

For this question you will need to group the plants found within the wetland into two categories: 1) emergent, and 2) forest and scrub/shrub.

There are four size thresholds used to score this characteristic: 1) forest or shrub > 1/3 the area of the wetland, 2) emergent plants > 2/3 area, 3) forest or shrub > 1/10 area, 4) emergent plants > 1/3 area. Figure 30 shows an aerial photograph of a riverine wetland that has dense shrub plants over most of its area.

> **NOTE**: This plant cover is NOT based on the Cowardin classification. The polygons you draw of emergent and shrub plants must have a 90% cover of the ground when you look down from a person's height (5ft).
>
> **NOTE**: If the wetland is covered with downed trees, you can treat large woody debris as "forest or shrub."

R 5.0 Does the Landscape Have the Potential to Support the Hydrologic Functions of the Site?

R 5.1 Is the stream or river adjacent to the unit downcut?

Rationale for indicator: Streams in developed areas are often downcut because of the increased flows from impermeable surfaces (review in Sheldon and others 2005). As a result the streams can become disconnected from the surrounding floodplain and floodwaters go overbank less frequently. A riverine wetland that is directly adjacent to a downcut stream will not provide the same level of flood attenuation as one that is adjacent to a stream with no downcutting.

To answer this question you will need to **view the section of the stream that provides the overbank flows to the wetland unit.** Generally, downcutting becomes visible when its watershed contains more than 10% impervious surface (Donaldson and Hefner 2005). Figures 31, 32, 33 and 34 show a progression of different levels of downcutting that result from development. For the purposes of this rating, Figures 33 and 34 show streams for which the answer to R 5.1 would be "YES". Figures 31 and 32 are streams for which the answer would be "NO" because the floodplain is still somewhat connected to the stream. Figures 31-34 are from Donaldson and Hefner 2005.

Figure 31: Stream in a watershed with less than 5 percent impervious cover, showing no downcutting.

Figure 32: A stream in a watershed with 8-10% impervious cover. Streambed is still relatively stable, but signs of stream erosion are more apparent. Not much downcutting is evident.

Figure 33: A stream in a watershed with approximately 20% impervious cover showing downcutting. You would answer "YES" to question R 5.1 for this stream.

Figure 34: This stream has a surrounding area of approximately 30%impervious cover. The manhole in the middle of the picture was originally in the floodplain and is an indicator of the degree to which the channel has been downcut.

R 5.2 Does the upgradient watershed include an UGA or incorporated area?

This question is the same as R2.2.

Rationale for indicator: Urban and suburban areas are a major source of impervious surface. These areas increase both intensity of peak flows and the amount of water flowing during a storm event (review in Sheldon and others 2005). The presence of development upstream of the wetland is a good indicator that the landscape is increasing the flood flows to the wetland unit and thereby increases its level of functioning in attenuating floods.

To begin, trace the stream or river to its source and determine if there are any urban areas or suburban areas adjacent to the stream. Answer "YES" to this question if there are any incorporated cities and towns or their Urban Growth Areas (UGA) upstream of the unit. The unit may be within the UGA as long as some the UGA is upstream. Maps of UGA's and urban areas can be found at http://www.ecy.wa.gov/programs/air/aginfo/ugamaps.htm.

If there are no developed areas adjacent to the stream you will need to identify the contributing basin to the stream that floods the wetland unit you are rating. This can be done using topographic maps or through web sites such as the USGS http://water.usgs.gov/wsc/map_index.html. Answer "YES" to this question if there are any incorporated cities and towns or UGAs within the contributing basin.

R 5.3 Is the upgradient stream or river controlled by dams?

Rationale for indicator: Dams will buffer the flood waters that a wetland receives by holding much of the waters back upstream of the unit. This can reduce the flood storage and attenuation that the wetland itself performs. The landscape potential for a wetland performing hydrologic functions is therefore reduced when dams are present upstream.

To answer this question you will have to trace on a map or aerial photo the stream or river adjacent to the unit you are rating. You answer "YES" to this question if there is a dam within 10 miles upstream of the unit. Look only for dams on the main channel. Dams on tributaries to the main stream do not count.

R 6.0 Are the Hydrologic Functions Provided by the Site Valuable to Society?

R 6.1 Distance to the nearest areas downstream that have flooding problems?

Rationale for indicator: The value of wetlands in reducing the impacts of flooding and erosion is based on the presence of human or natural resources that can be damaged by these processes. The indicator used characterizes whether the wetland's position in the landscape protects down-gradient resources from flooding. In general, the value of a wetland in reducing flood damage is judged to decrease with the distance downstream to flood-prone areas because the amount of water stored by the wetland relative to the overall flows decreases. Distance is characterized qualitatively in terms of hydrologic basins.

If you do not know if floods have caused damage downstream of the wetland unit you will need to do some research. Your best sources of information on flooding problems are the emergency planning office in your local government and the local FEMA (Federal Emergency Management Agency). You may also find useful information using search engines on the web. Search using the name of a downstream city or the name of the watershed name + flooding (or flood problems, flood history).

Determine if flooding occurs that damages resources in:

- The sub-basin that is immediately down-gradient of the unit.
- A sub-basin further down-gradient.

R 6.2 Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan?

Rationale for indicator: The values of flood storage and flood conveyance provided by wetlands are often recognized in regional flood control plans, and specific sites are mentioned in these plans. If the value of a wetland for flood attenuation has already been recognized it is assigned a High rating for value.

To answer this question contact the jurisdiction in which the site is found to determine if any regional flood control plans exist. A search of web sites will probably also list flood control plans for the watershed in question. If plans exist, try to determine if the site has been identified as important or valuable. To answer "YES" to this question, the flood control district needs to have developed a flood control plan or flood hazard mitigation plan that identifies the site as one that needs to be preserved or enhanced to improve flood protection.

5.5 Water Quality and Hydrologic Functions in Lake-Fringe Wetlands *(Questions Starting with "L")*

L 1.0 Does the Site have the Potential to Improve Water Quality?

NOTE: Lake-fringe wetlands have a maximum score of only 12 points for the site potential for the water quality functions instead of 16. The technical review team developing the 2004 Wetland Rating system concluded that lake-fringe wetlands do not improve water quality to the same extent as riverine or depressional wetlands because any pollutants taken up in plant material will be more easily released into the water column and dispersed when the plants die off.

L 1.1 Average width of plants along the lakeshore:

This indicator requires a figure be included with the field form.

Rationale for indicator: The intent of this question is to characterize the width of the zone of plants that provide a vertical structure to filter out pollutants or absorb them. Wetlands in which the average width of plants is large are more likely to retain sediment and toxic compounds than those where plants are in a narrow band (Adamus and others 1991). Even aquatic bed species that die back every year are considered to play a role in improving water quality. These plants take up nutrients in the spring and summer that would otherwise be available to stimulate algal blooms in the lake. In addition, aquatic bed species change the chemistry of the lake bottom to facilitate the binding of phosphorus (Moore and others 1994).

It is often difficult to map the outside edge of a wetland when it is along the shores of a lake where open water can extend out for large distances. For this reason the question is phrased in terms of width of plants perpendicular to the shore rather than the area of plants. There are three thresholds for scoring the average width of plants:

1) 33 ft or more (10 m)

2) 16 ft - < 33 ft (5–10 m)

3) 6 ft - <16 ft. (2 – 5 m)

For large wetlands along the shores of a lake it may be necessary to average the width by segments, and then calculate an overall average. Figure 35 gives an example of such a sketch. Figure 36 shows an actual lake-fringe wetland where the average width of plants is greater than 33 ft.

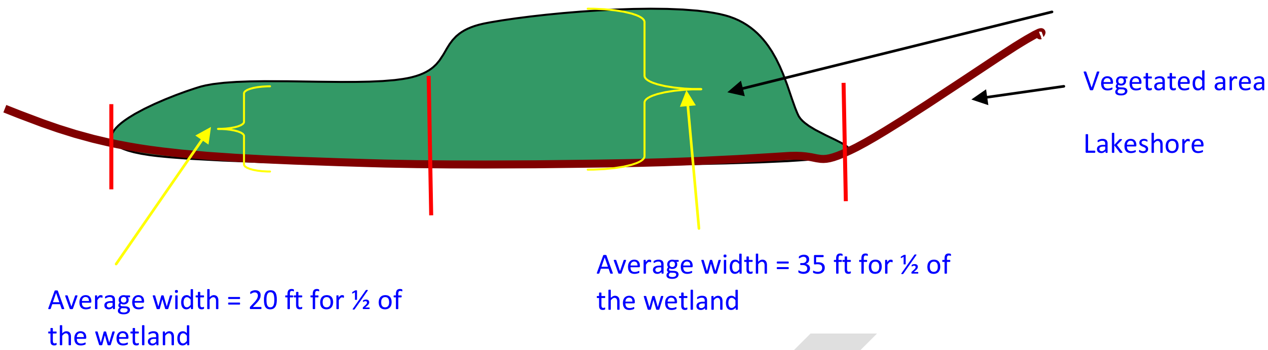


Figure 35: Estimating width of plants along the shores of a lake. The average width of plants for the entire area is: (20 ft x 0.5) + (35 ft x 0.5) = 27.5 ft.

Figure 36: A lake-fringe wetland where the plants are wider than 33 ft. The plants along the shores of this lake consist of a zone of shrubs and a zone of aquatic bed and emergent species.

L 1.2 Characteristics of the plants in the wetland:

This indicator requires a figure be included with the field form.

Rationale for indicator: The intent of this question is to characterize how much of the wetland is covered with plants that are more effective at improving water quality in a lake environment. Herbaceous emergent species have, in general, been found to sequester metals and remove oils and other organics better than other plant species (Hammer 1989, and Horner 1992).

For this question you will need to group the plants found within the wetland into three categories: 1) herbaceous, 2) aquatic bed, and 3) any other plants. For this question, the herbaceous plants can be either the dominant plant form (in this case it would be called emergent class) or as an understory in a shrub or forest community. **These groupings are not the Cowardin classes for plants.**

There are several size thresholds used to score this characteristic – more than 90%, more than 2/3, or more than 1/3, of the vegetated area is covered in herbaceous plants or other types. You will need to draw the area of plant types on a map or aerial photo before you can feel confident that your estimates are accurate.

> **NOTE**: In lake-fringe wetlands the area of the wetland used as the basis for determining thresholds is only the area that is vegetated. Do not include open water beyond the outer edge of the unit in determining the area of the wetland covered by a specific type of plants. Small patches of open water within the vegetated zone however are included in the estimate for total area.

L 2.0 Does the Landscape Have the Potential to Support the Water Quality Function of the Site?

L 2.1 Is the lake used by power boats?

Rationale for indicator: The presence of power boats on a lake will increase the pollutants entering a lake fringe wetland. Toxic chemicals, oils, cleaners, and paint scrapings from boat maintenance can make their way into the water (review in Asplund 2000). In addition, older two stroke engines still found on many recreational boats and jet skis were purposely designed to discharge their exhaust that often contains gasoline and oil into the water. The landscape potential to improve water of a wetland along a lake-shore quality is higher if the lake itself is directly receiving pollutants from power boats.

To answer this question you will need to know if the lake has any restrictions on use by power boats. The local planning department or parks department should have this information. The answer to this question is "NO" if there is a complete ban on gasoline or diesel motors on the lake. Many lakes are limited to small outboards of less than 5 or 10 hp, but these are still sources of pollutants and the answer would be "YES." Other lakes are limited to electric motors only. In this latter case, the answer would also be "NO".

The answer to this question should be "YES" unless you can provide evidence that a ban on power boats exists.

L 2.2 Does more than 10% of the area within 150 ft of the wetland unit (on the shore side) have an agricultural, pasture, residential, commercial, or urban land use?

Rationale for indicator: Farming, grazing, residential areas, commercial land uses, and urban areas in general are major sources of pollutants (reviewed in Sheldon and others 2005). The review also found that a well vegetated buffer of 150 ft will only remove 60-80% of some pollutants from surface runoff into a wetland. Thus, pollutants from such land uses will probably reach the wetland unit along the lake if they are within 150 ft of it.

Use your aerial photo and draw a line around the unit that is 150 ft from the upland edge of the unit. The line should be 150 ft on the landward side of the unit boundary. Answer "YES" to this question if you find the listed uses within 150 ft of the wetland and they cover more than 10% of the polygon.

L 2.3 Does the lake have problems with algal blooms or excessive plant growth such as milfoil?

Rationale for indicator: Algal blooms and blooms of larger plants such as milfoil are an indication of excessive nutrients in the lake water (Schindler and Fee 1974, Smith and others 1999). The increased levels of nutrients in the lake increase the amount of nutrients that the wetland plants absorb (Venterink and others 2002) and thus also increase the level of function within the wetland unit.

To answer this question you will need to visit the lake in the summer, or examine aerial photographs taken in the summer, to determine if there is excessive plant growth (Figures 37, 38). If you are rating the unit in the winter, you will need to inquire locally (residents, board of health officials, or parks departments) to determine if blooms occur in the summer.

Figure 37: Algal blooms in a lake in the Puget Sound area.

Figure 38: A lake infested with milfoil indicating the presence of excess nutrients (photo courtesy of NHDEP).

L 3.0 Is the Water Quality Improvement Provided by the Site Valuable to Society?

L 3.1 Is the lake on the 303(d) list of degraded aquatic resources?

Rationale for indicator: In Washington we identify all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards. The sites are ranked based on the uses of the water and severity of the pollution problem. Wetlands along the shores of lakes on the 303(d) list are judged to be more valuable because their role at cleaning up the pollution is critical for reducing further degradation of water quality.

To answer this question you will need to access the Department of Ecology's web site that lists the bodies of water that do not meet water quality standards http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html . Determine if the wetland unit is along the shores of a lake listed as a Category 5 water. The map tool on the Ecology web site provides a quick way to identify Category 5 waters.

L 3.2 Is the lake is in a sub-basin where another aquatic resource is on the 303(d) list?

Rationale for indicator: Lake-fringe wetlands can mitigate the impacts of pollution even if they are not located directly on a polluted body of water. At a watershed scale, lake-fringe wetlands can remove pollutants that might otherwise cause problems further downstream. They can also trap airborne pollutants. Thus, wetlands can provide an ecosystem service and value to our society in any basin and sub-basin that has pollution problems. The removal of pollutants by wetlands is judged to be more valuable in basins where other aquatic resources are already polluted. The 303(d) list is used as an indicator of pollution problems in a basin.

To answer this question you will need to access the Department of Ecology's web site that lists all the bodies of water that do not meet water quality standards (see above). Determine if the wetland unit is in a basin or sub-basin where any body of water is on the 303(d) list.

L 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality?

Rationale for indicator: Not all pollution and water quality problems are identified by Ecology's water quality monitoring program. Local and watershed planning efforts sometimes identify wetlands that are important in maintaining existing water quality. These wetlands provide a value to society that needs to be replaced if they are impacted.

To answer this question you will need to seek information from the planning department of the local jurisdiction where the site is located. Information on regional or local plans can often be found on the web site of the city or county in which the site is found. Useful "search" phrases include: "watershed plan," "water quality," or "wetland protection." If the basin in which the wetland is found has a TMDL plan (also called a Water Clean Up Plan) developed for it, then you answer "YES" for this question. It is assumed that all wetlands are valuable in a basin where water quality is poor enough to require a TMDL. The Department of Ecology's web site lists all the bodies of water that have TMDL's: http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html .

L 4.0 Does the Site Have the Potential to Reduce Shoreline Erosion?

The site potential for Lake-fringe wetlands has a maximum score of only 6 points for the hydrologic functions instead of 16. The technical review team developing the 2004 wetland rating system concluded that lake-fringe wetlands do not provide hydrologic functions to the same extent as riverine or depressional wetlands. The function of reducing shoreline erosion at the local scale was not judged to be as important as reducing peak flows and reducing erosion at the watershed scale, and should not be scored as highly. Lake-fringe wetlands, however, do provide a hydrologic function by dissipating wave energy before it reaches the shore. Waves can erode shorelines and cause damage to resources along the shore.

L. 4.1 Average width and characteristics of plants along the lakeshore (do not include aquatic bed species):

This indicator requires a figure be included with the field form.

Rationale for indicator: The intent of this question is to characterize how much of the wetland is covered with plants that provide a physical barrier to waves and protect the shore from erosion. This protection consists of both shoreline anchoring and the dissipation of erosive forces (Adamus and others 1991). Wetlands that have extensive, persistent (especially woody) plants provide protection from waves and currents associated with large storms that would otherwise penetrate deep into the shoreline (Adamus and others 1991). Emergent plants provide some protection but not as much as the stiffer shrubs and trees.

