WASHINGTON STATE WETLAND RATING SYSTEM

for

WESTERN WASHINGTON

Update – 2014

<u>DRAFT FOR REVIEW</u>

Ecology Publication # 14-06-007

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Washington State Department of Ecology

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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/1406007.html

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This publication should be cited as: Hruby, T. (2014) Washington State Wetland Rating System for Western Washington: Update – 2014 Draft for Review. Department of Ecology Publication #14-06-007.

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PREFACE

This document is an update of the "Washington State Wetland Rating System for Western 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 Eastern Washington – Update" is also available for review (Ecology publication #14-06-002).

Changes made to the 2004 Rating System in this update

Chapters 2-4 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 #10-06-011). 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 122 wetlands to calibrate the rating system in 2004. Data from 111 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 111 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. The number of Category I and IV wetlands are about the same (see table below) but the number of Category II and III wetlands differs. In the 2004 method 47% of the 111 sites were Category II whereas in this update only 40% of the sites are Category II. On the other hand, only 35% of the sites were Category III in 2004 while 44% are Category III in this update. Lowering the score between Category II and III wetlands by one point would have created even a bigger discrepancy in the other direction when using the updated method (58 % of the sites would be Category II and only 26% would be Category III)

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

Category	2004 Rating System	Updated Rating System
I	13	11
II	52	44
III	39	49
IV	7	7

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; or 2) are more sensitive to disturbance than most wetlands; or 3) are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or 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 111 wetlands used to field test the current rating system only 11 (10%) were rated as a Category I.

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

Large Undisturbed Estuarine Wetlands - Relatively undisturbed estuarine wetlands larger than 1 acre are Category I wetlands because they are rare and provide unique natural resources that are considered to be valuable to society. These wetlands need a high level of protection to maintain their functions and the values society derives from them.

Estuaries, the areas where freshwater and salt water mix, are among the most highly productive and complex ecosystems where tremendous quantities of sediments, nutrients and organic matter are exchanged between terrestrial, freshwater and marine communities. This availability of resources benefits an enormous variety of plants and animals. Fish, shellfish and birds and plants are the most visible. However, there is also a huge variety of other life forms in an estuarine wetland: for example, many kinds of diatoms, algae and invertebrates are found there.

Estuarine systems have substantial economic value as well as environmental value. All

Washington State estuaries have been modified to some degree, bearing the brunt of coastal development pressures through filling, drainage, port development and disposal of urban and industrial wastes. The over-harvest of certain commercial species has also modified the natural functioning of estuarine systems. Many Puget Sound estuaries such as the Duwamish, Puyallup, Snohomish and Skagit have been extensively modified. Up to 99% of the wetlands in some estuaries in the state have been lost.

Estuaries, of which estuarine wetlands are a part, are a "priority habitat" as defined by the state department of Fish and Wildlife. Estuaries have a high fish and wildlife density and species richness, important breeding habitat, important fish and wildlife seasonal ranges and movement corridors, limited availability, and high vulnerability to alteration of their habitat (Washington State Department of Fish and Wildlife (WDFW), http://www.wa.gov/wdfw/hab/phslist.htm, accessed October 15, 2003).

Estuarine wetlands are also put into a separate category because the indicators used to characterize how well a freshwater wetland functions cannot be used for estuarine wetlands. No rapid methods have been developed to date to characterize how well estuarine wetlands function in the state at the time of this update.

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 western 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 Region (WDFW 2013).

By categorizing these wetlands 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).

Wetlands with Mature and Old-growth Forests – Mature and old-growth forested wetlands over 1 acre in size are "rated" as Category I because these wetlands cannot be easily replaced through compensatory mitigation. A mature forest 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 et al. 2005). Placing mature and old-growth forests into a separate category makes it easier to address the temporal losses that accrue when forested wetlands are impacted and mitigation is required.

Wetlands in Coastal Lagoons – Coastal lagoons are shallow bodies of water, like a pond, partly or completely separated from the sea by a barrier beach. They may, or may not, be connected to the sea by an inlet, but they all receive periodic influxes of salt water. This can be either through storm surges overtopping the barrier beach, or by flow through the porous sediments of the beach.

Relatively undisturbed wetlands in coastal lagoons that are larger than 1/10 acre are placed into Category I. They probably cannot be reproduced through compensatory mitigation (we have no record of restoration or creation of coastal lagoons in Washington), and because they are relatively rare in the landscape. No information was found on any attempts to create or restore coastal lagoons in Washington that would suggest this type of compensatory mitigation is possible. Any impacts to lagoons will, therefore, probably result in a net loss of their functions and values.

In addition, coastal lagoons and their associated wetlands are proving to be very important habitat for salmonids. Unpublished reports of ongoing research in the Puget Sound (Hirschi et al. 2003, Beamer et al. 2003) suggests coastal lagoons are heavily used by juvenile salmonids.

Interdunal Wetlands - Interdunal wetlands form in the "deflation plains" and "swales" that are geomorphic features in areas of coastal dunes. These dune forms are the result of the interaction between sand, wind, water and plants. The dune system immediately behind the ocean beach (the primary dune system) is very dynamic and can change from storm to storm (Wiedemann 1984). For the purpose of rating, any wetlands that are located west of the upland boundary mapped in 1889 (western boundary of upland ownership) are considered to be interdunal.

The wetlands that form in the interdunal ecosystem are not well understood and most indicators used to rate the hydrologic and water quality functions of depressional wetlands are not applicable. As a result, interdunal wetlands cannot be rated using the three-function approach used. However, the wetland resource is important but small part of the total dune system (Wiedemann 1984) and needs to be protected.

Interdunal wetlands that are larger and that are also rich in habitat structure are Category I because they provide critical habitat in this ecosystem (Wiedemann 1984). Larger wetlands or those found in a mosaic of wetlands and dunes are Category II because they also probably provide important habitats in this ecosystem, but we know little about them. Until we know more about how interdunal wetlands function we need to provide adequate protection for this resource.

<u>Wetlands That Perform Functions at High Levels</u> - Wetlands scoring 23 points or more (out of 27) on the questions related to 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 23 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 111 wetlands used to calibrate the rating system in western Washington, only 11 (10%) scored 23 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 western Washington include:

<u>Smaller Estuarine Wetlands</u> - Any estuarine wetland smaller than an acre, or those that are disturbed and larger than 1 acre are category II wetlands. Although disturbed, these wetlands still provide unique natural resources that are considered to be valuable to society. Furthermore, the questions used to characterize how well a wetland functions cannot be used for estuarine wetlands.

<u>Wetlands That Perform Functions Well</u> - Wetlands scoring between 20 - 22 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.

<u>Interdunal Wetlands greater than 1 acre or those in a mosaic</u> -

The wetlands that form in the interdunal ecosystem are not well understood and most indicators used to rate the hydrologic and water quality functions of depressional wetlands are not applicable. As a result, interdunal wetlands cannot be rated using the three-function approach used. However, these wetlands are an important but small part of the total dune system (Wiedemann 1984) and needs to be protected.

Larger wetlands or those found in a mosaic of wetlands and dunes are Category II because they also probably provide important habitat in this ecosystem. Since we know so little about them the precautionary principle is chosen to protect them.

2.3 CATEGORY III

Category III wetlands are 1) wetlands with a moderate level of functions (scores between 16 -19 points) and 2) interdunal wetlands between 0.1 and 1 acre in size. 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 Wetlands 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 D 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 the functions 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 number) 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 yellow rectangle, but the unit for rating is the entire wetland (red 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

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 a s 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.