This characteristic is similar to that used in L 1.1 and L 1.2, but the grouping of plants types and thresholds for scoring are different. If you are familiar with the Cowardin classification of plants you are looking for the areas that would be classified as "Scrub/shrub," "Forested," or "Emergent." **This indicator is based on the Cowardin plant classes.**

It is difficult to map the outside edge of a wetland when it is along the shores of a lake where open water can extend out for large distances. For this reason the question is phrased in terms of the width and type of plants found only within the area of shrubs, trees, and emergents. There are two thresholds for measuring the average width of plants [33 ft

(10m) and 6 ft (2m)], and two thresholds based on distance along the shore [¾ and ¼ of the distance along the shore]. For large wetlands along the shores of a lake it may be necessary to sketch the plants types and average the width by type. Figure 39 gives an example of such a sketch.

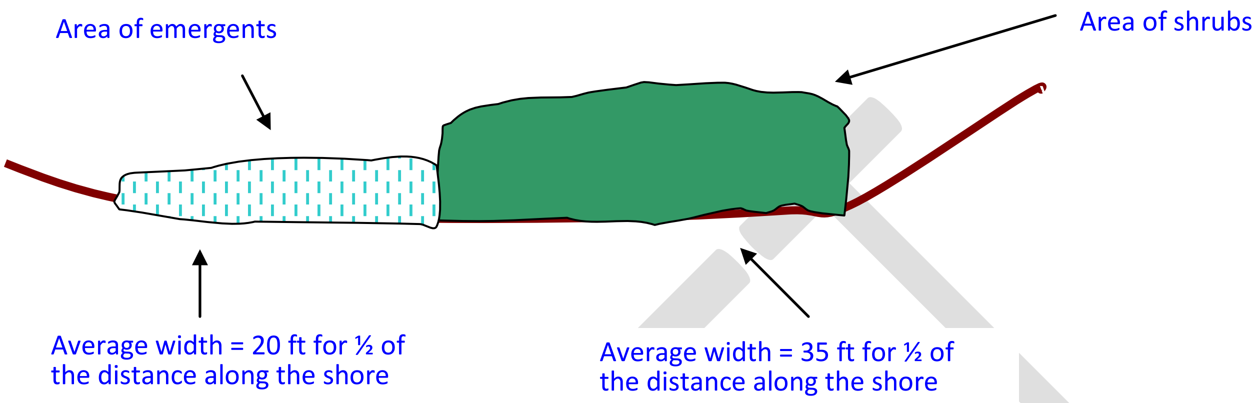


Figure 39: Estimating width of plants types along the shores of a lake. The average width of shrubs is 35 ft for ½ the distance along the shore and the width of emergents is 20 ft for ½ of the distance. This wetland would score 4 points because more than 1/4 distance consists of shrubs wider than 33ft.

L 5.0 Does the Landscape Have the Potential to Support the Hydrologic Functions of the Site?

L 5.1 Is the lake used by power boats with more than 10 hp?

Rationale for indicator: Boat wakes can be a major source of shoreline erosion (Maynord and others 2008, review in Asplund 2000). Lakes with boat traffic will have larger waves than lakes without. Wetlands along the shores of the latter will provide a higher level of function by reducing the impact of the larger waves.

To answer this question you will need to know if the lake has any restrictions on power boats. The local planning department or parks department should have this information. The answer to this question is "NO" if there is a complete ban on gasoline or diesel motors on the lake. Many lakes are limited to small outboards of less than 5 hp or 10 hp. Other lakes are limited to electric motors only. In both cases the answer would also be "NO" because the speed of these smaller boats is limited and correspondingly their wakes will be smaller.

The answer to this question should be "YES" unless you can provide evidence that the bans on power boats are present.

L 5.2 Is the fetch on the lake side of the unit at least 1 mile in distance?

Rationale for indicator: The size of wind generated waves on lakes depends on the fetch. The fetch is the uninterrupted distance over which the wind blows without a significant change in direction. Lakes with larger fetches will have larger waves. Wetlands along the shores of lakes with longer fetches will provide a higher level of function by reducing the impact of the larger waves. The threshold of 1 mile was chosen because in many lakes such a fetch will generate a wave of approximately 1ft in a 20 mph wind. http://woodshole.er.usgs.gov/staffpages/csherwood/sedx_equations/RunSPMWave.html

Use a topographic map or scaled aerial photograph to measure the farthest distance to another shore or obstruction. This is the maximum fetch over which a wind can blow. Answer “YES” to this question if the distance is one mile (1.6 km) or more.

L 6.0 Are the Hydrologic Functions Provided by the Site Valuable to Society?

L 6.1 Are there resources, both human and natural, along the shore that can be impacted by erosion?

Rationale for indicator: Lake-fringe wetlands provide value by protecting a shoreline from erosion if there is some resource that could be damaged by this erosion. For example, houses are often built along a shoreline, and these can be damaged by shoreline erosion, especially if the house is on a bluff. Buildings, however, are not the only resource that can be impacted. A mature forest along the shores of a lake is an important natural resource that provides important habitat. Shoreline erosion, especially man-made erosion from boat wakes, may topple trees into the lake and reduce the overall area of this resource.

Users of this method must make a qualitative judgment on the value of the lake-fringe wetland in protecting resources from shoreline erosion. Generally, a lake-fringe wetland does have value if:

- There are human structures or old growth/mature forests within 25 ft of OHWM of the shore in the unit.
- There are nature trails or other paths and recreational activities within 25 ft of OHWM.

The Rating Form has space to note observations of resources along the shore that do not meet the criteria above. If you observe or know of other resources, note this on the form and score it.

5.6 Water Quality and Hydrologic Functions in Slope Wetlands
(Questions Starting with "S")

S 1.0 Does the Site Have the Potential to Improve Water Quality?

The site potential for slope wetlands has a maximum score of only 12 points for the water quality functions instead of 16. The technical review team that developed the 2004 Wetland Rating System concluded that slope wetlands do not improve water quality to the same extent as riverine or depressional wetlands because slope wetlands will tend to release surface water fairly quickly. They are usually less effective at trapping sediment and all the pollutants associated with sediment because of their topography and the way water moves through them.

S 1.1 Characteristics of the average slope of the wetland:

Rationale for indicator: Water velocity decreases with decreasing slope. This increases the retention time of surface water in the wetland and the potential for retaining sediments and associated toxic pollutants. The potential for sediment deposition and the retention of toxics by burial increases as the slope decreases (review in Adamus and others 1991).

For this question you will need to estimate the average slope of the wetland unit. Slope is measured either in degrees (°) or as a percent (%). In this method, we use the latter measurement, (%), which is calculated as the ratio of the vertical change between two points and the horizontal distance between the same two points [vertical drop in feet (or meters) ÷ horizontal distance in feet (or meters)]. For example, a 1 ft drop in elevation between two points that are 100 ft. apart is a 1% slope, and a 2 foot drop in the same distance is a 2% slope.

For large wetlands the slope can be estimated from topographic maps of the area. The change in contour lines can be used to calculate the vertical drop between the top and bottom edges of the wetland unit. The horizontal distance can be estimated using the appropriate scale (printed at the bottom of the map). Local jurisdictions sometimes have assessor's maps that are contoured at 2 ft intervals. These can be very useful in estimating the slope.

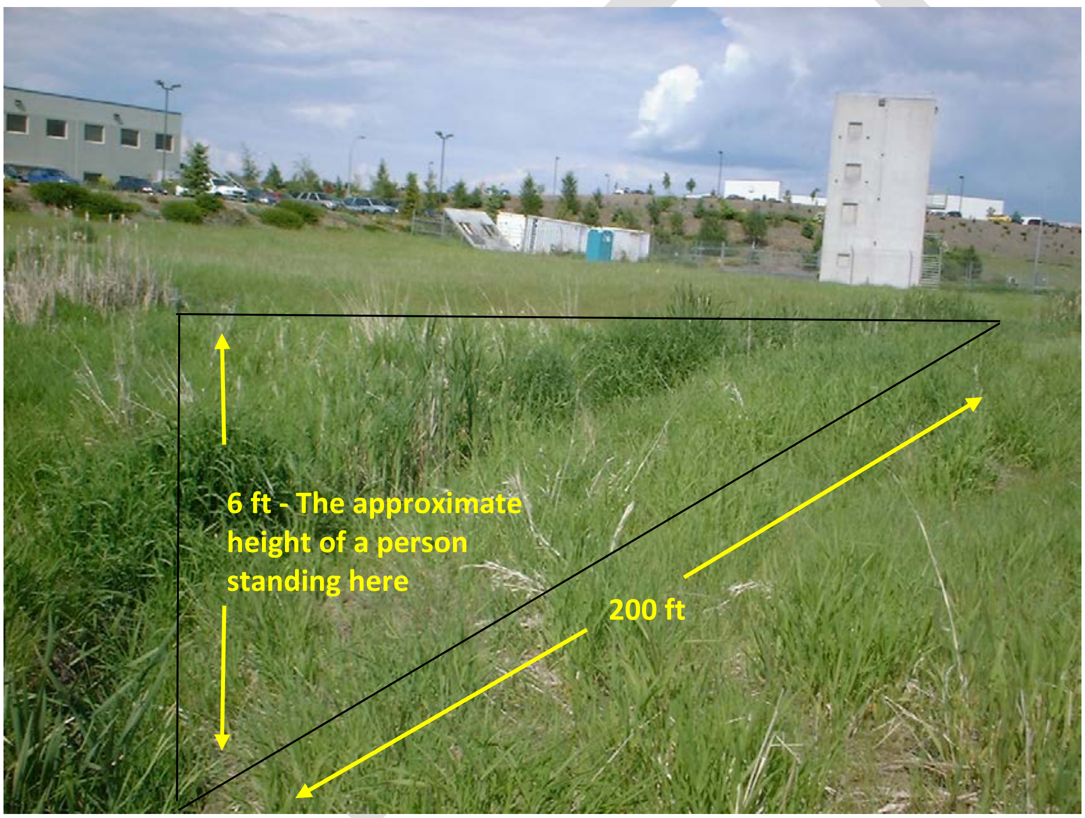
For small wetlands it will be necessary to estimate the vertical drop visually and the horizontal distance by pacing or using a tape measure. Visual estimates of the vertical drop are more accurate if you can find a point of reference near the bottom edge of the wetland. Stand at the upper edge of the wetland and visualize a horizontal line to a tree, telephone pole, or another person at the lower edge of the slope wetland. The point at which the" horizontal line intersects the object at the lower edge can be used to estimate the vertical drop between the upper and lower edges of the wetland (see Figure 40).

NOTE: If you are standing at the upper edge of the wetland looking for a visual marker at the lower edge using a level, do not forget to subtract your height from the total. If you are at the bottom edge, you will need to add your height.

NOTE: If the slope of a wetland changes, the best way to estimate the average is to calculate the slope between the upper most unit boundary and the lowest point on the boundary. This will average out all the variations unless the unit has a much higher slope for a short distance at either end.

NOTE: If the slope wetland has a ditch along its bottom side DO NOT use the bottom of the ditch for calculating the slope. Use the elevation of the top of the ditch for calculating the slope.

Figure 40: Estimating the slope of a small slope wetland. The top of a six foot person is about level with the upper edge of the wetland. The average slope is approximately 6/200 = 0.03 or 3%.



S 1.2 The soil 2 inches below the surface is a true clay or true organic soil.

Rationale for indicator: Clay soils and organic soils are both good indicators that a wetland can remove a wide range of pollutants from surface water. The uptake of dissolved phosphorus and toxic compounds through adsorption to soil particles is highest when soils are high in clay or organic content (Mitsch and Gosselink 1993).

If the wetland unit lies within an area that is mapped as an organic or clay soils by the NRCS in their county soil maps, you do not need to investigate further. Consider the unit to have clay or organic soils. If it is not mapped as an organic or clay soil you will need to take at least one sample at the site.

To look at the soil: dig a small hole within the unit boundary and pick a sample from the area that is about 2 inches below the duff layer. Usually it is best to sample the soil toward the middle of the wetland rather than at the edge. Avoid picking up any of the "duff" or recent plant material that lies on the surface. Determine if the soil is organic or clay. See the NRCS web page on soil taxonomy for more descriptions on how to identify soils. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050915.pdf

Appendix B also provides a field key for identifying clay soils.

NOTE: The presence of organic or clay soils anywhere within the wetland unit counts. There is no scaling for this question based on the size of the patch of soil. This simplification is necessary because it is not possible to develop a reproducible map of different soils in a wetland unit within the time frame for doing the field work.

S 1.3 Characteristics of the plants that trap sediments and pollutants:

This indicator requires a figure be included with the field form

Rationale for indicator: The intent of this question is to characterize how much of the wetland is covered with plants that are more effective at improving water quality in a slope environment. Herbaceous species have, in general, been found to sequester metals and remove oils and other organics better than other plant species (Hammer 1989, and Horner 1992). Furthermore, dense herbaceous plants present the greatest resistance to the surface flow often found on slope wetlands. Water in this environment tends to flow very close to the surface and be shallow (not more than a few inches). Trees and shrubs tend to be widely spaced relative to herbaceous plants and don't provide as much resistance to this type of surface flow.

For this question you will need to group the plants found within the wetland into only two groups: 1) dense, ungrazed or unmowed, herbaceous plants, and 2) all other types (Figure 41). **NOTE**: **The Cowardin plants types are NOT used for this question.** For this question the herbaceous plants includes the areas of emergent plants as classified by Cowardin and the herbaceous understory in a shrub or forest. To qualify for "dense", the herbaceous plants must cover at least ¾ (75%) of the ground (as opposed to the 30% requirement in the Cowardin plant classes).

> **NOTE**: The best information on reducing surface flows in a slope is provided by the basal cross-section of the plants. However, this is not easy to measure. The best indicator we were able to find is an estimate of the cover from a person's height. Generally, if less than 25% of the ground is visible at 5-6ft., then there will be a fairly high stem density and basal cross section to trap sediments and reduce flows. In Question S 1.3 we differentiate between herbaceous and non-herbaceous plants while in S 4.1 it is between rigid, dense, plants and other types.

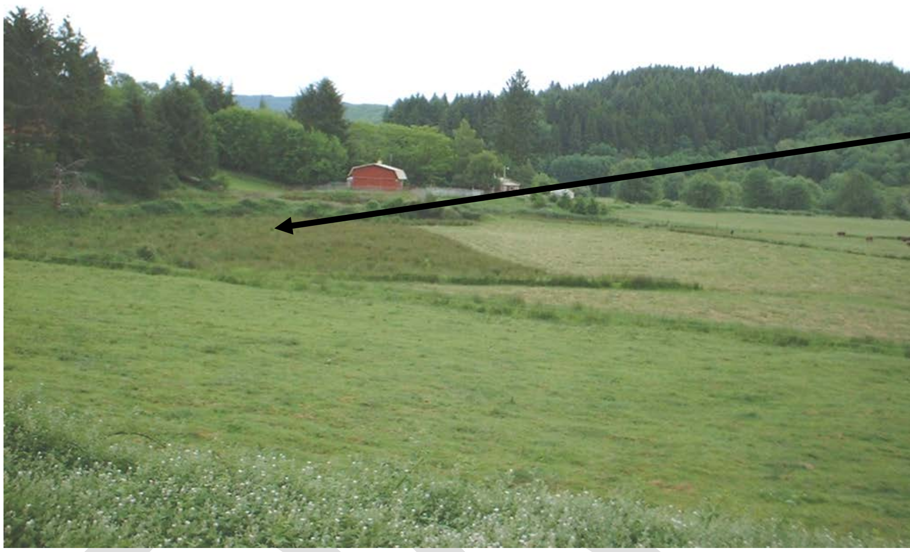


Figure 41: A slope wetland where dense unmowed, plants are between 1/4 and 1/2 the area of the wetland.

S 2.0 Does the Landscape Have the Potential to Support the Water Quality Function of the Site?

S 2.1 Is >10% of the buffer area within 150 ft upslope of the wetland unit in agricultural, pasture, residential, commercial, or urban land uses?

Rationale for indicator: Farming, grazing, residential areas, commercial land uses, and urban areas in general are major sources of pollutants (reviewed in Sheldon and others 2005). The review also found that a well vegetated buffer of 150 ft will only remove 60-80% of some pollutants from surface runoff into a wetland. Thus, pollutants from such land uses will probably reach the wetland unit if they are within 150 ft of the unit and upslope of it.

Use your aerial photo and draw a line around the unit that is 150 ft from the edge of the unit. The line should be 150 ft upslope of the unit boundary. Answer "YES" to this question if you find the listed uses within 150 ft of the wetland and they cover more than 10% of the polygon upslope of the unit.

S 2.2 Are there other sources of pollutants coming into the wetland that are not listed in questions S 2.1?

Rationale for indicator: The sources of pollutants listed in questions S 2.1 may not be the only sources coming into the wetland unit from the surrounding landscape. In addition, sources of pollutants can be within the wetland unit itself. For example, pollutants are discharged within the wetland if it is used for grazing.