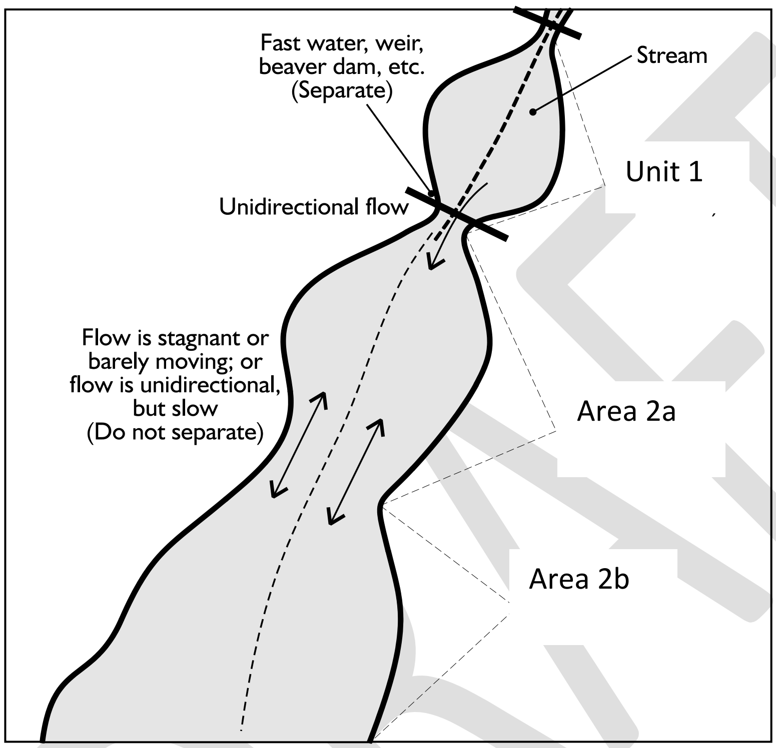


Figure 3: Determining depressional wetland units along a stream corridor with constrictions. Areas 2a and 2b should be rated as one unit.

4.2 Wetlands Along the Banks of Streams or rivers

In western 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) plants disappear and are replaced with unvegetated bars or banks for at least 50 ft along the stream, and 2) the wetland plant community is less than 30 ft wide along the shore for at least 100 feet.

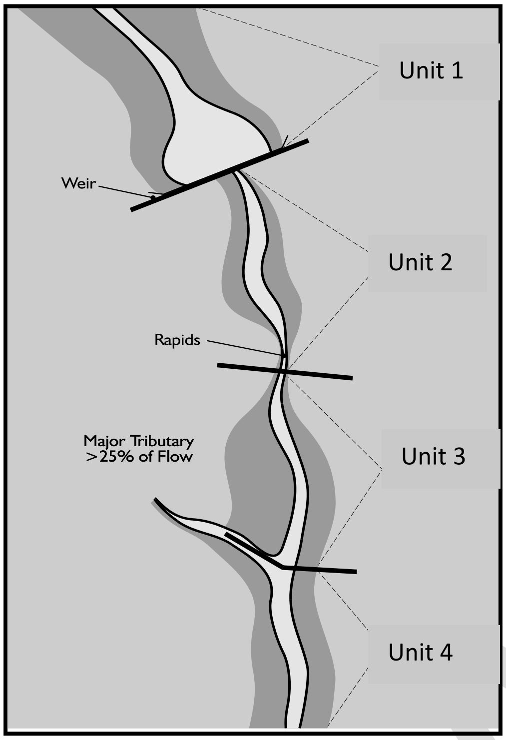


Figure 4: Determining wetland units in a riverine system based on changes in water regime.

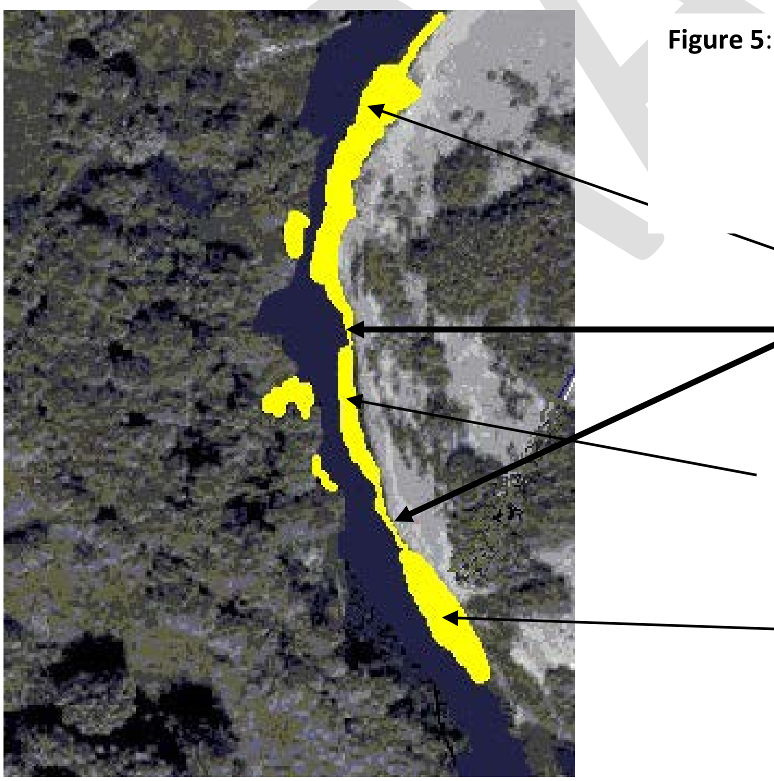


Figure 5: Determining wetland units in a riverine setting based on reduced plant cover. In this case the river is wider than 50ft. and the vegetated wetlands on either side are rated separately.

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:

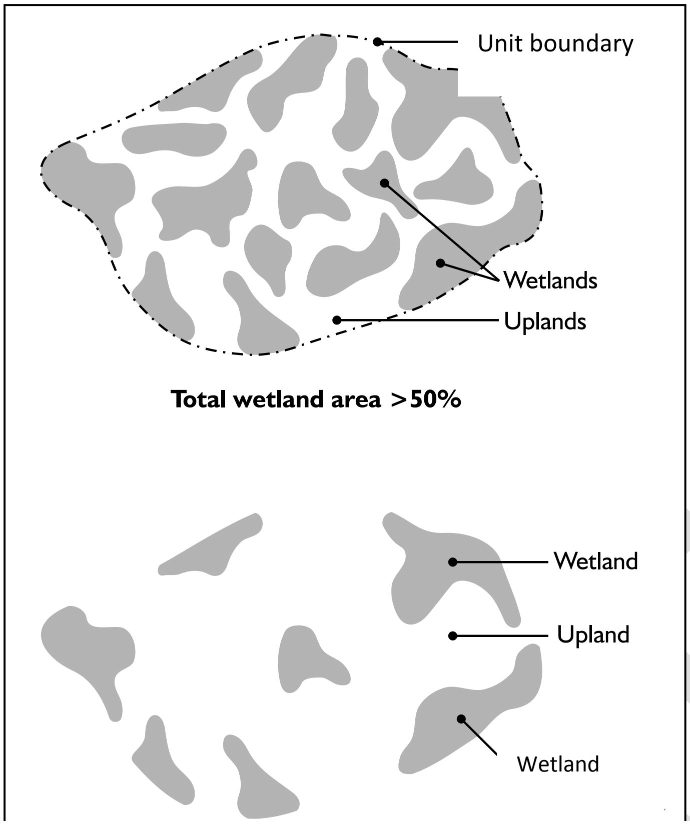
- Wetland on one side only — If the wetland unit is contiguous to, but only on one side of, a river or stream, **do not** include the river as a characteristic of the wetland unit for rating.
- Wetland on both sides of a wide stream or river — If the river or stream has an unvegetated channel that is more than 50 ft (15 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 50 ft (15 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** 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).