Answer "YES" to the question if you can identify any source of pollutants in the groundwater or surface water coming into the wetland caused by human activities. Identify the source of the pollution on the Rating Form. Other sources of pollutants may be pesticide spraying on golf courses, particulates in exhausts from airplanes or motor vehicles and pesticides used in mosquito control.

Activities that generate pollutants within the wetland itself, such as grazing, also count for a "yes" for this question. Cattle, sheep or large native herbivores such as elk grazing within the wetland are a source of pollutants. Also answer yes to this question if the wetland has a larger pond that is commonly used by migrating waterfowl. Waterfowl droppings are a source of both excess nutrients and bacteria.

S 3.0 Is the Water Quality Improvement Provided by the Site Valuable to Society?

S 3.1 Does the unit discharge directly to a stream, river, or lake that is on the 303(d) list?

Rationale for indicator: Wetlands that discharge directly to these polluted waters are judged to be more valuable than those that discharge to unpolluted bodies of water because their role at cleaning up the pollution is critical for reducing further degradation of water quality.

To answer this question you will need to access the Department of Ecology's web site that lists the bodies of water that do not meet water quality standards http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html . Determine from the aerial photo if the wetland unit you are rating is within at least one mile of any aquatic resource listed as a Category 5 waters and has a surface water channel, ditch or other conveyance of surface water to it. The map tool on the Ecology web site provides a quick way to identify Category 5 waters.

S 3.2 Is the unit in a basin or sub-basin where another aquatic resource is on the 303(d) list?

Rationale for indicator: Wetlands can mitigate the impacts of pollution even if they do not discharge directly to a polluted body of water. Wetlands can remove nitrogen from groundwater as well as surface water. They can also trap airborne pollutants. Thus, wetlands can provide an ecosystem service and value to our society in any basin and sub-basin that has pollution problems. The removal of pollutants by wetlands is judged to be more valuable in basins where other aquatic resources are already polluted. Any further degradation of these resources could result in irreparable damage to the ecosystem.

To answer this question you will need to access the Department of Ecology's web site that lists the bodies of water that do not meet water quality standards, and is listed as a Category 5 water. http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html. To find the boundaries of basins and sub-basins (called hydrologic units) in the area consult with the planning department of the local jurisdiction or use the map of hydrologic units developed by USGS. http://water.usgs.gov/GIS/huc.html.

S 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality?

> **Rationale for indicator**: Not all pollution and water quality problems are identified by Ecology's water quality monitoring program. Local and watershed planning efforts sometimes identify wetlands that are important in maintaining existing water quality. These wetlands provide a value to society that needs to be replaced if they are impacted.

To answer this question you will need to seek information from the planning department of the local jurisdiction where the site is located. Information on regional or local plans can often be found on the web site of the city or county in which the site is found. Useful "search" phrases include: "watershed plan," "water quality," or "wetland protection." If the basin in which the wetland is found has a TMDL plan (also called a Water Clean Up Plan) developed for it, then answer "YES" for this question. It is assumed that all wetlands are valuable in a basin where water quality is poor enough to require a TMDL. The Department of Ecology's web site lists all the bodies of water that have TMDL's: http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html .

S 4.0 Does the Site Have the Potential to Reduce Flooding and Stream Erosion?

The site potential for slope wetlands has a maximum score of only 8 points for the hydrologic functions instead of 16. The technical review teams that developed the 2004 Wetland Rating Systems concluded that slope wetlands may provide some velocity reduction but do not provide flood storage. Thus, they should be rated lower than wetlands that can perform both aspects of the function.

S 4.1 Characteristics of plants that reduce the velocity of surface flows.

> **Rationale for indicator**: The intent of this question is to characterize how much of the wetland is covered with plants that provide a physical barrier to sheetflow coming down the slope. Plants on slopes will reduce peak flows and the velocity of water during a storm event (U.S. Geologic Service, http://ga.water.usgs.gov/edu/urbaneffects.html, accessed July 31, 2003). The importance of plants on slopes in reducing flows has been well documented in studies of logging (Lewis and others 2001) though not specifically for slope wetlands. The assumption is that plants in slope wetlands play the same role as plants in forested areas in reducing peak flows.

For this question you will need to estimate the area of two categories of plants found within the wetland: 1) dense, uncut, rigid plants, and 2) all other plants. This indicator of plants is **not** related to any of the Cowardin classes. **Dense** means that individual plants are spaced closely enough that the soil is barely, if at all, (> 75% cover of plants) visible when looking at it from the height of an average person. **Uncut,** means that the height of the plants has not been significantly reduced by grazing or mowing. “Significantly reduced” means that the height is less than 6 inches. **Rigid** is defined as having stems thick enough (usually > 1/8 in.) to remain erect during surface flows.

There is only one threshold used to score this characteristic: dense, ungrazed, rigid plants for more than 90% of the area of wetland (Figure 42), The wetland in Figure 41 was mowed over much of its area, except where the *Juncus sp.* was growing. The mowed plants were less than 6 inches high, so the only plants that were included for this indicator were the *Juncus*. The site in Figure 41 does not meet the criterion and scores a [0] for this indicator.

> **NOTE**: This is a simpler version of the questions in the 2004 wetland rating system. Only one answer resulted in a [M]oderate rating of 6 or more points. As a result the other questions were dropped since all resulted in a [L]ow rating.

> **NOTE**: This description is not species specific because a species may be rigid in one environment and not rigid in another. For example, reed canarygrass (*P. arundinaceae*) can grow very thick and rigid stems in areas with high nutrients. In other situations, however, it can be very thin (e.g., shady environment) and would easily be bent to the ground by runoff.

Figure 42: A slope wetland with dense erect, ungrazed plants over more than 90% of its area. The direction of the slope is from the bottom of the photograph toward the center.

S 5.0 Does the Landscape Have the Potential to Support the Hydrologic Functions of the Site?

S 5.1 Is more than 10% of the buffer area within 150 ft upslope of wetland unit in agricultural, pasture, residential, commercial, or urban land uses?

> **Rationale for indicator**: Human land uses tend to de-stabilize the flows of water in a watershed. Generally, human activities reduce infiltration and increase the run-off during storm events (review in Sheldon and others 2005). For example, a lawn can reduce infiltration by as much as 65% (Kelling and Peterson 1975). Thus, a slope unit located in areas where run-off has increased can provide more velocity reduction of surface flows than one located in an undeveloped area.

Use your aerial photo and draw a line around the unit that is 150 ft from the edge of the unit. Estimate the land uses in the area 150 ft upslope of the unit boundary. Answer "YES" to this question if you find the listed land uses within 150 ft of the wetland and they cover more than 10% of the polygon.

S 6.0 Are the Hydrologic Functions Provided by the Site Valuable to Society?

S 6.1 Distance to the nearest areas downstream that have flooding problems.

> **Rationale for indicator**: The value of wetlands in reducing the impacts of flooding and erosion is based on the presence of human or natural resources that can be damaged by these processes. The indicator used characterizes whether the wetland's position in the landscape protects down-gradient resources from flooding. In general, the value of a wetland in reducing flood damage is judged to decrease with the distance downstream because the amount of water flowing through the unit relative to the overall flows decreases.

If you do not know if floods have caused damage in the sub-basin further downstream you will need to do some research. Your best sources of information on flooding problems are the emergency planning office in your local government and the local FEMA (Federal Emergency Management Agency).

Choose the description that best matches conditions around the wetland unit being rated.

The wetland reduces velocities that would otherwise impact down-gradient areas where flooding has damaged human or natural resources (e.g., salmon redds):

- In the sub-basin that is immediately down-gradient of unit.
- In a sub-basin further down-gradient.

S 6.2 Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan?

Rationale for indicator: The values of flood storage and flood conveyance provided by wetlands are often recognized in regional flood control plans, and specific sites are mentioned in these plans.

To answer this question contact the jurisdiction in which the site is found to determine if any regional flood control plans exist. If so, try to determine if the site has been identified as important or valuable. In general, however, slope wetlands are rarely recognized as being important in regional plans.

5.7 Habitat Functions (*Questions starting with "H" to be answered for all HGM classes)*

A rapid method such as this one relies on indicators of function that are fixed and present throughout most of the year (see Appendix C). As a result it is not possible to actually monitor the species that use a wetland, nor determine their abundance. The one aspect of habitat that we can determine is a relative number of habitat niches present. The questions below describe indicators that represent different habitat niches. The basic assumption is that wetlands with more niches can provide higher level of the habitat function than one with fewer. The rating of the site potential for this function is based on the number of species for which a site can potentially provide habitat.

H 1.0 Does the Site Have the Potential to Provide Habitat?

H 1.1 Structure of plant community:

This indicator requires a figure be included with the field form.

Rationale for indicator: This indicator addresses two types of vegetation structure, the "Cowardin" vegetation classes and several size ranges within the emergent class of vegetation. First, more habitat niches are provided within a wetland as the number of vegetation classes increases. The increased structural complexity provided by different vegetation optimizes potential breeding areas, escape, cover, and food production for the greatest number of species (Hruby et al. 2000). Secondly, the team developing the methods for assessing wetland functions in the Columbia Basin judged that different guilds of species may partition the habitat based primarily on "height" differences in the emergent vegetation. Different heights of emergent vegetation provide different niches for organisms. The assessment team determined that the varying heights of emergent vegetation played a significant role in providing structural complexity that might otherwise, in wetter environments, be provided by scrub/shrub and forested vegetation. This increased species richness arising from the increased structural diversity also supports a greater number of terrestrial species in the overall wetland food web (Hruby et al 2000).

For this question you will need to identify the "Cowardin" classes of vegetation in the wetland and whether the emergent class has areas where plants are of different heights. Vegetation classes are grouped into 6 categories.

- Aquatic bed
- Emergent plants 0-12 inches high (0 – 30 cm)
- Emergent plants >12 – 40 inches high (>30 – 100cm)
- Emergent plants > 40 inches high (> 100 cm)
- Scrub/shrub (areas where shrubs have >30% cover)
- Forested (areas where trees have >30% cover)

If you have determined there is an “emergent” type of vegetation in the wetland, you will need to estimate whether these plants can be further divided based on the heights of the plants. There are three size criteria: 0-12 inches (0-30 cm), >12-40 inches (>30 – 100 cm), and more than 40 inches (> 1m). Record the number of different categories of plant height categories in the wetland. Remember, a height category must cover at least ¼ acre, or 10% of the wetland for wetlands smaller than 2.5 acres, to be counted.

Do not count the actual vertical height of vegetation that is broken or on the ground when identifying structure categories. Use the estimated vertical height of vegetation before it was knocked down. Figure 44 shows a wetland with three concentric rings of emergent plants of different heights.

NOTE 1: Each class of vegetation or height category of emergent species has to cover more than ¼ acre, or if the wetland is smaller than 2.5 acres 10% of the wetland area. Cowardin” vegetation types are distinguished on the basis of the uppermost layer of vegetation (forest, shrub, etc.) that provides more than 30% surface cover within the area of its distribution.

NOTE 2: Aquatic bed plants do not always reach the surface and care must be taken to look beneath the water’s surface. Because waterfowl can heavily graze certain species of aquatic bed early in the growing season, it can be incorrectly concluded that aquatic bed is not present if the field visit is made during this time period**. Therefore, examine the substrate in open water areas for evidence of last year’s growth of aquatic bed species.** If a wetland is being rated very late in the growing season, when either the standing water is gone or very limited in extent, examine mudflats and adjacent vegetated areas for the presence of dried aquatic bed species (Figure 43).

NOTE 3: *Nuphar* (water lilies) is considered as aquatic bed, not emergent. Water level fluctuations in eastern Washington are so great that it is difficult to base the classification on water levels. The intent of the question was to highlight habitat functions, and *Nuphar* generally has the habitat characteristics of aquatic bed rather than emergent regardless of whether it sticks out above the water or is below it. See page 32 for a description on how to identify aquatic bed plants.

NOTE 4: If a vegetation type is distributed in several patches, the patches can be added together 10 or fewer patches are needed to meet the size threshold.

Figure 43. Aquatic bed plants that have been bleached by the sun and left stranded as the water levels receded during the summer.

NOTE 5: You cannot assume that a plant species will always be of the same height category. Reed canary grass is a good example. This species will grow to be 6 ft. tall in nutrient rich wetlands, but it will be less than 40" tall if it is stressed by too much water. The same can be said for *Juncus effusus* which is usually 12-40" tall but can reach 5 feet in some wetlands.

Figure 44: A depressional wetland with three height classes of emergent plants.

H 1.2 Is one of the vegetation types "aquatic bed?"

Rationale for indicator: Aquatic bed plants were judged to be more important than the other vegetation types as a habitat feature in eastern Washington. The increased structural complexity provided by aquatic bed species increases habitat niches for a number of invertebrate and vertebrate species. The team developing function assessment methods for eastern Washington observed an increase in the number of invertebrate species when aquatic bed plants were present (unpublished data collected during the validation of methods for assessing functions).

Add one point to the habitat score if the wetland was identified as having aquatic bed vegetation.

H 1.3 Surface Water

H 1.3.1 Does the wetland have areas of ponded surface water without emergent or shrub plants over at least 10% of its area during the spring (March to early June) OR in early fall (August to end of September)? *Note: answer YES for Lake-fringe wetlands.*

This indicator requires a figure be included with the field form.

Rationale for indicator: This indicator attempts to capture several different habitat features that are important for birds, bats, and amphibians. It represents a simplification of several habitat indicators used in the methods for assessing functions (Hruby and others 2000) that are too complex for this rating system. Generally, open water provides an area for waterfowl access to the wetland. It also is an indicator of potentially greater underwater structural heterogeneity that supports a greater variety of invertebrate food sources for different species of waterfowl. The presence of open water is also an indicator that the wetland may hold water long enough to provide for the successful incubation of amphibian eggs (Hruby and others 2000). Open water also provides space for flying insectivores such as bats and some birds to forage near the wetland surface. The time periods for open water specified in the question (March – June, or August – September) coincide with the peak of the waterfowl migrations. The question is divided into two parts to avoid ambiguity. Some riverine wetlands have "open" water in the form of a stream. Streams play a similar role in riverine wetlands that open water does in depressional wetlands. Lake-fringe wetlands, by definition, have to have open water adjacent to them, and thus, are answered "yes" in all cases.

To answer this question you will have to determine if the wetland has surface water present during the specified seasons without any persistent emergent, shrub, or forest species poking up through the water. You are trying to judge if the wetland has open water on which waterfowl can land or if flying insectivores can forage near the surface. Aquatic bed species are not a detriment for this indicator because they do not cover the open water all the time. There is a period during the early part of the growing season when the water is open, before the aquatic bed species grow to the surface.

It may sometimes be hard to determine if a wetland has open water if you do your field work outside the times specified (March – June and August – September). There are however, some indicators that can be used to determine if surface water was present.

- If the **entire** central (or deepest) part of the wetland is covered with large species such as cattails and bulrushes (see Figure 44), you can assume the wetland **does not** have open water.
- If the wetland still has standing water outside the zone of emergent plants in July or October, you can assume the wetland **does** have open water during the spring and late summer (see Figure 43).
- If the wetland has exposed areas of "mudflats" without any vegetation (Figure 45), you can assume the wetland **does** have open water.

Figure 45: A mudflat indicates the presence of open water earlier in the season.

The size threshold for this indicator is ¼ acre, or 10% of the area of the wetland unit if the unit is smaller than 2.5 acres. This may require you to make a rough sketch of the wetland, and on it superimpose an outline of the area of open water.

H 1.3.2 Does the wetland have an intermittent or permanent stream within its boundaries or along one side with an unvegetated bottom (answer only if H 1.3.1 is NO)?

Consider this question only if the wetland does not have any open water as defined in H1.3.1. Some riverine wetlands or depressional wetlands without "open" water may have a stream or river adjacent or within it. The open water provided by the stream plays a similar ecological role as the "open" water defined above. If you answered NO to H 1.3.1 you will need to determine if there is a permanently or seasonally flowing stream or river in the wetland unit, or immediately adjacent (contiguous), to the it To answer "yes" for this question the stream or river needs to have defined banks with a bottom that is not vegetated and the **area that is contiguous with the wetland that is at least 10% or ¼ acre of the wetland unit**. Also answer "yes" if the wetland is along the side of a stream or river with an unvegetated area that is at least 16 ft (5m) wide.

H 1.4 Richness of Plant Species:

> **Rationale for indicator**: The number of plant species present in a wetland reflects the potential number of niches available for invertebrates, birds, and mammals. The total number of animal species in a wetland is expected to increase as the number of plant species increases (Hruby, and others 2000). For example, the number of invertebrate species is directly linked to the number of plant species (Knops and others 1999). This indicator includes both native and non-native plant species (with the exceptions noted below) because both provide habitat for invertebrate and vertebrate species. The six non-native species excluded from the count tend to form large mono-cultures that exclude other species and reduce the structural richness of the habitat.

As you walk through the wetland, or do your delineation, keep a list of the patches of different plant species you find. You do not have to record individual plants, only species that form patches that cover at least 10 square feet. Different patches of the same species can be combined to meet the size threshold. This threshold was established to reduce the variability among users with different levels of expertise in identifying plants.

You should try to identify plants, but keying them out is not necessary. All you need to track is the total number, so you can identify species as Species 1, Species 2, etc. In order to capture the full range of plant species present during the year, record any species that are "dead" and recognizably different from other species present.

For this question the following species are **NOT TO BE INCLUDED** in the total: Eurasian water-milfoil (*Myriophyllum spicatum*), reed canarygrass (*Phalaris arundinaceae*), Russian olive (*Elaeagnus angustifolia*), Canadian thistle (*Circium arvense*), salt cedar (*Tamarix pentandra*), and "yellow-flag" iris (*Iris pseudacorus*).

H 1.5 Interspersion of Habitats:

This indicator requires a figure be included with the field form.

> **Rationale for indicator:** In general, interspersion among different physical structures (e.g. open water) and types of vegetation (e.g. aquatic bed, emergent vegetation of different heights) increases the suitability for some wildlife guilds by increasing the number of ecological niches (Hruby and others 2000). For example, a higher diversity of plant forms is likely to support a higher diversity of macro-invertebrates (Chapman 1966, Dvorak and Best 1982, Lodge 1985).

In question H.1.1 you determined how many different vegetation classes are present in the wetland unit being rated, and in question H 1.3 you determined if there was any open water present. This question uses the information from both questions and asks you to rate the "interspersion" between these structural characteristics of the wetland. The diagrams on the rating form show what is meant by ratings of High, Medium, Low, or None. Each polygon with a different shading represents a different habitat structure, either a vegetation class or open water. Note: The plant structures under a forest canopy, however should not be included in this indicator because they are within one type of structure listed in H1.1.

To answer this question first consider if the interspersion falls into the two "default" ratings. If the wetland has only one vegetation class present (question H 1.1) and no open water, it will always be rated as NONE (see Figures 12, 13). If the wetland has four vegetation structures (from question H 1.1), or three types and open water (from questions H1.1 and H 1.3) it will always be rated as HIGH. The only time you will have to make a decision is when the wetland has two or three types of habitat structure. In scoring units with two types of structure the difference between LOW and MODERATE interspersion is the amount of edge habitat between the structures. Units with convoluted edges are scored moderate. Those with relatively straight edges are scored "low." For units with three types of structure the same criterion is used to differentiate between a MODERATE and HIGH scoring.

For example, the wetland in Figure 44 has three concentric rings of different size emergent plants and no open water. This wetland is rated as Moderate for interspersion (see the fourth diagram on the rating form). The wetland in Figure 46 has one vegetation type and open water in a concentric system. It is rated as LOW (see the second diagram on the rating form).

Additional notes for determining the interspersion are:

- Lake-fringe wetlands will always have <u>at least</u> two categories of structure (open water and one class of vegetation).
- A wetland with a meandering, unvegetated, stream (seasonal or permanent) should be rated MODERATE if it has only one vegetation category, or HIGH if it has two or more.
- Several isolated patches of one structural category (e.g. patches of open water) should be considered the same as one "patch" with many lobes.

Figure 46: A depressional wetland with one height category of emergent plants and open water. The interspersion is rated as LOW.

H 1.6 Special Habitat Features:

Rationale for indicator: There are certain habitat features in a wetland that provide refuge and resources for many different species. The presence of these features increases the potential that the wetland will provide a wide range of habitats (Hruby and others 2000). These special features include: 1) rocks within the area of surface ponding or large downed woody debris in the wetland, 2) cattails or bulrushes as indicators of long periods of ponding, 3) snags, 5) emergent or shrub vegetation in areas permanently ponded, and 6) steep banks of fine material that might be used by aquatic mammals for denning.

In many instances rocks mimic the function of large woody debris typically found in western Washington, but rarely found in many areas of eastern Washington. Rocks provide refuge, habitat, and structure for a number of different species. Woody debris, snags, and erect vegetation, where present, provide major niches for decomposers (i.e. bacteria and fungi) and invertebrates. They also provide refuge for some amphibians and other vertebrates. Downed woody material and the duration of ponding are important structural elements of habitat for many other species. (review in Hruby and others 2000).

Record on the rating form the presence of any the following special habitat features within the wetland:

- Rocks > 4 inches (10cm) in diameter or large woody debris that is more than 4 inches in diameter within the area that is seasonally or permanently ponded (Figures 47, 48).
- Presence of cattails (*Typha* sp.) or bulrushes (*Schoenoplectus (*formerly Scirpus) *acutus*).
- Snags present in the wetland, or in the first 30 ft of the buffer, that are more than 4 inches in diameter at breast height.

- Emergent or shrub vegetation is found in areas that are permanently ponded. The presence of "yellow flag" Iris is a good indicator of vegetation in areas that are permanently ponded.
- Steep banks of fine material for denning, or evidence of use of the wetland by beaver or muskrat. Banks need to be at least 33 ft long, 2 ft high within or immediately adjacent to the wetland and have the following characteristics: at least a 30 degrees slope, with at least a 3 ft depth of fine soil such as sand, silt, or clay. OR, Evidence the area has been recently used by beaver, such as downed trees and shrubs with teeth marks, and where the wood has not turned gray yet (Figure 49). Evidence of grazing by muskrat does not count because it may be the result of Nutria, an invasive aquatic mammal. It is very difficult to differentiate between these two species in the field unless the animal is actually seen.
- Invasive plants cover less than 20% of the wetland area in each vertical stratum of plants (i.e. canopy, understory, herbaceous ground-cover). For example, a forested wetland with a 100% canopy of native species but with an understory of reed canary grass that covered 70% of the ground would not quality for this indicator. The species that are considered "invasive" for answering this question are as follows:

  Circium arvense (Canadian thistle)
  Rubus laciniatus (evergreen blackberry)
  Rubus armeniacus (Himalayan blackberry)
  Polygonum cuspiindicator (Japanese knotweed)
  Polygonum sachalinense (giant knotweed)
  Polygonum cuspiindicator x sachalinense (hybrid of Japanese and giant knotweeds)
  Lysimachia vulgaris (garden loosestrife)
  Lythrum salicaria (purple loosestrife)
  Myriophyllum spicatum (European milfoil)
  Phalaris arundinaceae (reed canarygrass)
  Phragmites australis (common reed)
  Tamarix spp.(either *Tamarix ramosissima* and/or *T. parviflora*, salt cedar. There is some dispute regarding the correct taxonomy of the deciduous species of tamarisk that have escaped and become invasive in western North America.)

Only the species on the list count as invasive. This is the list on which the experts developing and reviewing the rating system could agree. Other species may be considered invasive by one of more botanists but we could not achieve consensus to include any other species on the list.

Figure 47: Rocks within area of surface ponding.

Figure 48: Large woody debris in wetland.

Figure 49: Evidence of beaver activity. Note the conical shape of the cut.

H 2.0 Does the Landscape Have the Potential to Support the Habitat Functions of the Site?

Habitat loss and fragmentation are a major source of losses in biodiversity (Fahrig 2003). Thus, wetlands in areas that have not been subject to fragmentation and habitat loss are in a better landscape position to provide habitat for a wide range of species that require both uplands and wetlands to survive. Questions H 2.1 and H 2.2 describe two indicators for characterizing the availability of good habitat around a wetland.

Land uses that are often called "high intensity" such as dense residential areas, manufacturing areas, and commercial all have negative impacts on habitat because of noise, light, toxic runoff, and other disturbances (reviewed in Sheldon and others 2005). Wetlands that are located in such areas are therefore less suited as habitat for many species. Question H 2.3 attempts to characterize these impacts by reducing the overall landscape potential of a site if these high intensity land uses are present.

You will need to map three types of land uses in a polygon that extends 1 km from the edge of the wetland unit being rated. These are "high intensity" land uses, "moderate and low intensity" land uses, and "relatively undisturbed." Do this by:

1. Drawing a polygon around the unit that extends 1 km from the edge of the unit. Use an aerial photograph or a map of land uses if available.

2. Drawing smaller polygons within this 1 km circle around the areas that are relatively undisturbed, have low or moderate intensity land uses and have high intensity land uses.

Terms are defined in the following box and in Table 2. If you find a land use that is not listed you will have to decide how to categorize it (high intensity, moderate intensity, relatively undisturbed). In this case you should document your rationale on the data form or attached to the figures you submit.

"***Relatively undisturbed***" is a general term used to describe areas that are almost completely free of human impacts and activities. Relatively undisturbed areas can include uplands, other wetlands, lakes or other bodies of water. It means that the area is free of regular disturbances such as:

- Tilling and cropping
- Residential and urban development
- Grazing
- Paved roads or frequently used gravel roads
- Mowing
- Pets
- Boating and fishing

NOTE 1: Areas dominated by aggressive species are not considered disturbed unless you also have other evidence that disturbances are still present. The aggressive species could be a result of some past disturbance that is no longer present.

NOTE 2: Logged areas that have been undisturbed for at least 5 years can qualify as "relatively undisturbed." This includes hybrid poplar plantations that are more than 5 years old.

NOTE 3: Areas that are daily accessed or visited by dogs, either from residential areas or from people walking their dog should be treated as disturbed. Dogs and other pets cause stress among the animals using a wetland.

NOTE 4: A rarely used path or gravel road can be considered "relatively undisturbed" if it is used less than once or twice a week. Daily usage of a road or area is considered "disturbed."

NOTE 5: Lakes, ponds and other bodies of open water can be considered relatively undisturbed if they are not regularly used for boating or for other water related activities. Daily usage of the lake by boats would be considered "disturbed." A lake can be considered undisturbed if it is used only once or twice a week by non-motorized craft.

Table 2: Land uses that can be classified as high and moderate/low intensity based on their impacts to wetland habitat.

Level of Impact	Types of Land Use Based on Common Zoning Designations
High Intensity	• Commercial • Urban • Industrial • Institutional • Retail sales • Residential (more than 1 unit/acre) • High-intensity agriculture (dairies, nurseries, greenhouses, growing and harvesting crops requiring annual tilling and raising and maintaining animals, etc.) • High-intensity recreation (golf courses, ball fields, etc.)
Moderate and Low Intensity	• Residential (1 unit/acre or less) • Parks • Moderate-intensity agriculture (orchards, hay fields, pastures.) • Trails • Forestry • Utility corridors

H .2.1 What is the area of accessible habitat?

This indicator requires a figure be included with the field form.

Rationale for indicator: It is difficult to separate the effects of habitat loss from the fragmentation of habitat (Fahrig 2003). Thus, Eigenbrod and others (2008) have developed an indicator, called "accessible habitat," that integrates these two concepts into one measurable indicator. Accessible habitat is defined as the amount of habitat that can be reached from the wetland without crossing a human land use (e.g., roads, fields, and development). Some lower intensity human land uses such as parks do not completely isolate a habitat. As a result, low and moderate intensity land uses are not totally discounted as accessible habitat. The total area of low and moderate intensity land uses adjacent to the unit is divided by two and then added to the area of undisturbed habitat. This addresses the issue that some lower intensity land uses do still provide habitat, but not to the same level as undisturbed areas.

To calculate the accessible habitat around the wetland unit you are scoring follow these steps.

1. Highlight all polygons of "relatively undisturbed" land uses on your map that are contiguous with the unit boundary and not separated from the unit by some human disturbance.

2. Estimate the area of all such polygons as a percent of the total area within the larger 1 km polygon unit. You do not need to measure actual acreages, just the percent of the total areas within the larger polygon (Figure 50). Include this number on the Rating Form.
3. Highlight all polygons of "moderate or low intensity" land uses that are contiguous with the unit boundary or to the relatively undisturbed areas mapped in #1 above.
4. Estimate the area of the polygons categorized as "moderate or low intensity" as a percent of the total area within the larger 1 km polygon unit. Divide this result by 2 and add it to the percent accessible, undisturbed, habitat calculated in steps #1 and #2 above.

Use the sum as the area of Accessible Habitat to answer question H 2.1.

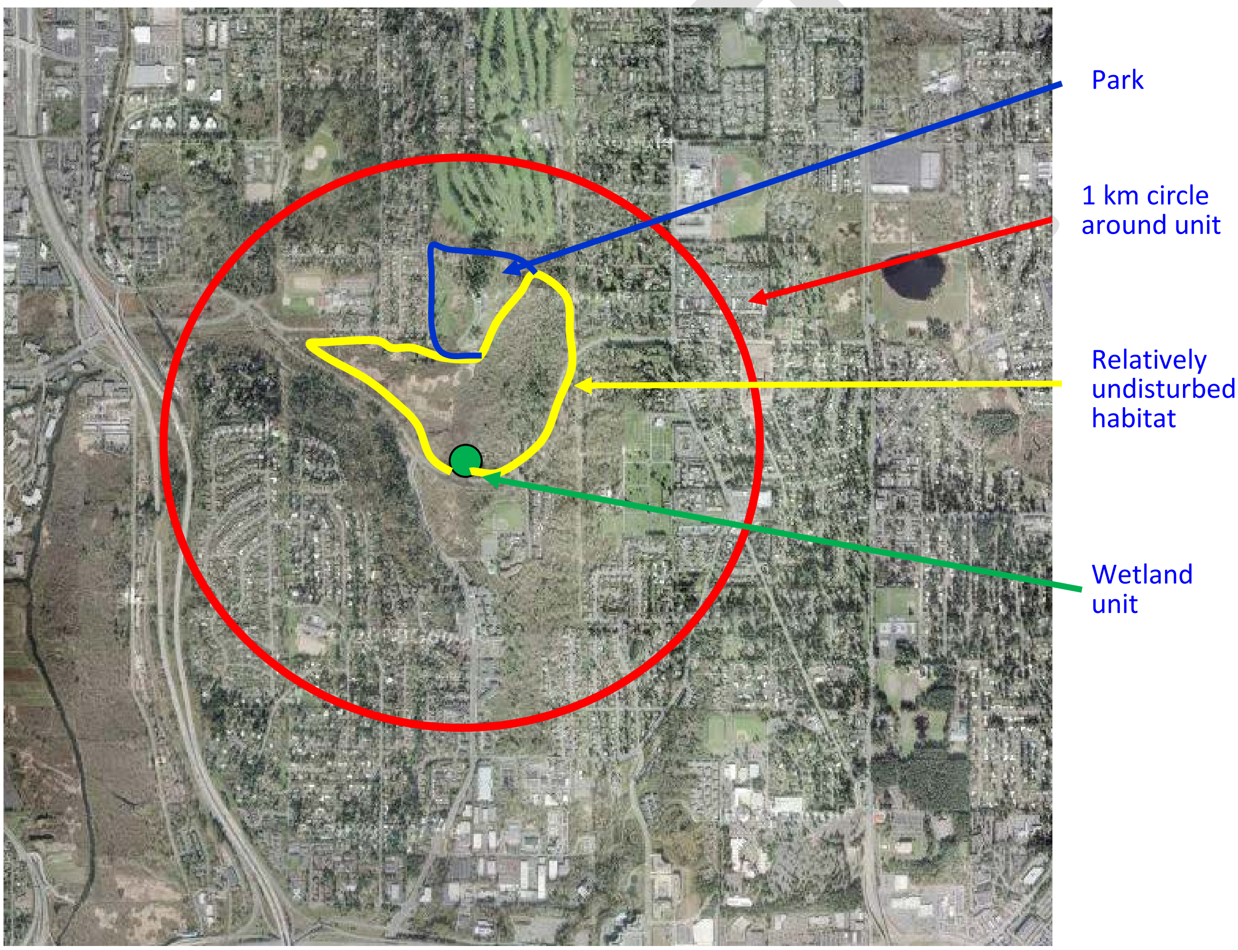


Figure 50: A 1 km circle around a wetland unit showing the Accessible Habitat. Accessible Habitat is 10 – 25 % of the total area of the 1 km polygon.

H 2.2 Total undisturbed habitat in 1 km circle around unit

Rationale for indicator: The focus of this indicator is more toward the fragmentation of the surrounding landscape. Flying species such as birds are not dependent on undisturbed corridors to move from habitat patch to habitat patch but more on the total area of habitat available (Rodewald and Bakermans 2006). This indicator characterizes the overall undisturbed habitat available surrounding the wetland unit.