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.

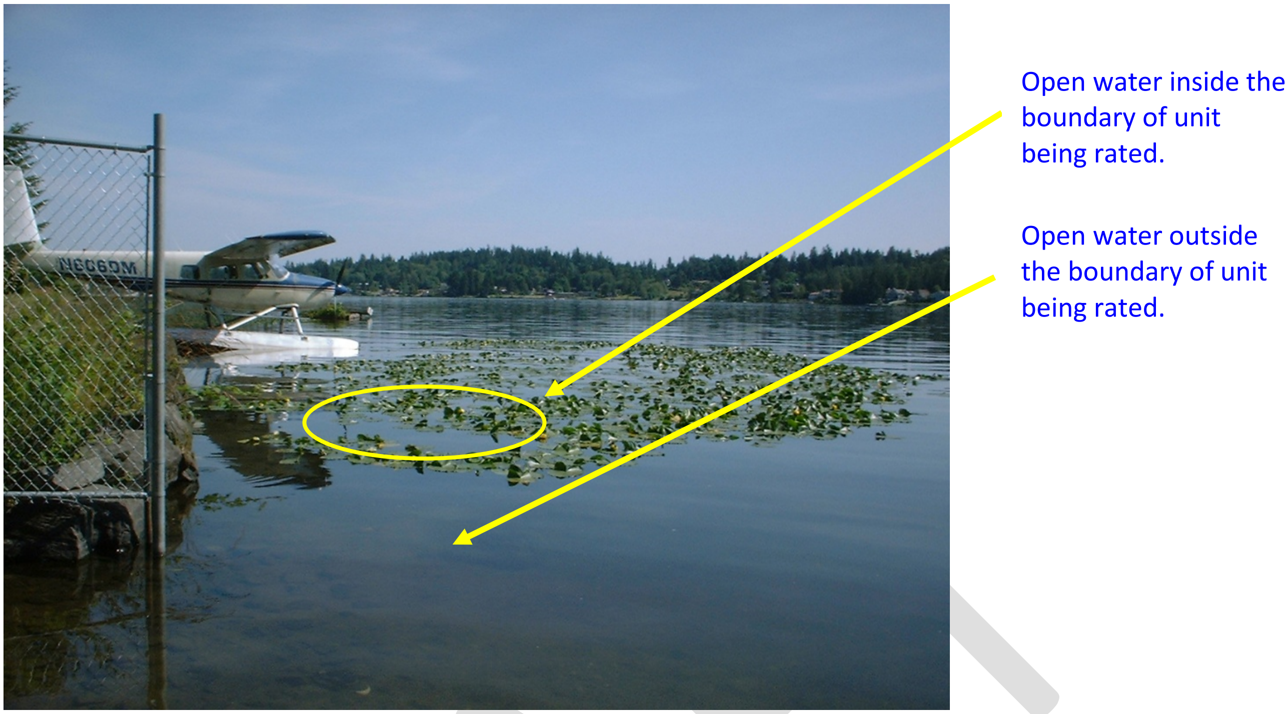


Figure 7: Lake-fringe wetland showing open water that is included within the wetland boundary

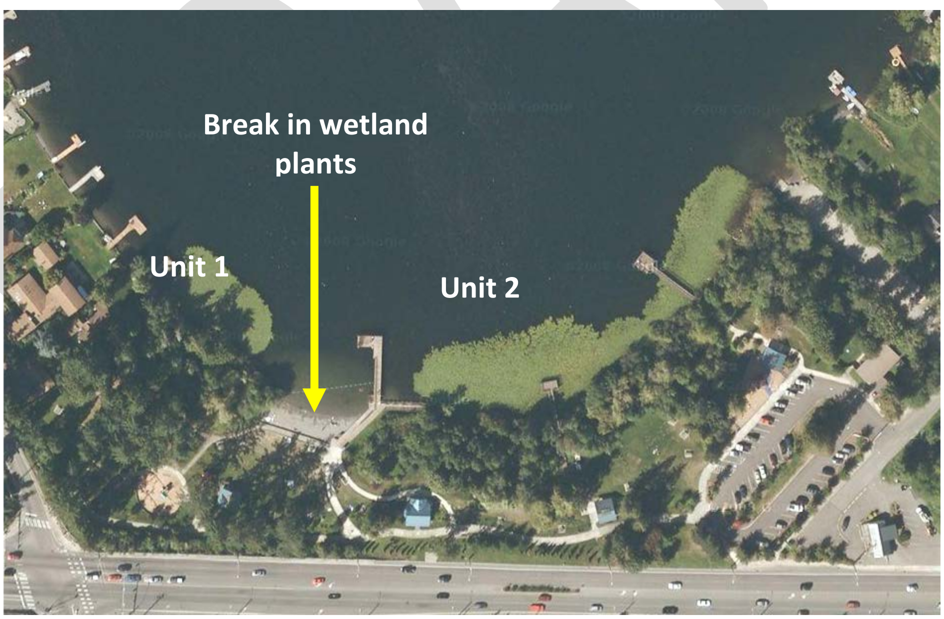


Figure 8: Absence of wetland plants along the shore of a lake that separates the wetlands into two units for rating.

Another common situation found in western Washington is a lake-fringe wetland that is contiguous with a large wetland that extends far from the edge of the lake (Figure 9).

These wetlands are usually classified as depressional or riverine. The entire unit of riverine and lake-fringe wetlands should be rated as one unit.