Use the diagram of land uses within 1 km of the unit to answer this question as well, but analyze using the following criteria:

1. Select the polygons identified as relatively undisturbed even if they are separated from the unit by some human disturbance. Also include areas with low or moderate intensity land uses but remember the total area of these lands uses has to be divided by 2 before adding them to the total.
2. Calculate the total area of undisturbed habitat in the 1 km circle. If it is more than 50% of the total record that on the Rating Form.
3. If the area is between 10% and 50% count the number of distinct patches in the circle and score this using the criteria on the Rating Form.

H 2.3 Land use intensity in 1 km circle

Rationale for indicator: Land uses that are often called "high intensity" such as dense residential areas, manufacturing areas, and commercial all have negative impacts on habitat because of noise, light and other disturbances (reviewed in Sheldon and others 2005). Wetlands that are located in such areas are therefore less suited as habitat for many species.

Use the diagram of land uses within 1 km of the unit to answer this question as well, but analyze using the following criterion.

1. Identify all polygons of high intensity land uses.
2. Calculate the total area of in the 1 km circle. If it is more than 50% of the total record that on the Rating Form and subtract two points from the total.

H 3.0 Is the Habitat Provided by the Site Valuable to Society?

People do not value all species equally. Some are valued for their "charismatic" characteristics, some because they are in danger of extinction, some for their commercial, aesthetic, or moral values (Perry 2010). The value of the habitat a wetland provides for society is therefore linked to the presence of these more valued species. However, as individuals we often place different values on wildlife. For example, some may value a beaver more than frogs while others disagree.

Question H 3.1 attempts to characterize the values of different species of wildlife at a broad level by highlighting wetlands that provide habitat for species that are recognized by jurisdictions, the state, and federal agencies as having some importance and that are protected by laws and regulations. In this case, we are relying on the agencies and jurisdictions (as representatives of society as a whole) to identify the valuable species and habitats. The Department of Ecology does not have the resources, or the mandate, to develop a different list of "valuable" species.

H 3.1 Does the site provides habitat for species valued in laws, regulations, or policies?

Rationale for indicator: There are some species that are identified through federal and state Endangered Species Acts or are the focus of management and conservation by the Washington State Department of Fish and Wildlife through their priority species and habitat program (http://wdfw.wa.gov/hab/phspage.htm). These species are judged to have a higher value to society than others. Wetland units that provide habitat for these species are considered to have a higher habitat value than wetlands that do not.

Wetlands are assigned a high value for habitat if the unit:

- Provides habitat for Threatened or Endangered species on either a state or federal list. This includes both plants and animals. For the latest information on T/E species you will have to access the U.S. Fish and Wildlife and WA Dept. of Fish and Wildlife (WDFW) links below or contact the local WDFW biologist. These links are active as of November 2013. http://www.fws.gov/endangered/
  http://wdfw.wa.gov/conservation/endangered/
  For information on plants contact the Natural Heritage Program:
  http://www1.dnr.wa.gov/nhp/refdesk/plants.html
  NOTE: Be aware that wetlands with streams running through them in the Puget Sound area and on the Columbia River will probably be providing habitat for one or more species of threatened or endangered fish species.

- Is mapped as a location for an individual WDFW priority species. The WDFW maintains maps of important habitat areas and locations for species on their priority species list. These maps should be used to identify if a habitat "point" in the database falls within the unit. The WDFW website provides a map of the entire state with the "habitat points" mapped http://wdfw.wa.gov/mapping/phs/ . Zoom to the location of your wetland unit, and determine if a habitat point (not a habitat polygon) fall within the boundary of the unit.

- Is a wetland with a high conservation value as determined by the Department of Natural Resources. (See question SC 2.0 under Wetlands with Special Characteristics; Section 5.4).
  http://www1.dnr.wa.gov/nhp/refdesk/lists/communitiesxco/countyindex.html

- Has at least three different WDFW priority habitats within 100 m of the unit. The list on the data form summarizes the priority habitats as of July 2013. However these may change and you need to use the latest definitions for priority habitats. These will be found on the WDFW web page: http://wdfw.wa.gov/conservation/phs/list/

  NOTE: Wetlands are specifically excluded from the list of priority habitats in the rating system because all wetlands are a priority habitat.

- Has been categorized as an important habitat site in a local or regional comprehensive plan, Shoreline Master Plan, or a watershed plan. The Department of Ecology does not maintain a database of important habitat areas identified in local plans. You will need to contact the planning department of the jurisdiction in which your wetland unit is found to determine if it has been identified as an area that provides valuable habitat.

Wetlands are assigned a moderate value for habitat if the unit has one or two different WDFW priority habitats within 100 m.

Wetlands are assigned a low value for habitat if they do not meet any of the criteria above.

CHAPTER 6

Detailed Guidance for the Rating Form – Special Characteristics

This rating system was designed to differentiate between wetlands based on their sensitivity to disturbance, their significance, their rarity, our ability to replace them, and the functions they provide. The first four criteria can be considered as values that are somewhat independent of the functions provided by a wetland. Questions SC 1 to SC 6 provide the information needed to identify and rate the wetlands with these special characteristics. These types of wetlands have an importance or value that may supersede their functions. **You should determine whether the wetland being rated meets any of the conditions described below as well as answering the questions about functions.**

<u>Questions to identify wetlands with special characteristics:</u>

SC 1.0. Vernal pools

Vernal pools are precipitation-based, seasonal wetlands. For the purposes of this rating system they include only "scabrock" and "rainpool" vernals. Pools where surface water ponds for short periods that are found in forested areas, or surrounded by trees and shrubs, are not considered vernal pools in the context of this rating system. Figures 51 and 52 show typical vernal pools in the scabland area.

> <u>Relatively undisturbed vernal pools are either a category II or III, depending on their location in the landscape.</u>

Figure 51: A scabrock vernal pool above Lake Lenore. Photo taken 7/14/99.

Figure 52: A scabrock vernal pool with water still in it. The pool is in a grazed pasture but undisturbed in early spring.

To be classified as a vernal pool the wetland should be less than 4000 ft^2, and meet **at least two** of the following criteria:

- *Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input.* The wetland will typically lie in areas where the basalt has been exposed by the ice age floods. It has formed in a small surface depression in the basalt and does not have an outlet.
- *Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals.* The water is present in the wetland for only short periods of time, usually less than 120 days. Wetland plants will be found only during the time of standing water or immediately afterwards. NOTE: If you find perennial, "obligate," wetland plants the wetland is probably NOT a vernal pool.
- *The soils in the wetland are shallow (< 30 cm or 1ft deep) and are underlain by an impermeable layer such as basalt or clay.* You can determine the depth of the soil by digging a small hole with a tile spade. Determining if the impermeable layer is basalt should be easy (can't dig any further), but identifying a clay layer is harder. You may have to take some of the soil between your fingers, add water, and feel if it is "greasy" and smooth (without grit). If in doubt, use the "ribbon test" for clay (Appendix B).
- *Surface water is present for less than 120 days during the "wet" season.* Estimating the duration of surface water in a vernal pool wetland is difficult unless one visits the wetland several times and notes the time at which the wetland fills and the time it dries out. Information about the drying and wetting cycles in the wetland may sometimes be obtained from local residents or frequent visitors to the wetland.

SC 1.1 Is the vernal pool relatively undisturbed in February and March?

To meet the criterion for "**relatively undisturbed**" a vernal pool has no disturbance within 200 ft during the months of February and March. Disturbance includes grazing, pets, urban or residential noise and human activity including road traffic. If the pool is grazed during the late spring and summer or fall, but not the early spring it can be considered "not disturbed."

SC 1.2 Is the wetland a relatively undisturbed vernal pool in an area where there are at least 3 other separate aquatic resources (other wetlands, rivers, streams, lakes, etc.), within 0.5 miles?

If the wetland being rated meets the criteria for undisturbed vernal pools described in the section above, determine if there are any other wetlands or aquatic resources within ½ mile. Aquatic resources include lakes, reservoirs, wasteways with open water, rivers, and other wetlands. Use an aerial photograph or topographic map to answer this question if you cannot visit or see the area around the wetland.

<u>If there are at least 3 other aquatic resources nearby the vernal pool is rated as a Category II wetland.</u>

If the wetland is a relatively undisturbed vernal pool with fewer than three aquatic resources within ½ mile it is rated a Category III wetland.

SC 2.0 Alkali wetlands –Alkali wetlands are wetlands with high concentrations of salt. They have formed where groundwater comes to the surface and evaporates. The evaporation over many years has concentrated the salts that were present in the groundwater. These wetlands cannot be replicated through compensatory mitigation to our knowledge, and are rare on the landscape.

All alkali wetlands are Category I wetlands. A wetland is alkali if it meets **one** of the following four criteria.

- *The wetland has conductivity greater than 3.0 mS.* Conductivity is measured with a "conductivity" meter, and the units are "Siemens" or "Mhos". The units of measures are equivalent. For example, 3.0 milliSiemens is the same as 3.0 millimhos. Measure the conductivity in the water if any is present at least 1-2 feet from the edge. If the weather is hot the conductivity near edge may be much higher because of local evaporation. If you do not have a conductivity meter, you will have to determine if the wetland is alkali using the other criteria listed below.
- *The wetland has a conductivity between 2.0 - 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 2 for list of plants found in alkali systems).* The plant list in Table 2 is not exclusive, and the criterion can be met by any plant species known to be salt tolerant.

> Conductivity measures the ability of a solution to conduct an electric current between two electrodes. With an increasing amount of ions (i.e. salts) present in the liquid, the liquid will have a higher conductivity.
>
> Normal units of measurement are:
> 1 micromho (µmho) = 1 microSiemen (µS),
> 1 millimho (mmho) = 1 milliSiemens (mS) = 1,000 µS

- *If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt.* (Figure 53)

Figure 53: An alkali wetland where surface is covered with salt encrustations. In this wetland the salt was 4-6 inches deep.

Table 2: Plants species that are tolerant of high salt concentration and are often dominant in alkali wetlands.

Latin Name	**Common Name**
Scirpus maritimus	bulrush
Juncus balticus	Baltic rush
Distichls spicata	saltgrass
Potentilla gracilis, P. anserina	Cinquefoils
Salicornia rubra S. virginica	Glasswort, Saltwort
Puccinellia lemmonii	Alkali grass
Bassia hyssopifolia	Smother weed
Eleocharis rostellata	Beaked spike-rush

- *Wetland meets two of the following three sub-criteria.*
    - *Salt encrustations around more than 3/4 of the edge of the wetland*. Alkali wetlands will usually have a rim of salt crystals around their edge as the water in the wetland evaporates. Some freshwater wetlands have a fairly high salt content and are on the verge of being alkali. Such borderline wetlands will have an occasional patch of salt encrusted around its edge. Any wetland, however, where the encrustations are found around more than 3/4 of the edge should be alkali. The eight alkali wetlands found during the function assessment project all met this criterion and had their conductivity confirmed by the meter. Figure 54 gives an example of an alkali wetland with a salt ring around it.

- *More than ¾ of the plant cover consists of species listed on Table 2.*
- *A pH above 9.0.* All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. The pH can be measured using a pH meter or paper tabs with indicators on them (pH paper).

Figure 54: Salt encrustations around an alkali wetland.

SC 3.0 Wetlands with High Conservation Value (formerly Natural Heritage Wetlands)

Is the wetland a Wetland with High Conservation Value?

Wetlands that are Wetlands of High Conservation Value (WHCV) (formerly called Natural Heritage Wetlands) have been identified by the Washington Natural Heritage Program at the Department of Natural Resources (DNR) as either high quality undisturbed wetlands or wetlands that support rare or sensitive plant populations. At the time of publication, the Natural Heritage Program is updating their database on these wetlands. The information on the Wetlands of High Conservation Value will be available on line in the future. Until the information is available on line you will need to use the approach developed in the previous version of the rating system. More up-to-date information may be available on the Natural Heritage internet site at http://www1.dnr.wa.gov/nhp/refdesk/datasearch/index.html .

Until DNR updates their database, you first need to determine if the Section, Township, and Range (S/T/R) within which the wetland is found contains a Wetland of High Conservation Value (Question SC 2.3 on the rating form). The latest list of Sections with such wetlands is available on the DNR web site at: http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf If the site does not fall within the S/T/R's listed, it is not a WHCV. *(This question is used to screen out most sites before you need to contact WNHP/DNR).*

If, however, the wetland being rated falls within one of the Section/Township/Ranges listed, you will need to contact the Natural Heritage Program directly to find out if the wetland is a heritage site (Questions SC 2.3 and SC 2.4). Contact information is also available at http://www1.dnr.wa.gov/nhp/refdesk/datasearch/index.html. Another option is to contact the Natural Heritage Program by calling 360-902-1667. You should ask whether the wetland has been identified as a wetland with a high conservation value. The Natural Heritage Program will provide information on whether the site contains a Natural Heritage plant community, sensitive species or T/E plant species. If it does it is a Category I wetland. If the site you are rating does not match the description of the wetland in the DNR database it is not a WHCV. **However, you will need to provide the data to prove your conclusion.**

We have changed the name from Natural Heritage Wetlands to Wetlands with High Conservation Value because the former name has caused some confusion. Some users of the rating system believed that the Natural Heritage Wetlands are Natural Heritage Sites maintained by DNR. This is not the case. Wetlands are category I wetlands because DNR has found that they hold rare or threatened plant communities or populations of rare or threatened plant species. These wetlands are not necessarily heritage sites.

SC 4.0 Bogs

Is the wetland a bog? If more than a 1/4 acre of the wetland unit you are rating meets the criteria for bogs described below, it is a Category I wetland. Bogs cannot be replicated through compensatory mitigation and are very sensitive to disturbance.

The terms associated with bogs are complex and often confusing (e.g. bogs, fens, mires, peat bogs, Sphagnum bogs, heath). Bogs occupy one end of a gradient of wetlands dominated by organic soils, low nutrients, and low pH (between 3.5 and 5.0). Bogs are generally acidic, and have low levels of nutrients available for plants growth. Plants growing in these sensitive wetlands are specifically adapted to such conditions, and are usually not found elsewhere. Relatively minor changes in the water regime or nutrient levels in bogs may cause major changes in the plant community. Bogs, and their associated acidic peat environment, provide a habitat for unique species of plants and animals. The ground is usually very spongy and covered with mosses (often of the genus *Sphagnum*). Some bogs will actually float on top of a lake or pond.

Forested bogs are more difficult to identify. Bogs may contain highly stunted individual trees of sitka spruce, western red cedar, western hemlock, lodgepole pine, western white pine, Engelmann's spruce, sub-alpine fir, aspen, or crab apple. However, some bogs contain mature, full-size, trees especially on the Long Beach Peninsula. These wetlands contain mature, full-sized trees of sitka spruce, western red cedar, western hemlock, lodgepole pine, western white pine, Engelmann's spruce, or aspen. The trees grow very slowly and may take many centuries to reach sizes common in much younger forests. The characteristics that typically identify these forests as bogs are peat soils and, frequently, the presence of shrub or herbaceous bog species such as Sphagnum moss. Sphagnum or other bog species may only cover a small portion of the ground, especially if there are pools of standing water in the forest or if there is substantial litter.

Identifying bogs can be challenging, particularly in a forested setting. It is necessary to confirm the presence of organic soils by digging soil pits, and it further requires the identification of particular plant species. It may also be difficult to determine the boundaries of a bog.

Key for Identifying Bogs in the Rating System

1. Does the wetland have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile?
Yes - go to Q. 3 No - go to Q. 2

The following description of organic soils is from the Natural Resources Conservation Service (formerly the Soil Conservation Service). Soils with an organic carbon content of 18% or more (excluding live roots) if the mineral fraction contains more than 60% clay; 2) soils with an organic carbon content of 12% if the mineral fraction contains no clay; or 3) soils with an organic carbon content between 12-18% based on the percentage of clay present (multiply the actual percentage of clay by 0.1 and add to 12%). It is not usually necessary, however, to do a chemical analysis of the soil to determine if a soil is organic. Organic soils are easy to recognize as black- colored mucks or as black or dark brown peats. Mucks feel greasy and stain fingers when rubbed between the fingers. Peats have plant fragments visible throughout the soil and feel fibrous. Many organic soils, both peats and mucks, may smell of hydrogen sulfide (rotten eggs). Black soils that feel gritty or sandy however are usually not organic soils.

2. Does the wetland have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

Yes - go to Q. 3 No - **Is not** a bog for purpose of rating

3. Does the wetland have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)?

Yes **– Is a bog** for purpose of rating No - go to Q. 4

NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species are present in Table 3, the wetland is a bog.

4. Is the wetland forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover (> 30% coverage of the total shrub/herbaceous cover)?

Yes – **Is a bog** for purpose of rating No - **Is not** a bog for purpose of rating

NOTE: Total cover is estimated by assessing the area of wetland covered by the shadow of plants if the sun were directly overhead. You are trying to determine whether 30% of the total "footprint" of plants within the polygon identified as a bog consists of plant species listed in Table 3.