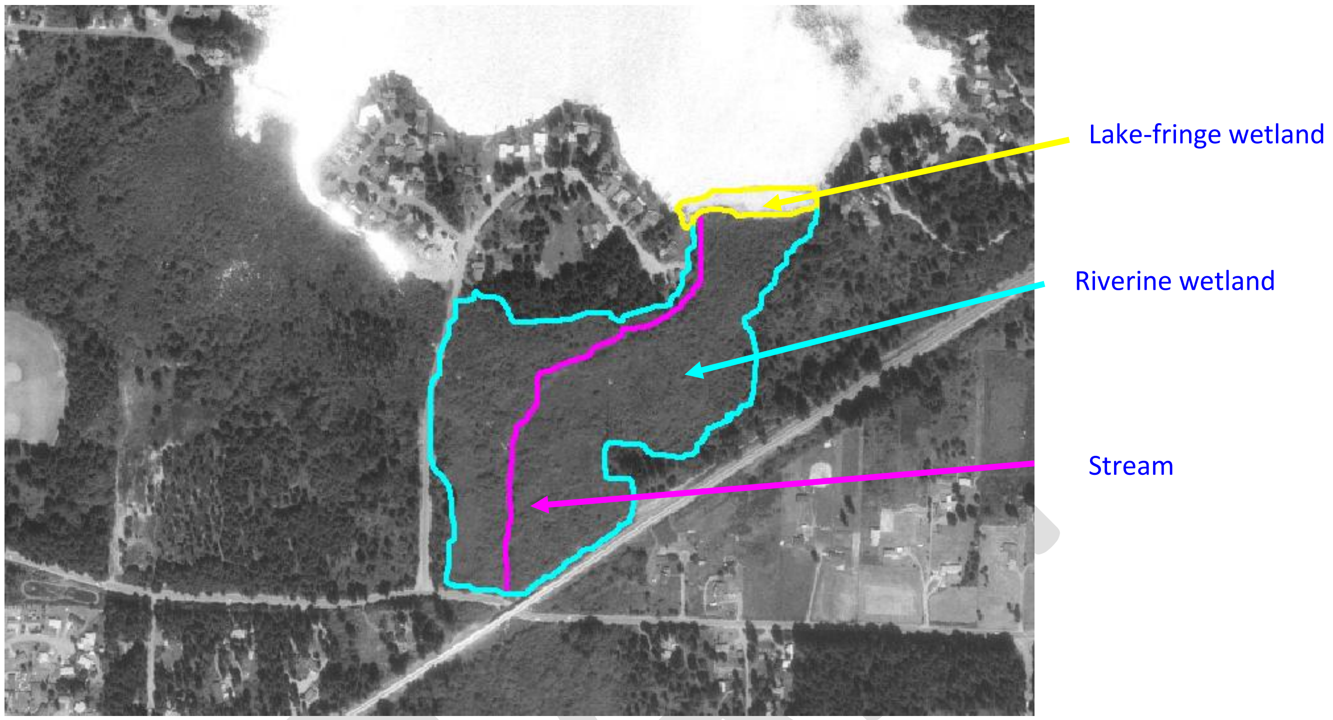


Figure 9: Aerial photograph of a lake-fringe wetland connected to a riverine wetland without any topographic or hydrologic breaks between them. Both types of wetlands are rated as one using the questions for Riverine wetlands.

Sometimes a strip of open water is found between the wetland plants further from shore and those closer to shore. In this situation, the open water is considered a part of one unit that encompasses both the rooted submerged plants offshore and the shore-side plants. The absence of plants in the area of open water may only be temporary, or the submerged plants are present but not visible because they do not grow to the surface. The plants may also be absent due to wave action or physical removal.

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 <u>not</u> be divided into different units if there is a <u>level</u> 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 10 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 10: 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 30 and 69 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.

Dual ratings are acceptable only when a wetland contains a small area of bog or forest, or in certain estuarine cases (see below). **Wetlands that are a Category I Natural Heritage sites Category I coastal lagoons, or Category II interdunal wetlands cannot be split.**

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. Category I Estuarine Wetlands With a Fringe of *Spartina* spp.

A dual rating is also possible when an estuarine wetland that meets the criteria for a Category I estuarine wetland has a fringe along the seaward edge of the invasive *Spartina* spp. The area that has more than 10% cover of *Spartina,* but no other invasive species, meets the criteria for a Category II estuarine wetland. The entire vegetated system can be categorized as an estuarine I/II. The boundary between the two categories is the zone where the cover of *Spartina* spp. becomes 10%. The area of *Spartina* would be rated a

Category II while the relatively undisturbed upper marsh with native species would be a Category I.

4.9 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 11 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 11: 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 - Functions

This chapter provides detailed guidance for answering the questions on the rating forms. The questions are listed in the order they appear on the forms. 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 #04-06-025).

A correctly filled out wetland rating form requires seven 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 tidal-fringe, flats, lake-fringe, slope, riverine, or depressional. The key contains eight questions that need to be answered sequentially. Each question is described below in more detail than found on the key.

Question 1: Tidal Fringe Wetlands

Tidal fringe wetlands are found along the coasts and in river mouths to the extent of tidal influence. The dominant source of water is from the ocean or river. The unifying characteristic of this class is how water moves in the unit. All tidal fringe wetlands have water flows dominated by tidal influences, and water depths are usually controlled by tidal cycles in the adjacent ocean.

This method does not rate the functions and values of estuarine wetlands, but it can be used to rate the functions of freshwater tidal fringe wetlands.

Tidal fringe wetlands, in which the water has a salinity higher than 0.5 parts per thousand, are classified as "Estuarine" and not scored. Tidal fringe wetlands in which the waters are tidal but freshwater (salinities below 0.5 parts per thousand), are scored using the forms for riverine freshwater wetlands.

There are numerous tidal fringe wetlands in the estuaries and tidal sloughs in the Puget Sound region as well as in Willapa Bay and Grays Harbor. The difficulty is in identifying the boundary between fresh and brackish waters. In the absence of local information (e.g., the salt wedge in the Snohomish River extends upstream to the Route 2 bridge), users will have to rely on plants to identify the boundaries between fresh and salt water. Appendix B lists common wetland plants that are tolerant of salt (from Hutchinson 1991). If the dominant plants in the community are those listed as "Tolerant" or "Very Tolerant," it can be assumed that the waters in the slough or river at that point are saline.

Figure 12 shows Edison Slough which has a fringe of *Triglochin* sp. and *Carex lyngbyei* along the edge of the mudflat. On this basis the wetland was classified as "estuarine." If you have the situation presented in Figure 12; a fringe of freshwater plants that is above an area of salt-tolerant plants, you should consider the entire unit as estuarine. See question 8 on the classification key in the field form.

Figure 12: An estuarine slough at low tide with salt tolerant plants along the edges.

Question 2: Flats Wetlands

"Flats" wetlands occur in topographically flat areas that are hydrologically isolated from surrounding groundwater or surface water. The main source of water in these wetlands is precipitation directly on the wetland itself. They receive virtually no groundwater discharge or surface runoff from the surrounding landscape. This characteristic distinguishes them from depressional and slope wetlands. In western Washington such wetlands are very rare. They occur in areas raised above the surrounding landscape and underlain by glacial till. It is highly unlikely that you can find a flats wetland in areas where the rate of evapotranspiration is greater than rainfall, such as eastern Washington.

Wetlands that should be classified as flats may be hard to distinguish from flat depressional wetlands that are fed by groundwater. This need not be a concern however, because both depressional and flats wetlands use the same questions in the Rating Form.

Question 3: Lake-fringe Wetlands

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 next to a vegetated wetland is larger than 20 acres (8 hectares), and more than 6.6 feet deep (2m) over 30% of the open water areas, the wetland is considered to be "lake-fringe." The criterion here is 20 acres of open water without any aquatic plants. The Shoreline Management Act requires 20 acres within Ordinary High Water Mark (OHWM). 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 13: Lake-fringe wetland with an area of aquatic bed plants and a narrow band of wetland shrubs along the shore.

The definition of lakes is based on limnological characteristics and not the criteria used in the Shoreline Management Act. Lakes have different environmental processes than small ponds (e.g., stratification, spring turnover, etc.). In general, these processes occur in western Washington only in systems that have at least 20 acres of open water that is deeper than 2 meters. Figure 13 shows a lake-fringe wetland in Snohomish County with aquatic bed plants and a fringe of wetland shrubs.

Wetlands found along the shores of large reservoirs such as those found behind the dams along the major rivers are also considered to be lake-fringe. Although the area was once a river valley, the wetlands along the shores of the reservoirs function more like lake-fringe wetlands rather than riverine wetlands. The technical teams developing the 2004 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 4: Slope Wetlands

Slope wetlands occur on hill or valley 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 14 shows a slope wetland that formed where the slope of the hillside changed and caused groundwater to come to the surface.