Table 3

Characteristic bog species in Washington State

Andromeda polifolia	Bog rosemary
Betula glandulosa	Bog birch
Carex aquatilis	
Carex atherodes	Awned sedge
Carex brunescens	Brownish sedge
Carex buxbaumii	Brown bog sedge
Carex canescens	Hoary sedge
Carex chordorhiza	Creeping sedge
Carex comosa	Bearded sedge
Carex echinata var phyllomania	
Carex lasiocarpa	Woolly-fruit sedge
Carex leptalea	Bristly-stalk sedge
Carex limosa	Mud sedge
Carex livida	Livid sedge
Carex magellanica	Poor sedge
Carex rostrata	Beaked sedge
Carex saxatilis	Russet sedge
Carex aquatilis	Sitka sedge
Carex interior	Inland sedge
Carex pauciflora	Few-flower sedge
Carex utriculata	Bladder sedge
*Cladina ran*gifera	Reindeer lichen
Comarum palustre	Marsh cinquefoil
Drosera rotundifolia	Sundew
Eleocharis quinqueflora	Few-flower spike rush
Empetrum nigrum	Black crowberry
Eriophorum chamissonis	Cottongrass
Eriophorum angustifolium	Coldswamp cottongrass
Nephrophyllidium crista-galli	Deer-cabbage
Gentiana douglasiana	Swamp gentian

Juncus supiniformis	Hairy leaf rush
Kalmia microphylla	Alpine laurel
Ledum glandulosum	Labrador tea
Menyanthes trifoliata	Bog bean
Myrica gale	Sweet gale
Pedicularis groenlandica	Elephant's-head lousewort
Platanthera dilatata	Leafy white orchid
Rhynchospora alba	White beakrush
Salix commutata	Under-green willow
Salix eastwoodiae	Mountain willow
Salix farriae	Farr willow
Salix myrtillifolia	Blue-berry willow
Salix planifolia	Diamond leaf willow
Sanguisorba officinalis	Great burnet
Sphagnum spp.	Sphagnum mosses
Spiranthes romanzofianna	Hooded ladies'-tresses
Triantha glutinosa	Sticky false-asphodel
Vaccinium oxycoccus	Bog cranberry

NOTE: Latin names and spelling are based on the NRCS Plant Database http://plants.usda.gov/java/ (accessed November 1, 2013).

If in doubt, it is important to consult someone with expertise in identifying bogs. The intent of the criteria is to include those bogs that have relatively undisturbed native plant communities. NOTE: *Spiraea* sp. is not included in the list because it is often found in peat systems that no longer have the low pH and other special characteristics. It is not considered to be an indicator species for the bogs dominated by mosses at the ground level.

SC 5.0 Forested Wetlands

Does the wetland have an area of forest rooted within its boundary that meets at least one of the following three criteria? *(Continue only if you have identified a forested class is present in question H 1.1)*

- The wetland is within the "100-year" floodplain of a river or stream.
- Aspen (*Populus tremuloides*) are a dominant or co-dominant of the "woody" vegetation. (Dominants means it represents at least 50% of the cover of woody species, co-dominant means it represents at least 20% of the total cover of woody species).
- There is at least ¼ acre of trees (even in wetlands smaller than 2.5 acres) that are "mature" or "old-growth" according to the definitions for tree size, age, and community composition developed by WDFW, and listed below. The descriptions of these forests are copied from WDFW and any updates are available on the department's web page - http://wdfw.wa.gov/conservation/phs/ .

<u>Old-growth east of Cascade crest:</u> Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 25 trees/ha (10 trees/acre) that are greater than 53 cm (21 in) diameter at breast height (dbh), and 2.5-7.5 snags/ha (1 - 3 snags/acre) > 30-35 cm (12-14 in) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is an "OR" so old-growth forests do not necessarily have to have trees of this diameter. Data collected in wetlands indicates that 200 year-old trees may have different diameters (Painter 2007).

<u>Mature forests</u>: Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 160 years old east of the Cascade crest.

NOTE: The criterion for dbh is based on measurements for upland forests. Eighty to 200 year-old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is an "OR" so mature forests do not necessarily have to have trees of this diameter.

NOTE: Trees can be either deciduous or coniferous.

NOTE: There are no requirements for the number of trees per acre in the mature forest definition. For the purpose of the rating system, we will assume that the **average dbh** refers only to the trees forming the canopy. This is based on clarification from Jeff Azerrad (see quote below).

"The second part describes just how old a forest needs to be before we consider it mature (i.e., 80-200 years for western WA). This part of the definition should weigh heavily in identifying mature forest. And because most of Washington's forests have been invaded by a dense understory layer due to widespread fire suppression, I interpret our definition as not including the smaller understory trees. But if I was to update this definition, mentioning that the dbh measured is only intended for the overstory trees only would certainly add clarity." (e-mail from Jeff Azerrad (WDFW) received on 4/10/2013)

SC 5.1 Does the wetland have a forest canopy of at least ¼ acre where more than 50% of the tree species (by cover) are slow growing native trees?

Slow growing forests include those where more than 50% of the tree species (by cover) that provide the canopy are slow growing as listed in Table 4.

YES = Category I NO = go to SC 5.2

SC 5.2 Does the wetland have aspen (*Populus tremuloides*) as a dominant or co-dominant species in the category of woody species?

YES = Category I NO = go to SC 5.3

SC 5.3 Does the wetland have at least ¼ acre of a fast growing forest?

Fast growing forests include those where more than 50% of the tree species (by cover) that provide the canopy are fast growing as listed in Table 4.

YES = Category II NO = go to SC 5.3

SC 5.4 Is the forested component of the wetland unit within the "100 year floodplain" of a river or stream?

YES = Category II NO = not a forested wetland with special characteristics

All forested wetlands in the 100-year floodplain are Category II wetlands based on their location. These wetlands, however, may often be a Category I based on functions. The "100-year floodplain" is mapped by FEMA (Federal Emergency Management Agency). Generally, local planning departments or departments of pubic works have this information available.

Table 4: List of slow growing and fast growing native trees found in eastern Washington wetlands.

SLOW GROWING WETLAND TREES	FAST GROWING WETLAND TREES
Cedar – western red (*Thuja plicata*) Alaska yellow (*Chamaecyparis nootkatensis*)	Alders – red (*Alnus rubra*) thin-leaf (*A. tenuifolia*)
Pine spp. mostly "white" pine (*Pinus monticola*)	Cottonwoods – narrow-leaf (*Populus angustifoli* black (*P. balsamifera*)
Hemlock – western (*Tsuga heterophylla*)	Willows- peach-leaf (*Salix amygdaloides*) Sitka (*S. sitchensis*) Pacific (*S. lasiandra*)
Englemann spruce (*Picea engelmannii*)	Aspen (*Populus tremuloides*)
	Water Birch (*Betula occidentalis*)

If only part of the wetland is forested, and the category based on functions is II or III, the wetland may be assigned a dual rating as described in Section 4.3.

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Appendix A. Rating Form

SUMMARY

Name of wetland (or ID #): ___________________________________ Date of site visit: _____

Rated by______________________________ Trained by Ecology? Yes__No___ Date of training______

HGM Class Used for Rating__________________ Unit has multiple HGM classes?___Y ____N

NOTE: **Form is not complete without the figures requested.**
Depressional (6 figures) Riverine (8 figures) Lake-fringe (7 figures) Slope (5 figures)

OVERALL WETLAND CATEGORY ____

1. Category of wetland based on FUNCTIONS

_______**Category I** - Total score = 22 – 27

_______**Category II** - Total score = 19 - 21

_______**Category III** - Total score = 16 - 18

_______**Category IV** – Total score = 9 - 15

FUNCTION	**Improving Water Quality**	**Hydrologic**	**Habitat**
	Circle the	*appropriate*	*ratings*
Site Potential	H M L	H M L	H M L
Landscape Potential	H M L	H M L	H M L
Value	H M L	H M L	H M L
Score Based on Ratings			

Score for each function based on three ratings
(order of ratings is not important)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**CATEGORY** *Circle the appropriate category*
Vernal Pools	II III
Alakali	I
Wetland with high conservation value	I
Bog	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	

NOTES AND FIELD OBSERVATIONS

HGM Classification of Wetland Units in Eastern Washington

For questions 1-4 the criteria described must apply to the entire unit being rated for it to be classified correctly.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire wetland unit **meet both** of the following criteria?

___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 acres (8 ha) in size

___At least 30% of the open water area is deeper than 10 ft (3 m)

NO – go to 2 **YES –** The wetland class is **Lake-fringe (Lacustrine Fringe)**

2. Does the entire wetland unit **meet all** of the following criteria?

____The wetland is on a slope (*slope can be very gradual*),

____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

____Does the water leaves the wetland **without being impounded**?

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3ft diameter and less than 1 foot deep).

NO - go to 3 YES – The wetland class is **Slope**

3. Does the entire wetland unit **meet all** of the following criteria?

____ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

____ The overbank flooding occurs at least once every ten years.

NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.

NO - go to 4 YES – The wetland class is **Riverine**

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	HGM Class to Use in Rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake-fringe	Depressional
Riverine + Lake-fringe	Riverine

If you are unable still to determine which of the above criteria apply to your wetland, or if you have more than 2 HGM classes within a wetland boundary, classify the wetland as ***Depressional*** *for the rating.*

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality.	Points (only 1 score per box)
D 1.0 Does the wetland unit have the potential to improve water quality?	
D 1.1 Characteristics of surface water flows out of the wetland unit: *Show outlet (if present) on map of hydroperiods in question D1.4* Wetland has no surface water outlet - points = 5 Wetland has an intermittently flowing outlet points = 3 Wetland has a highly constricted permanently flowing outlet points = 3 Wetland has a permanently flowing surface outlet points = 1	
D 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions of soils)* YES points = 3 NO points = 0	
D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) *Provide map of Cowardin plant classes* Wetland has persistent, ungrazed, vegetation for > 2/3 of area points = 5 Wetland has persistent, ungrazed, vegetation from 1/3 to 2/3 of area points = 3 Wetland has persistent, ungrazed vegetation from 1/10 to < 1/3 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0	Figure ___
D 1.4 Characteristics of seasonal ponding or inundation. *Provide map of hydroperiods* *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland points = 3 Area seasonally ponded is ¼ - ½ total area of wetland points = 1 Area seasonally ponded is < ¼ total area of wetland points = 0	Figure ___
Total for D 1 Add the points in the boxes above	

Rating of Site Potential **If score is: 12 – 16 = H 6 – 11 = M 0 – 5 = L**
Record the rating on the first page

D 2.0 Does the landscape have the potential to support the water quality function at the site?	
D2.1 Does the Wetland unit receive stormwater discharges? Yes = 1 No = 0	
D 2.2 Is more than 10% of the area within 150 ft of wetland unit in agricultural, pasture, residential, commercial, or urban Yes = 1 No = 0	
D2.3 Are there are septic systems within 250 ft of the wetland unit? Yes = 1 No = 0	
D2.4 Are there are other sources of pollutants coming into the wetland that are not listed in questions D2.1 – D2.3? Source____________ Yes = 1 No = 0	
Total for D 2 Add the points in the boxes above	

Rating of Landscape Potential **If score is: 3 or 4 = H 1 or 2 = M 0 = L**
Record the rating on the first page

D 3.0 Is the water quality improvement provided by the site valuable to society?	
D3.1 Does the unit discharge directly (within 1 mile) to a stream, river, or lake that is on the 303dlist? Yes = 1 No = 0	
D 3.2 Is the unit in a basin or sub-basin where water quality is an issue in some aquatic resource (303d list, eutrophic lakes, problems with nuisance and toxic algae)? Yes = 1 No = 0	
D 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality? (*answer YES if there is a TMDL for the drainage or basin in which unit is found*) Yes = 2 No = 0	
Total for D 3 Add the points in the boxes above	

Rating of Value **If score is: 2-4 = H 1 = M 0 = L**
Record the rating on the first page

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream erosion.	Points (only 1 score per box)
D 4. 0 Does the wetland unit have the potential to reduce flooding and erosion?	
D 4.1 Characteristics of surface water flows out of the wetland unit: Wetland has no surface water outlet — points = 8 Wetland has an intermittently flowing outlet — points = 4 Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat unit as "intermittently flowing")*	
D 4.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: => 3 ft above the lowest point in unit or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in unit or the surface of permanent ponding — points = 6 The wetland is a "headwater" wetland" — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: <6 in orr unit has only saturated soils — points = 0	
Total for D 4 — Add the points in the boxes above	

Rating of Site Potential **If score is:** **12 – 16 = H** **6 - 11 = M** **0 - 5 = L**

Record the rating on the first page

D 5.0 Does the landscape have the potential to support hydrologic functions at the site?	
D5.1 Does the unit receive any stormwater discharges? Yes = 1 No = 0	
D5.2 Is >10% of the area within 150 ft of wetland unit in land uses that increase flows? Yes = 1 No = 0	
D 5.3 Is more than 25% of the contributing basin of the wetland unit covered with intensive human land uses? Yes = 1 No = 0	
Total for D 5 — Add the points in the boxes above	

Rating of Landscape Potential **If score is:** **3 = H** **1,2 = M** **0 = L**

Record the rating on the first page

D 6.0 Are the hydrologic functions provided by the site valuable to society?	
D 6.1 Is the unit is in a landscape that has flooding problems? Choose the description that best matches conditions around the wetland unit being rated. *Do not add points. Choose the highest score if more than one condition is met.* ☐ The site has been identified as important for flood storage or flood conveyance in a regional flood control plan. — points = 2 ☐ The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g. salmon redds), AND o Damage occurs in sub-basin that is immediately downgradient of unit — points=2 o Damage occurs in a sub-basin further down-gradient — points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* ____ — points = 0 ☐ There are no problems with flooding downstream of the unit. — points = 0	

Rating of Value **If score is:** **2 = H** **1 = M** **0 = L**

Record the rating on the first page

Attach Figures to field form after this page.

RIVERINE WETLANDS **Water Quality Functions** - Indicators that site functions to improve water quality	Points (only 1 score per box)
R 1.0 Does the wetland unit have the potential to improve water quality?	
R 1.1 Area of surface depressions within the riverine wetland that can trap sediments during a flooding event: *If depressions > 1/10th of area of unit draw polygons on aerial photo or map* Depressions cover >1/3 area of wetland points = 6 Depressions cover > 1/10 area of wetland points = 3 Depressions present but cover < 1/10 area of wetland points = 1 No depressions present points = 0	Figure ___
R 1.2 Dense vegetation in the unit (area of polygons with >90% cover at person height. This is not Cowardin vegetation classes): *Include photo or map showing polygons of different plants types* Forest or shrub > 2/3 the area of the wetland points = 10 Forest or shrub 1/3 – 2/3 area of the wetland points = 5 Ungrazed, herbaceous plants > 2/3 area of wetland points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland points = 0	Figure ___
Total for R1 Add the points in the boxes above	

Rating of Site Potential **If score is:** **12 – 16 = H** **6 - 11 = M** **0 - 5 = L** *Record the rating on the first page*

R 2.0 Does the landscape have the potential to support the water quality function at the site?	
R 2.1 Is the unit within an incorporated city or within its UGA? Yes = 2 No = 0	
R. 2.2 Does the contributing basin include a UGA or incorporated area? Yes = 1 No = 0	
R 2.3 Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? Yes = 1 No = 0	
R 2.4 Is more than 10% of the area within 150 ft of the wetland unit in agricultural, pasture, golf courses, residential, commercial, or urban? Yes = 1 No = 0	
R 2.5 Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1 – R 2.4? Source______________________ Yes = 1 No = 0	
Total for R 2 Add the points in the boxes above	

Rating of Landscape Potential **If score is:** **3 – 6 = H** **1 or 2 = M** **0 = L** *Record the rating on the first page*

R 3.0 Is the water quality improvement provided by the site valuable to society?	
R 3.1 Is the unit along a stream or river that is on the 303 d list or on a tributary that drains to one? Yes = 1 No = 0	
R 3.2 Does the river on stream have TMDL limits for nutrients, toxics, or pathogens? Yes = 1 No = 0	
R 3. Has the site been identified in a watershed or local plan as important for maintaining water quality? (*answer YES if there is a TMDL for the drainage in which unit is found*) Yes = 2 No = 0	
Total for R 3 Add the points in the boxes above	

Rating of Value: **If score is:** **2 – 4 = H** **1 = M** **0 = L** *Record the rating on the first page*

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion	Points (only 1 score per box)
R 4.0 Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	
R 4.1 Characteristics of the overbank storage the unit provides: *Provide aerial photo showing average widths* *Estimate the average width of the wetland unit perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of unit)/(average width of stream between banks).* If the ratio is more than 2 points = 10 If the ratio is between 1 – 2 points = 8 If the ratio is ½ - <1 points = 4 If the ratio is ¼ - < ½ points = 2 If the ratio is < ¼ points = 1	Figure ___
R 4.2 Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as "forest or shrub". Choose the points appropriate for the best description.* (polygons need to have >90% cover at person height NOT Cowardin classes): *Provide photo or map showing polygons of different plants types* Forest or shrub for more than 2/3 the area of the wetland. points = 6 Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area points = 4 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 2 Plants do not meet above criteria points = 0	Figure ___
Total for R 5 Add the points in the boxes above	

Rating of Site Potential **If score is:** **12 – 16 = H** **6 - 11 = M** **0 - 5 = L**
Record the rating on the first page

R 5.0 Does the landscape have the potential to support the hydrologic functions at the site?	
R5.1 Is the stream/river adjacent to the unit downcut? Yes = 0 No = 1	
R 5.2 Does the upgradient watershed include a UGA or incorporated area? Yes = 1 No = 0	
R 5.3 Is The upgradient stream or river controlled by dams? Yes = 0 No = 1	
Total for R 5 Add the points in the boxes above	

Rating of Landscape Potential **If score is:** **3 = H** **1 or 2 = M** **0 = L**
Record the rating on the first page

R 6.0 Are the hydrologic functions provided by the site valuable to society?	
R 6.1 Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* The sub-basin immediately down-gradient of site has surface flooding problems that results in $$ loss or loss of natural resources points = 2 Surface flooding problems are in a basin further down-gradient points = 1 No flooding problems anywhere downstream points = 0	
R 6.2 Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	
Total for R 6 Add the points in the boxes above	

Rating of Value **If score is** **2 – 4 = H** **1 = M** **0 = L**
Record the rating on the first page

Attach Figures to field form after this page.

LAKE-FRINGE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality.	Points (only 1 score per box)
L 1.0 Does the wetland unit have the potential to improve water quality?	
L 1.1 Average width of plants along the lakeshore *(use polygons of Cowardin classes)*: *Provide map of Cowardin classes with widths marked* Plants are more than 33ft (10m) — points = 6 Plants are more than 16 (5m) wide and <33ft — points = 3 Plants are more than 6ft (2m) wide and <16 ft — points = 1 Plants are less than 6 ft wide — points = 0	Figure ___
L 1.2 Characteristics of the plants in the wetland: *Choose the appropriate description that results in the highest points, and do not include any open water in your estimate of coverage. The herbaceous plants can be either the dominant form or as an understory in a shrub or forest community.* These are not Cowardin classes. Area of Cover is total cover in the unit, but it can be in patches. NOTE: Herbaceous does not include aquatic bed. *Provide map with polygons of different plants types* Cover of herbaceous plants is >90% of the vegetated area — points = 6 Cover of herbaceous plants is >2/3 of the vegetated area — points = 4 Cover of herbaceous plants is >1/3 of the vegetated area — points = 3 Other plants that are not aquatic bed > 2/3 unit — points = 3 Other plants that are not aquatic bed in > 1/3 vegetated area — points = 1 Aquatic bed plants and open water cover > 2/3 of the unit — points = 0	Figure ___
Total for L 1 — Add the points in the boxes above	

Rating of Site Potential **If score is:** **8 - 12 = H** **4 – 7 = M** **0 - 3 = L**
Record the rating on the first page

2. Does the landscape have the potential to support the water quality function at the site?	
L2.1 Is the lake used by power boats? Yes = 1 No = 0	
L2.2 Is more than 10% of the area within 150 ft of wetland unit (on the shore side) agricultural, pasture, residential, commercial, or urban? Yes = 1 No = 0	
L2.3 Does the lake have problems with algal blooms or excessive plants? Yes = 1 No = 0	
Total for L 2 — Add the points in the boxes above	

Rating of Landscape Potential **If score is:** **2 or 3 = H** **1 = M** **0 = L**
Record the rating on the first page

L 3.0 Is the water quality improvement provided by the site valuable to society?	
L 3.1 Is the unit on a lake that is on the 303d list? Yes = 1 No = 0 L 3.2 Is the lake in a sub-basin where water quality is an issue? (at least one aquatic resource in the basin is on the 303(d) list) Yes = 1 No = 0	
L 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality? Yes = 2 No = 0	
Total for D 3 — Add the points in the boxes above	

Rating of Value **If score is:** **2 - 4 = H** **1 = M** **0 = L**
Record the rating on the first page

LAKE-FRINGE WETLANDS **Hydrologic Functions** - Indicators that the wetland unit functions to reduce shoreline erosion	Points (only 1 score per box)
L 4.0 Does the wetland unit have the potential to reduce shoreline erosion?	
L 4.1 Distance along shore and average width of Cowardin classes along the lakeshore (**do not** include aquatic bed): *(choose the highest scoring description that matches conditions in the wetland)* *Include aerial photo or map with Cowardin plant classes* > ¾ of distance is shrubs or forest at least 33 ft (10m) wide — points = 6 > ¾ of distance is shrubs or forest at least 6 ft. (2 m) wide — points = 4 > ¼ distance is shrubs or forest at least 33 ft (10m) wide — points = 4 Plants are at least 6 ft (2m) wide (do not include aquatic bed) — points = 2 Plants are less than 6 ft (2m) wide (do not include aquatic bed) — points = 0	Figure__

Rating of Site Potential **If score is:** **6 = M** **0 – 5 = L**

Record the rating on the first page

L 5.0 Does the landscape have the potential to support hydrologic functions at the site?	
L5.1 Is the lake used by power boats with more than 10 hp? Yes = 1 No = 0	
L5.2 Is the fetch on the water side of the unit at least 1 mile in distance? Yes = 1 No = 0	
Total for L 5 Add the points in the boxes above	

Rating of Landscape Potential **If score is:** **2 = H** **1 = M** **0 = L**

Record the rating on the first page

L 6.0 Are the hydrologic functions provided by the site valuable to society?	
L 6.1 *If more than one resource is present, choose the one with the highest score.* There are human structures or old growth/mature forests within 25 ft of OHWM of the shore in the unit — points = 2 There are nature trails or other paths and recreational activities within 25 ft of OHWM — points = 1 Other resources that could be impacted by erosion — points = 1 There are no resources that can be impacted by erosion along the shores of the unit — points = 0	

Rating of Value **If score is:** **2 = H** **1 = M** **0 = L**

Record the rating on the first page

Attach Figures to field form after this page

SLOPE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
S 1. Does the wetland unit have the potential to improve water quality?	
S 1.1 Characteristics of average slope of unit: *(a 1% slope has a 1 foot vertical drop in elevation for every 100 ft horizontal distance*) Slope is 1% or less points = 3 Slope is > 1% - 2% points = 2 Slope is > 2% - 5% points = 1 Slope is greater than 5% points = 0	
S 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES = 3 points NO = 0 points	
S 1.3 Characteristics of the plants in the wetland that trap sediments and pollutants: Choose the points appropriate for the description that best fits the plants in the wetland. Dense plants means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 inches. *Provide photo or map showing polygons of different plants types* Dense, uncut, herbaceous plants > 90% of the wetland area points = 6 Dense, uncut, herbaceous plants > 1/2 of area points = 3 Dense, woody, plants > ½ of area points = 2 Dense, uncut, herbaceous plants > 1/4 of area points = 1 Does not meet any of the criteria above for plants points = 0	Figure__
Total for S 1 Add the points in the boxes above	

Rating of Site Potential **If score is:** **12 = H** **6 - 11 = M** **0 - 5 = L**
Record the rating on the first page

S 2. 0 Does the landscape have the potential to improve water quality at the site?	
S2.1 IS >10% of the buffer area within 150 ft upslope of wetland unit in agricultural, pasture, residential, commercial, or urban? Yes = 1 No = 0	
S 2.2 Are there other sources of pollutants coming into the wetland that are not listed in questions S 2.1? Yes = 1 No = 0	
Total for S 2 Add the points in the boxes above	

Rating of Landscape Potential **If score is:** **1 – 2 = M** **0 = L**
Record the rating on the first page

S 3.0 Is the water quality improvement provided by the site valuable to society?	
S 3.1 Does the unit discharge directly to a stream, river, or lake that is on the 303d list? Yes = 1 No = 0	
S 3.2 Is the unit in a sub-basin where water quality is an issue? (at least one aquatic resource in the basin is on the 303(d) list)? Yes = 1 No = 0	
S 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality? Yes = 2 No = 0	
Total for D 3 Add the points in the boxes above	

Rating of Value **If score is:** **2 - 4 = H** **1 = M** **0 = L**
Record the rating on the first page

SLOPE WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream erosion	Points (only 1 score per box)
S 4.0 Does the wetland unit have the <u>potential</u> to reduce flooding and stream erosion?	
S 4.1 Characteristics of plants that reduce the velocity of surface flows during storms. Choose the points appropriate for the description that best fit conditions in the wetland. *(Stems of plants should be thick enough (usually > 1/8 in), or dense enough, to remain erect during surface flows)* Dense, uncut, **rigid** plants covers > 90% of the area of the wetland. YES = 1 All other conditions = 0	

<u>Rating of Site Potential</u> **If score is:** **1 = M** **0 = L**

Record the rating on the first page

S 5.0 Does the landscape have the potential to support the hydrologic functions at the site?	
S 5.1 Is more than 25% of the buffer area within 150 ft upslope of wetland unit in agricultural, pasture, residential, commercial, or urban? Yes = 1 No = 0	

<u>Rating of Landscape Potential</u> **If score is:** **1 = M** **0 = L**

Record the rating on the first page

S 6.0 Are the hydrologic functions provided by the site valuable to society?	
S 6.1 Distance to the nearest areas downstream that have flooding problems Immediate Sub-basin down-gradient of site has surface flooding problems that results in $$ loss or loss of natural resources points = 2 Surface flooding problems are in a sub-basin further down-gradient points = 1 No flooding problems anywhere downstream points = 0	
S 6.2 Has the site has been identified as important for flood conveyance in a regional flood control plan? Yes = 2 No = 0	
Total for S 6 Add the points in the boxes above	

<u>Rating of Value</u> **If score is:** **2 - 4 = H** **1 = M** **0 = L**

Record the rating on the first page

Attach Figures to field form after this page

NOTES and FIELD OBSERVATIONS:

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

(only 1 score per box)

H 1. Does the wetland unit have the potential to provide habitat for many species?

H 1.1 Categories of vegetation structure

Check the Cowardin vegetation classes present and categories of emergents. Size threshold for each category is >= ¼ acre or >= 10% of the unit if unit is < 2.5 acres. *Provide map of Cowardin plant classes*

Figure__

____Aquatic bed

____Emergent plants 0-12 in. (0 – 30 cm) high are the highest layer and have > 30% cover

____Emergent plants >12 – 40 in.(>30 – 100cm) high are the highest layer with >30% cover

____Emergent plants > 40 in.(> 100cm) high are the highest layer with >30% cover

____Scrub/shrub (areas where shrubs have >30% cover)

____Forested (areas where trees have >30% cover)

4-6 checks	points = 3
3 checks	points = 2
2 checks	points = 1
1 check	points = 0

H 1.2. Is one of the vegetation types "aquatic bed?" YES = 1 point NO = 0 points

H 1.3. Surface Water *Provide map showing areas of open water*

Figure__

H 1.3.1 Does the unit have areas of "open" water (without herbaceous or shrub plants) over at least ¼ acre **OR** 10% of its area during the March to early June **OR** in August to the end of September?

Note: answer YES for Lake-fringe wetlands

YES = 3 points & **go to H 1.4** NO = go to H 1.3.2

H 1.3.2 Does the unit have an intermittent or permanent, and unvegetate,d stream within its boundaries, or along one side, over at least ¼ acre or 10% of its area, (*answer yes only if H 1.3.1 is NO*)?

YES = 3 points NO = 0 points

H 1.4. Richness of Plant Species

Count the number of plant species in the wetland that cover at least 10 ft^2. (*different patches of the same species can be combined to meet the size threshold*) *You do not have to name the species.*

Do not include Eurasean Milfoil, reed canarygrass, purple loosestrife, Russian Olive, Phragmites, Canadian Thistle, Yellow-flag Iris, and Salt Cedar (Tamarisk)

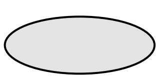
# of species ____ Scoring: > 9 species = 2 points 4-9 species = 1 point < 4 species = 0 points

H 1.5. Interspersion of habitats

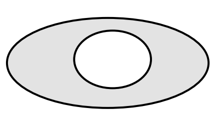
Figure__

Decide from the diagrams below whether interspersion between types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, medium, low, or none.

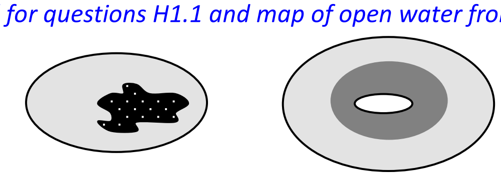
Use map of Cowardin plant classes prepared for questions H1.1 and map of open water from H1.3



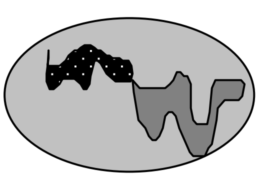
None = 0 points



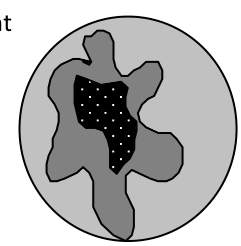
Low = 1 point



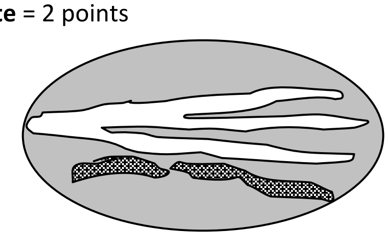
Moderate = 2 points



High = 3 points



High = 3 points



riparian braided channels with 2 classes = High

NOTE: If you have four or more classes or three plants classes and open water the rating is always "high".

H 1.6. Special Habitat Features: *Check the habitat features that are present in the wetland unit. The number of checks is the score.* ____Loose rocks larger than 4" **or** large, downed, woody debris (>4in. diameter) within the area of surface ponding or in stream. ____Cattails or bulrushes are present within the unit. ____Standing snags (diameter at the bottom > 4 inches) in the wetland unit or within 30 m (100ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (>45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)* *Maximum score possible = 6*	
H 1. TOTAL Score - Add the points in the boxes above	

Rating of Site Potential **If score is:** **12 – 16 = H** **6 - 11 = M** **0 - 5 = L**

Record the rating on the first page

H 2.0 . Does the landscape have the potential to support habitat at the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland unit). *Calculate:* % undisturbed habitat _____ + [(% moderate and low intensity land uses)/2] ____ =______% *Provide map of land use within 1 km of unit edge* If total accessible habitat is: > 1/3 (33.3%) of 1km circle (~100 hectares) points = 3 20 - 33% of 1km circle points = 2 10- 19% of 1km circle points = 1 <10% of 1km circle points = 0	Figure__
H2.2 Undisturbed habitat in 1km circle around unit. If: Undisturbed habitat > 50% of circle points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of circle points = 0	
H2.3 Land use intensity in 1 km circle. If: > 50% of circle is high intensity land use points = (- 2) Does not meet criterion above points = 0	
Total for H 2 Add the points in the boxes above	

Rating of Landscape Potential **If score is:** **4- 6 = H** **1-3 = M** **< 1 = L**

Record the rating on the first page

H 3.0 Is the Habitat provided by the site valuable to society?	
H3.1Does the site provides habitat for species valued in laws, regulations or policies? *(choose the highest score)* Site meets ANY of the following criteria: points = 2 __It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) __It is a "priority area" for an individual WDFW species __It is a Natural Heritage Site as determined by the Department of Natural Resources __It has 3 or more priority habitats within 100m (see Appendix B) __It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100m (see next page) points = 1 Site does not meet any of the criteria above points = 0	

Rating of Value **If score is:** **2 = H** **1 = M** **0 = L**

Record the rating on the first page

Attach Figures to field form after this page

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland unit meets the attributes described below and circle the appropriate Category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All units should also be characterized based on their functions.