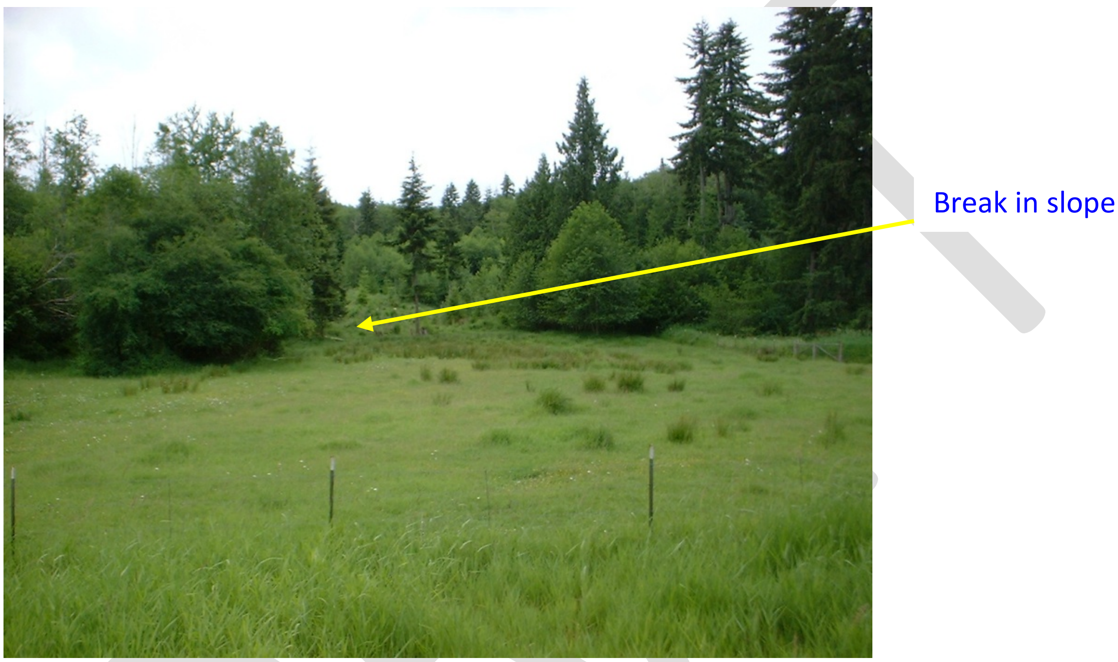


Figure 14: Slope wetland in Lewis County identified by the presence of wetland plants (*Carex* sp. *Juncus* sp.) and hydric soils. Wetland occurs where there is a major break in the slope of the hillside.

Slope wetlands with surface flows can be 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. There is no surface flow coming into the wetland through channels. 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 5: 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 flows in the river or stream. Their proximity to the river facilitates the rapid transfer of floodwaters in and out of the wetland, and the import and export of sediments. The distinguishing characteristic of riverine wetlands in western Washington is that they are flooded by overbank flow from the river at least once every two years. Riverine wetlands, however, may also receive significant amounts of water from other sources such as groundwater and slope discharges.

Wetlands that lie in floodplains but are not frequently flooded 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.

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 inundation by surface or groundwater. In headwaters, the dominant source of water becomes surface runoff or groundwater seepage. However, for the purposes of classification, wetlands that show evidence of frequent overbank flooding, even if from an intermittent stream, are considered riverine even if they receive water from surface flows or groundwater.

Riverine wetlands normally merge with tidal fringe wetlands near the mouths of rivers. The interface occurs where tidal fluctuations become the dominant hydrologic driver (Brinson and others 1995). This interface has been significantly modified in western Washington by diking. Many wetlands that were once freshwater tidal are now either riverine or depressional (depending on the frequency of flooding).

The operative characteristic of riverine wetlands in Washington is that of being "frequently flooded" by overbank flows (Figure 15).

Figure 15: A riverine wetland being inundated by flood waters from North Creek. The creek is in the background. This flooding occurs at least once a year.

In western Washington the technical committees developing wetland methods decided that the frequency of overbank flooding needed to call a wetland riverine is at least once in two years (2 yr. "return" frequency). This characteristic, however, cannot be easily measured in the field and needs to be established from field indicators. The following are some field indicators that can be used to classify a wetland as riverine:

- Scour marks are common in the wetland.
- Recent sediment deposits.
- Plants are bent in one direction or damaged.
- Soils with layered deposits of sediment.
- Flood marks on plants along the edge of the bank at different levels.

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.

Question 6: Depressional Wetlands

Depressional wetlands occur in topographic depressions where the elevation of the 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 is not lake-fringe, or riverine, it can be classified as depressional (Figure 16).

Figure 16: A depressional wetland. Note the surface ponding in the low point of the wetland where the cattails are found.

Question 7: Flat Areas Maintained by High Groundwater

Many wetlands have developed on the outwash plains left by the glaciers. These are maintained by high levels of groundwater in the region and do not easily fit into either the depressional, riverine, or flats class. These wetlands are fairly flat, are often ditched, and do not seem to have an identifiable natural outlet (Figure 17). If they pond water it is usually only because groundwater levels are high in the entire region and the water has nowhere to drain. These wetlands are classified as "depressional" for the purpose of scoring them.

Figure 17: Wetland maintained by high levels of groundwater. It is not in an easily identified topographic depression and has slope wetlands along its upper edge.

Question 8: Wetland Is Hard to Classify

Sometimes it is hard to determine if the wetland unit you are scoring 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 wetlands with multiple hydrogeomorphic classes for the purpose of rating their functions.

HGM classes found within one wetland unit	HGM Class to use 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
Salt Water Tidal fringe and any other class of wetland	Treat as ESTUARINE and do not score. Categorize the wetland based on the Special Characteristics section.

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 western 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 Rating Form identifies the wetland class for which the question is intended:

D = Depressional or 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 Rating 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 Systgem 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 big-leaf maple 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 shrub plants must provide at least 30% cover and be the uppermost layer. Examples of common shrubs in western 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 e 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 and Flats 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 unit note carefully if there are any indications that surface water leaves the wetland and flows further down-gradient. The question is relatively easy to answer if you find a channel.

Figure 18: A small depressional wetland with no outlet.

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

Unit has no surface water outlet - Unit is a depression or "flat depression" (Q. 7 on HGM classification key) with no surface water leaving it. You find no evidence that or a channel or ditch that can carry surface water out of the wetland unit. The wetland lies in a depression where the water never goes above the edge (Figure 18).

Unit has an intermittently flowing, or highly constricted, outlet. This means the unit has water leaving it through a stream or ditch that dries out sometimes, OR a highly constricted permanently flowing outlet. Intermittently flowing means that there is no outflow from the unit at some times during the year. The water levels in the unit fall below the elevation of the outlet. Highly constricted outlets, on the other hand **are permanently flowing** but are small relative to the flow. Marks of flooding or inundation have to be three feet or more above the bottom of the outlet (live storage is ≥ 3 ft) for the outlet to be considered constricted. Note: A depressional wetland with occasional outflow resulting from stormwater runoff from an adjacent developed area is considered to have intermittent flow.

Unit has an unconstricted, or slightly constricted, surface outlet that is permanently flowing. The outlet does not provide much hindrance to flood waters flowing through the wetland. The distance between the low point of the outlet and average height of inundation will be less than three feet. Beaver dams are considered to be unconstricted unless there are indicators that water is backed up at least 3 ft above the top of the dam.

Unit is a "flat" depression (Q. 7 on HGM classification key), whose outlet is a permanently flowing ditch. The bottom of the ditch usually has a lower elevation than the rest of the unit. Answer this question as "YES" if you find no outlet and there are no indicators that the unit ponds more than 6-10 inches of water. Usually, these wetlands have no indicators that they pond. These types of wetlands are often drained by man-made ditches. However, if the ditch is not permanently flowing score the unit as intermittently flowing.

NOTE: If you cannot find an outlet but know the wetland is not completely closed, score it as intermittently flowing.

D 1.2 The soil two 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 on their county soil maps 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 and determine its composition.

To look at the soil: dig a small hole within the wetland 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. Do not sample the soil under areas of permanent ponding. Avoid picking up any of the duff or recent plant material that lies on the surface. Determine if the soil is organic or clay. If you are unfamiliar with the methods for doing this, a key for clay soils is provided in Appendix C.

> **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 a rating.

See the NRCS web page on soils for more descriptions on how to identify soils.

http://soils.usda.gov/technical/manual/contents/chapter3.html (as of July 2013)

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

> **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 or mowed.

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, or unmowed, 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 ½ of the wetland unit is covered; or more than 95% of the wetland unit is covered. These thresholds can usually be estimated visually in small wetlands less than ½ acre in size. Larger wetlands, however, will require you 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 because much of the vertical structure of wetland plants is removed when plants are grazed. The remaining area is then by default the area of persistent plants. Figure 19 shows a depressional wetland in which persistent plants cover between 50% and 95% of the area of the wetland. The remainder is open water.

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, if the unit is smaller than 2.5 acres, or at least 1/4 acre if the unit is 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. If the grazing occurs in summer (because the area is too wet for cows in the winter) but the plants have time to grow again before the flood season, then the unit is ungrazed because the plants will meet the height threshold at the time of flooding. 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." The same question can be asked of seasonal mowing or haying.

Figure 19:
A depressional wetland in which persistent, ungrazed, plants cover is between 50% and 95% of the area of the wetland.

D 1.4 Characteristics of seasonal ponding or inundation.

Rationale for indicator: The area of the wetland that is seasonally ponded is an important characteristic in understanding how well it will remove different forms of nitrogen that cause eutrophication. The highest levels of nitrogen transformation occur in areas of a wetland that undergo a cyclic change between oxic (oxygen present) and anoxic (oxygen absent) conditions. The oxic regime is needed so certain types of bacteria can 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 is seasonally ponded with water. Areas that are seasonally ponded must be inundated for at least 2 consecutive months, but then dry out for part of the year. Because the seasonally ponded area will change from year to year, try to estimate what the average condition might be five years out of 10.

One way to estimate this area is to make a 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 wetland also has permanent surface water you will have to draw this and subtract it when making your estimate (see Figure 20).

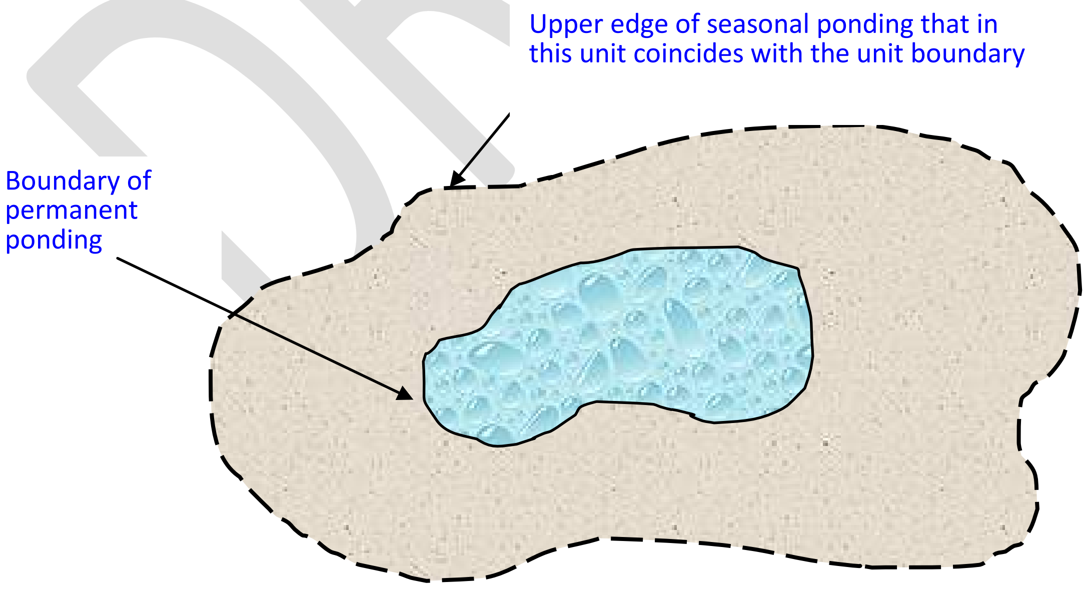


Figure 20: Sketch showing the boundaries of areas that are seasonally ponded and permanently ponded. The answer to question D 1.4 for this wetland is that the area seasonally ponded is more than ½ the total area of the wetland unit.

During the dry season, the boundary of areas ponded for several months (*seasonal ponding*) will have to be estimated by using indicators such as:

- 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 plants lying on wetland surface (grayish or blackish appearance of leaves on the surface).
- Dried algae left on the stems of emergent plants and shrubs and on the wetland surface (Figures 22 and 23).

Figure21: 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.

Figure23: Algae left hanging on plants 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 western 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 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. 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.

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 D 1.1. The difference between D 1.1 and D 4.1, 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 *(estimating "live storage"):*

> **Rationale for indicator**: The amount of water a depressional 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 and others 1994). It is too difficult to estimate the actual amount of water stored for a rapid method such as this one, and we use an estimate of the maximum depth of the "live storage" as a surrogate. This is only an approximation because depressional wetlands may have slightly different shapes and thus the volume of water they can store is not exactly correlated to the maximum depth of storage.
>
> Live storage is a measure of the volume of storage available during major rainfall or snowmelt events that cause flooding in western Washington. This indicator recognizes that some wetlands, particularly those with groundwater connections, have water present all year around, or have some storage below the elevation of the outlet that does not contribute to reductions in peak flows (so called "dead storage"). In most depressional wetlands in western Washington the depressions have filled to the edge of the outlet by the time the peak flooding occurs in late winter and early spring (Hruby and others 1999).

Locate the outlet of the unit and identify its lowest point (Figures 24, 25). In wetlands without outlets: 1) identify the deepest "hole" if the wetland is dry (Figure 26), or 2) the level of the areas that are permanently flooded. Estimate the difference in elevation between these low points and the marks of seasonal ponding (use information from D 1.4). This will provide an estimate of the depth of live-storage during the seasonal high water. Try to find water marks as close to the outlet as possible so you can estimate the height from the outlet. Figures 24 and 25 show water marks directly on the culverts. Estimate the difference in elevation between the lowest point of the outlet and the level at which you noted marks of inundation. There are four thresholds of concern: 1) more than 3 ft of storage, 2) between 2-3 ft of storage, 3) between 6 inches and 2 ft of storage, and 4) less than 6 inches of storage. These thresholds can usually be estimated with a yard stick or tape measure without needing to use special equipment.

NOTE 1: If the outlet is a beaver dam or weir, treat the top of the dam or weir as the lowest point. If water is flowing over the dam then the water surface anywhere in the wetland can be used to establish the low point. Beaver dams generally have less than 6 inches of live storage because they allow water to flow out over a wide area. Four inches of live storage was the highest measured in the 11 beaver dams that were visited during the calibration of the method.

NOTE 2: If the wetland has multiple outlets, try to find the one that has the lowest topographic elevation.