Wetland Type *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	Category
SC 1.0 Vernal pools Is the wetland unit **less than 4000 ft^2**, and does it meet at least **two** of the following criteria? — Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input — Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *NOTE: If you find perennial, "obligate", wetland plants the wetland is probably NOT a vernal pool* — The soil in the wetland are shallow (<1ft deep (30 cm)) and is underlain by an impermeable layer such as basalt or clay. — Surface water is present for less than 120 days during the "wet" season. YES = Go to SC 1.1 NO - *not a vernal pool* SC 1.1 Is the vernal pool relatively undisturbed in February and March? YES = Go to SC 1.2 NO – *not a vernal pool with special characteristics*	
SC 1.2 Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 miles (other wetlands, rivers, lakes etc.)? YES = Category II NO = Category III	**Cat. II** **Cat. III**
SC 2.0 Alkali wetlands Does the wetland unit meets **one** of the following two criteria? — The wetland has a conductivity > 3.0 mS/cm. — The wetland has a conductivity between 2.0 - 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 2 for list of plants found in alkali systems). — If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meets two of the following three sub-criteria? — Salt encrustations around more than 80% of the edge of the wetland — More than ¾ of the plant cover consists of species listed on Table 2 — A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. **YES = Category I** NO – *not an alkali wetland*	**Cat. I**
SC 3.0 Wetlands with High Conservation Value (WHCV)	

SC 2.1 Has the Department of Natural Resources updated their web site to include the list of Wetlands with High Conservation Value? YES - Go to SC 2.2 NO – Go to SC 2.3 SC 2.2 Is the wetland unit you are rating listed on the DNR database as having a High Conservation Value? YES = Category I NO = not a WHCV SC 2.3 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf YES____ – contact WNHP/DNR and go to SC 2.4 NO = not a WHCV SC 2.4 Has DNR identified the wetland within the S/T/R as a wetland with High Conservation value and is listed on their web site? YES = Category I NO ____not an WHCV	**Cat. I**
SC 4.0 Bogs Does the wetland unit **(or any part of the wetland unit)** meet both the criteria for soils and vegetation in bogs. *Use the key below to identify if the wetland is a bog. If you answer yes you will still need to rate the wetland based on its functions.* SC 4.1. Does the wetland unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to SC 4.3 No - go to SC 4.2 SC 4.2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?? Yes - go to SC 4.3 No - *Is not a bog for rating* SC 4.3. Does the wetland unit have more than 70% cover of mosses at ground level in any area within its boundaries, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Category I bog No - go to Q. 4.4 *NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog.* SC 4.4. Is the unit, or any part of it, forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* **Yes – Category I bog** NO ___ Is not a bog for purpose of rating	**Cat. I**

SC 5.0 Forested Wetlands Does the wetland unit have an area of forest rooted within its boundary that meet **at least one** of the following three criteria? (*Continue only if you have identified a forested class is present in question H 1.1*) — The wetland is within the "100 year" floodplain of a river or stream — aspen (*Populus tremuloides*) are a dominant or co-dominant of the "woody" vegetation. (*Dominants means it represents at least 50% of the cover of woody species, co-dominant means it represents at least 20% of the total cover of woody species*) — There is at least ¼ acre of trees (even in wetlands smaller than 2.5 acres) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW *(see definitions in question H3.1)* YES = go to SC 5.1 NO –*not a forested wetland with special characteristics*	
SC 5.1 Does the wetland unit have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees Slow growing trees are: western red cedar (*Thuja plicata*), Alaska yellow cedar (*Chamaecyparis nootkatensis*), pine spp. mostly "white" pine (*Pinus monticola*), western hemlock (*Tsuga heterophylla*), Englemann spruce (*Picea engelmannii*). YES = Category I NO = go to SC 5.2 SC 5.2 Does the unit have areas where aspen (*Populus tremuloides*) are a dominant or co-dominant species? YES = Category I NO = go to SC 5.3 SC 5.3 Does the wetland unit have areas with a forest canopy where more than 50% of the tree species (by cover) are fast growing species. Fast growing species are: Alders – red (*Alnus rubra*), thin-leaf (*A. tenuifolia*) Cottonwoods – narrow-leaf (*Populus angustifolia*), black (*P. balsamifera*) Willows- peach-leaf (*Salix amygdaloides*), Sitka (*S. sitchensis*), Pacific (*S. lasiandra*), Aspen - *(Populus tremuloides*), Water Birch (*Betula occidentalis*) YES = Category II NO = go to SC 5.5 SC 5.4 Is the forested component of the wetland within the "100 year floodplain" of a river or stream? YES = Category II	 **Cat. I** **Cat. I** **Cat. II** **Cat. II**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories.* If you answered NO for all types enter "Not Applicable" on p.1	

WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf)

Count how many of the following priority habitats are within 330 ft (100m) of the wetland unit? *NOTE: This question is independent of the land use between the wetland unit and the priority habitat.*

____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre).

____**Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report p. 152*).

____**Old-growth/Mature forests:** Old-growth east of Cascade crest: Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 25 trees/ha (10 trees/acre) that are > 53 cm (21 in) dbh, and 2.5-7.5 snags/ha (1 – 3 snags/acre) that are > 30-35 cm (12-14 in) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests: Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west and 80 - 160 years old east of the Cascade crest.

____**Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

____**Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

____**Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

____**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

____**Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft.

____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

____**Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long.

____**Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

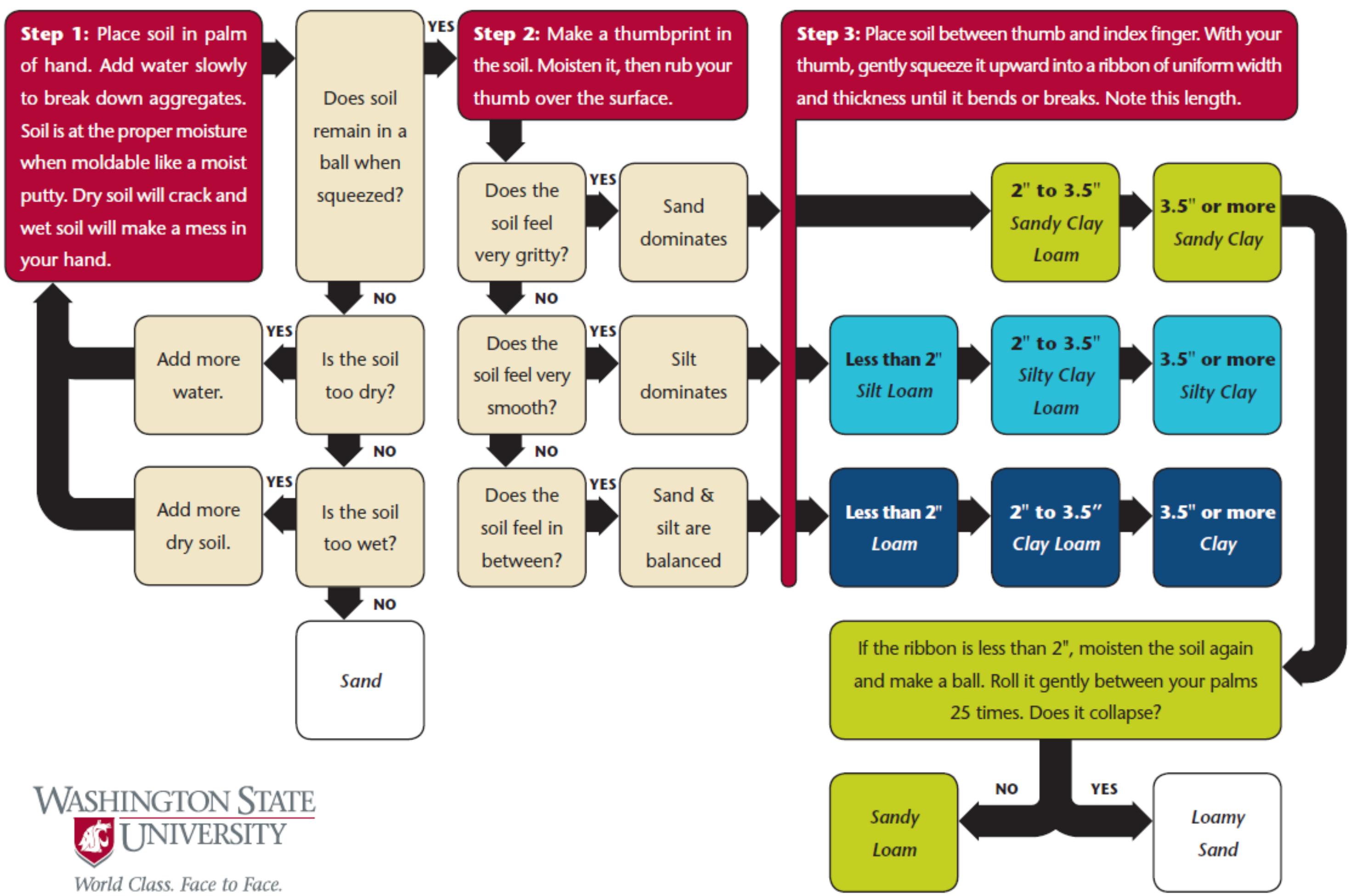
____**Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch Wheatgrass (Pseudoroegneria spicata) is often the prevailing cover component along with Idaho Fescue (Festuca idahoensis), Sandberg Bluegrass (Poa secunda), Rough Fescue (F. campestris), or needlegrass (Achnatherum spp.).

____ **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Appendix B. Estimating Soil Texture

Estimating Soil Texture



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Appendix C

Modeling Functions and Values in This Rapid Method

The Structure of the Method

Rapid methods for analyzing the environment often use data that are both qualitative and quantitative. The analyses may also involve numeric models that in themselves represent qualitative, multi-criteria, decision tools (Hruby 1999). As a result, generating a single score or index for a wetland function requires algorithms (rules that are similar to equations), for combining different characteristics that may not be mathematically compatible. Qualitative data and quantitative data both have to be transformed into ordinal numbers so they can be combined. In the method described here, wetland functions are first scored using ordinal numbers based on three separate aspects of a function (Site Potential, Landscape Potential, and Value). Each aspect is then rated as [H]igh, [M]edium, and [L]ow based on the sum of the ordinal numbers. The ratings are combined using a decision matrix that assigns final scores to each function (see first page of the field form in Appendix A).

The three aspects of functions used to rate them are: 1) the potential of the site to provide each of function, 2) the potential the landscape has to maintain the function at the site scale, and 3) the value each function may have for society at that location. Each aspect of a function is scored, but the score is transformed to a qualitative rating of high, medium, or low. The rating of each aspect is then given equal weight in the final score for that function.

The questions and scoring of the "site potential" used in this method are the same as the "Potential" used in the Washington State Wetland Rating System for Eastern Washington (Ecology publication #04-06-15). The "opportunity" score from the wetland rating system, however, is not used. Rather, the information once provided by the opportunity score is expanded into two categories. Functions are rated based on their "landscape potential" and the "values" instead of opportunity. These changes provide better information to meet the objectives of this method.

The numeric models used to characterize functions in rapid methods do not model actual environmental processes but rather are multi-criteria decision models where each indicator represents a decision criterion to describe the level of function (Hruby 1999).

Wetland Functions and Their Indicators

The functions provided by wetlands derive from the interactions among different components of the ecosystem and the landscape. These interactions are called *environmental processes*. Processes are dynamic and can occur at all geographic scales. Thus the functions performed by a wetland can be influenced by events occurring within the wetland unit as well as in the watershed. For example, the river adjacent to a wetland may be deepened (downcut) as a result of increased runoff from up-gradient development. This changes the effectiveness of the wetland at storing overbank flood waters (a hydrologic function).

Any factor that changes how well, or how much, a function is performed by a wetland can be considered a "control" of that function. Another term often used in the scientific literature is *driver*. The drivers of functions in wetlands determine how well the functions are performed. An event that affects a driver is called a *disturbance* by ecologists (Dale and others. 2000). The type, intensity, and duration of disturbances can significantly change environmental processes (Dale and others 2000), and thereby wetland functions.

Climate, geology, and the topography are major processes in a watershed that control how water, sediment, and nutrients move. These processes, along with factors that occur within the boundary of a wetland, control the functions performed by the wetland. If human activities change these processes in a watershed then the functions in a wetland will also change (Sheldon and others 2005). Any rating of functions at a site, therefore, also requires information about the watershed in which it lies.

The ecological functions that provide value to society fall into three major groups: 1) hydrologic [e.g. flood storage], 2) improving water quality, and 3) habitat and maintaining food webs. Each of these can be sub-divided into separate functions. For example, hydrologic functions may include flood storage, velocity reduction, groundwater recharge, and de-synchronization of flood-flows (Hruby 2001). The Rating System characterizes only the three major groups of functions to meet the need for being rapid.

In "rapid" methods such as this one, functions and values are analyzed by answering a series of questions that note the presence, or make simple measurements, of environmental indicators. Indicators are easily observable characteristics that are correlated with quantitative or qualitative observations of the performance of a function (Hruby 1999, NRC 2002). Most indicators represent relatively stable characteristics that describe the structure of the ecosystem or its physical or geologic properties (Brinson and others 1995). Indicators, unfortunately, cannot reflect actual rates at which functions are performed because rates can change in time. Our knowledge however, "is sufficiently well developed such that indicators can be used as shortcuts to judge whether functions are occurring at appropriate levels" (NRC 2002, p. 120).

The Values of Functions

The three basic functions rated in this method are all considered to be valuable and need to be replaced if lost. The wetland functions that are addressed in the tools developed by

Ecology for Washington State are defined as the ecological processes that provide services/values to society (Hruby 2001). This is a subset of the possible functions wetlands perform. There are many ecological processes that are not usually considered of any significant value to society (e.g. providing habitat for Nematode worms or mosquitoes; taking up nitrogen from surface waters but then releasing back into the surface water when plants decompose).

Since all three functions are considered to be valuable, the approach used in the "value" sub-unit of the method is to rate the values relative to other wetlands in the landscape. The value part of the score is intended to highlight those wetlands where a function is more valuable to society because of factors in the surrounding landscape. For example, flood storage is more valuable in a watershed where flooding causes major damage than in a watershed without flooding. A wetland that is moderately effective at cleaning up pollutants is assigned a higher value if it is in a watershed that already does not meet water quality standards. In this case, the wetland removes pollutants that would otherwise further degrade water quality. A wetland that provides habitat for Threatened and Endangered Species (T/E species) is more valuable than one that provides habitat for other wetland dependent species since society has passed laws that give preference and added value to T/E species.

Calibrating the Indicators

An initial list of indicators identified from a review of the literature was used to develop protocols and data sheets for sampling reference sites. Indicators were divided into three types:

- Those present at the site itself (indicators of site potential).
- Those found in the surrounding landscape (indicators of landscape potential).
- Those that indicate the function performed is providing some value to society (indicators of value).

Data on each indicator were collected at a minimum of 20 sites for each Hydrogeomorphic Class of wetlands in eastern Washington. Sites were chosen to represent the widest possible range of environmental conditions found in the class. Data on some of the indicators could be collected from aerial color photographs, but all of this information was verified by at least one visit to each site.

The calibration process involved the following steps:

1. Deletion of indicators that could not be readily estimated from aerial photographs or during a brief field visit (< 3hrs). This represents a compromise between the science and the needs of the user. Some important indicators of function could not be used because they could not be measured within the time allocated, or could not be collected with reproducible results by the majority of environmental scientists. For example, the organic or clay contents of wetland soils are an important indicator of chemical processes that improve water quality (Rosenblatt and others 2001, NRC 2002), but these cannot be readily measured in the field. The indicators of organic

and clay soils therefore had to be simplified. Users are asked to determine if organic soils or clay soils are present in the unit based on the mapping done by the National Resource Conservation Service (NRCS). If it is not mapped, users are asked to perform one simple field test to determine if the soil meets the NRCS criteria. If the organic or clay content does not meet the percent needed to classify it as an organic soil or clay soil, the unit is considered not to have the indicator. In this case, the reproducibility of the data collection among different users was judged to be more important than achieving additional scientific rigor by scaling the amount of organic or clay material in the soil.

2. The indicators for Site Potential were calibrated to the data collected for the Washington State Function Assessment Methods (Ecology Publications #00-06-48, #00-06-47) and as described in Hruby 1999 and Hruby and others 2000. This involved developing an independent, and qualitative, assessment of how well a wetland performs a function and then calibrating the scores of the indicators to get the best fit to the independent assessment. The calibration involved alternatively changing the scoring for each indicator and the scaling within an indicator to get the best fit to the independent assessment.

3. Indicators for the Landscape Potential were calibrated by reviewing the literature on wetland indicators, and determining what aspect of the indicators represent the high and low levels of functioning. The data for each indicator collected at the reference sites are then sorted based on the values representing the highest level of function to the lowest in the reference wetlands. This ranking of data generates a distribution that is used to help determine where the breaks in the scoring should occur. The final decisions on scoring, however, were developed from graphical analyses of the distribution of scores of all sites. The goal was to ensure a relatively even distribution of ratings among the calibration sites. Although statistical methods are being developed for multi-criteria decision models (e.g. Ferguson and others 2007, Fuller and others 2008), these methods are not yet applicable to a categorization that incorporates values, special characteristics, as well as quantitative indicators.

Further details on the approach used to calibrate the rapid assessment methods developed by Ecology can be found in Hruby and others (1999), Hruby (2001), and Hruby (2009).