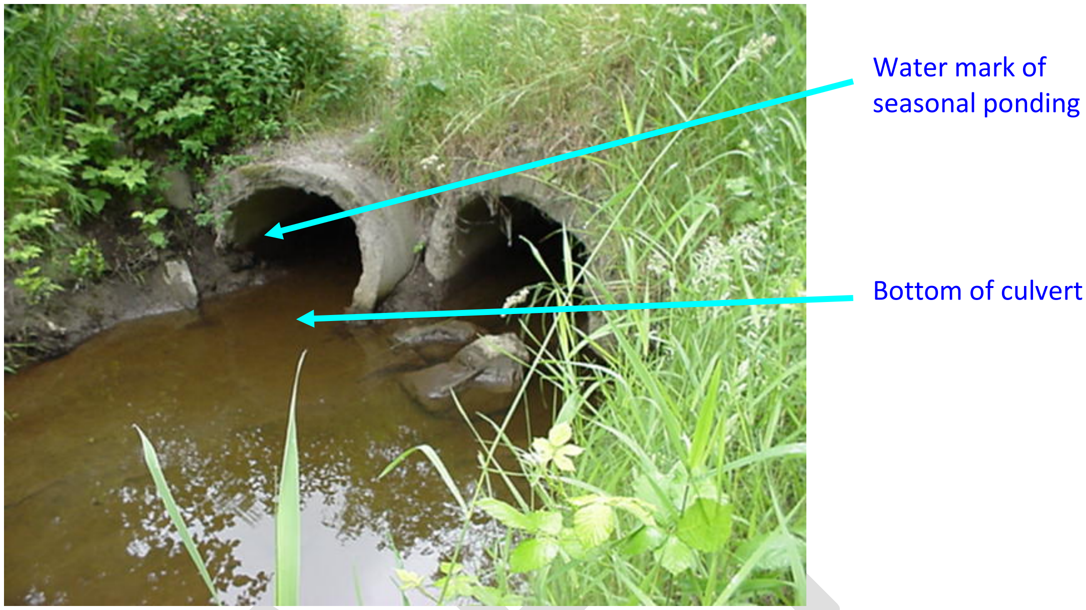
NOTE 3: Sometimes the lowest point of the outlet is flooded or flowing. In these cases, measure from the bottom of the outlet to the mark of the seasonal flooding. A common mistake is to measure from the current water level in the outlet to the marks of flooding.

NOTE 4: It can be difficult to extrapolate the height of flooding above the lowest point of the outlet in large wetlands where the flood marks are distant from the outlet.

NOTE 5: If the wetland has no outlet measure the storage as the difference between the level of permanent ponding and the seasonal ponding. If the wetland dries out in the summer use the lowest point in the depression as you baseline (Figure 26).

Figure24: A box culvert that is the outlet of a depressional wetland. The live-storage is measured as the distance between the bottom of the culvert and the water marks on the side. The distance here is approximately 15 inches.

Figure25: A round culvert with water still present. Live storage is measured from the bottom of the culvert, not the present water level. The depth of storage is approximately 7 inches.



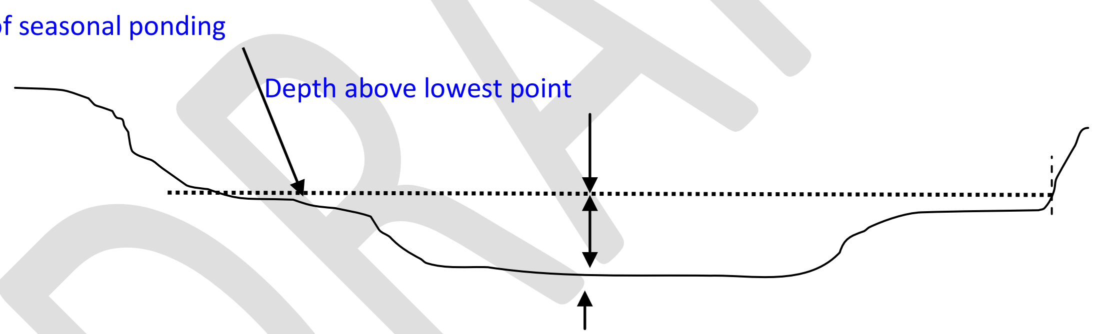


Figure26: Measuring maximum depth of seasonal ponding in a wetland without an outlet.

<u>Headwater wetlands</u>: 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 3 points, out of 7 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 4.3 Contribution of the wetland to storage in the watershed:

Rationale for indicator: The potential of a wetland to reduce peak flows from its contributing basin is a function of its retention time (volume coming into a unit during a storm event/the amount of storage present). The area of the contributing basin is used to estimate the relative amount of water entering it, while the area of the wetland is used to estimate the amount of storage present. Large contributing basins are expected to have larger volumes for any given storm event than smaller basins. Thus a small wetland with a large contributing basin is not expected to reduce peak flows as much as a large wetland with a small contributing basin.

This question asks you first to estimate 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 area of the unit and calculate the ratio of the two. You do not need to estimate these areas exactly because the scoring is based on thresholds for the ratio. If the contributing basin is less than 10 times the size of the wetland itself, the wetland will score the most points. On the other hand, if the area of the contributing basin is more than 100 times the area of the wetland the score is [0], and you will not need to make any further estimates. If the wetland is large relative to its contributing basin you will need to add the area of the wetland to the total since rain also falls within the wetland unit.

> **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.nycswcd.net/files/NRCS%20Reading%20Topo%20Maps%20to%20Delineate%20Watersheds1.pdf . NOTE: If this link is no longer "live" search for the title of the focus shed using your web search engine.

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.)?

Rationale for indicator: 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). Research in the Puget Sound area by the University of Washington has found that there are significant increases in water flows when intensive land uses represent more than 25 – 35% of the contributing basin (Azous and Horner 1997).

Use the map of the contributing basin you developed for question D 4.3 and estimate the area within the basin that has intensive land uses that de-stabilize surface flows.

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, the local FEMA (Federal Emergency Management Agency), or the USGS for groundwater issues. 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.

o Surface flooding problems are in a sub-basin further down-gradient.

- Flooding from groundwater is an issue in the sub-basin where the unit is found. For example, certain areas of Pierce and Thurston counties have problems with flooding and damage from groundwater. See USGS information for Puget Sound at: http://wa.water.usgs.gov/projects/pugethazards/urbanhaz/PDF/fs111_00.pdf

- 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. Depressional wetlands in western Washington, however, rarely, if ever get most of their water from groundwater. For example, assume an average rainfall of 48" in western Washington and an average rate of evapotranspiration of 18"/year for a forest. Thus, a minimum of 30"/year of water comes into the unit from rain alone within its boundary. To exceed the 90% threshold the unit would need to receive the equivalent of 300 inches of groundwater/unit area. A 1 acre wetland would need a minimum of 25 acre feet of groundwater flowing through the system to meet the volume threshold for being dominated by groundwater, even if the only source of surface water is rain within its boundaries.

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 and Freshwater-Tidal 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:

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 indicate the water was present in the depression for longer periods of time.

Figure 27: A riverine wetland in an old oxbow of the Nisqually River with one big depression that is filled with water and covers more than ¾ of the wetland.

R 1.2 Characteristics of the plants in the wetland:

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 question 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 gets 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 two size thresholds used to score this characteristic: 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. Larger wetlands, however, will require you to draw the area of plant types on a map or aerial photo before you can feel confident that your estimates are accurate.

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.

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. Maps of UGA and urban areas can be found at http://www.ecy.wa.gov/programs/air/aginfo/ugamaps.htm.

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.

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 polluted, or is on a tributary to one.

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 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:

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 20, a ratio between 10 – 20, a ratio between 5 – <10 , a ratio between 1 - <5, and a ratio < 1.

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 plants fill only a small part of the distance between the banks. In this case the ratio is < 1.

- 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 from an aerial photo using a ruler. 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 five times as wide? If not, the ratio is between 1- <5. If it is more than five times greater, is it more than 10 times, etc. Figure 29 shows a riverine wetland in an old oxbow where the ratio was measured to be between 1- <5.

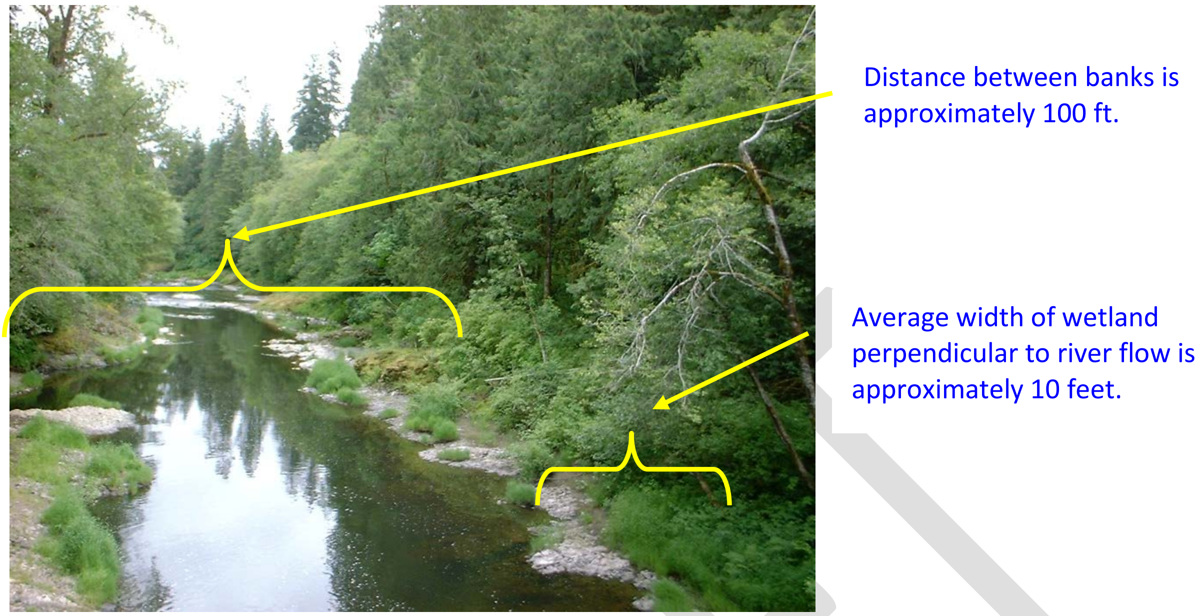


Figure 28: A riverine wetland where the width of the wetland is less than the distance between the banks (ratio ≤ 1).

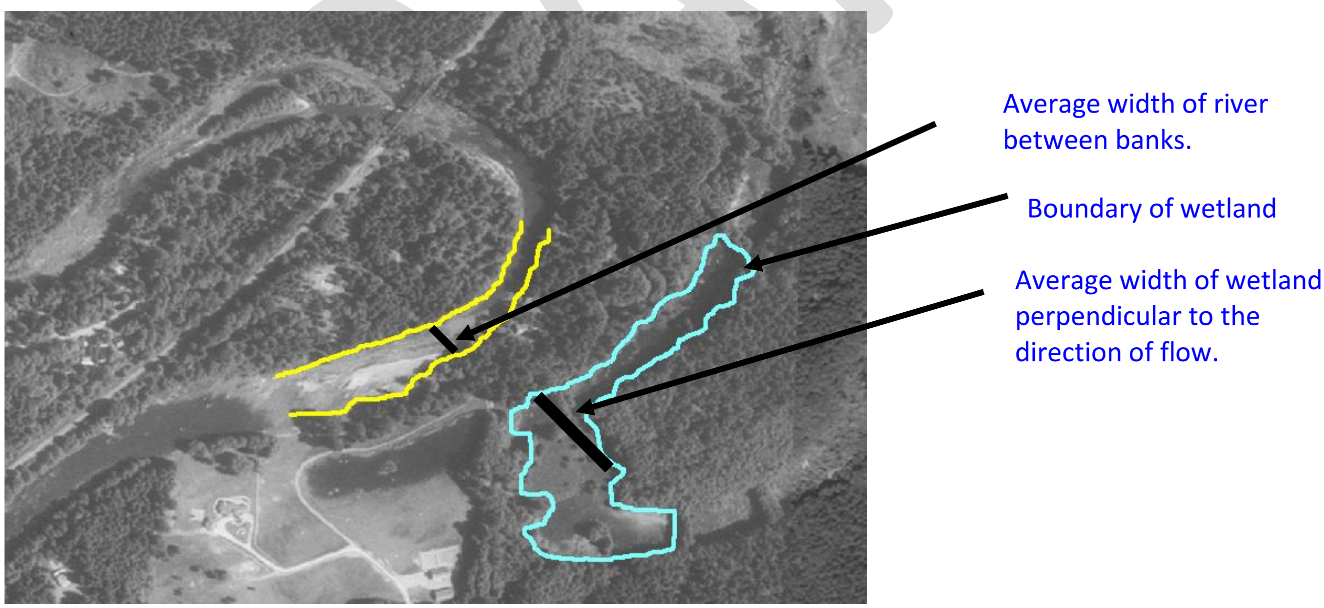


Figure 29: A riverine wetland in an old oxbow of the Nisqually River where the average width of the wetland is between 1-5 times the width of the river channel.

- 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.

- Braided channels: If the wetland is associated with only one braid you should 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:

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."

Figure 30: A riverine wetland in Bothell that has shrub plants over more than 1/3 of its area in many patches. Other important characteristics are: 1) the stream is part of the wetland because it is narrower than 50 ft. and there are wetland plants on both sides, 2) the average ratio of width of wetland to width of stream is greater than 20.

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?

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 for site potential of only 12 points instead of 16 for the water quality functions. 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:

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 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 sketch the plants and average the width by segment, 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.

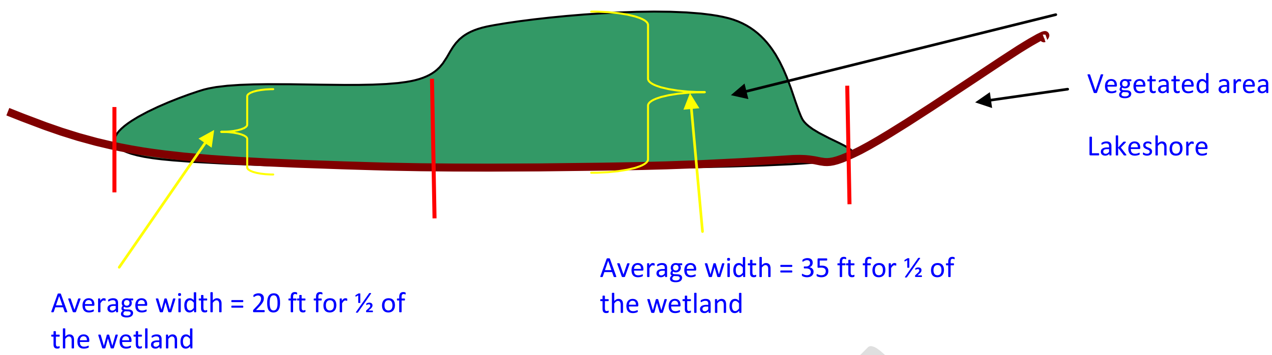


Figure 35: Estimating width of plants along the shores of a lake. The average width of plants for the entire area is: (20 ft x 0.5) + (35 ft x 0.5) = 27.5 ft.

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:

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. These thresholds can usually be estimated visually in small wetlands less than ½ acre. Larger wetlands, however, will require you 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 on the 303(d) list.

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):

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.

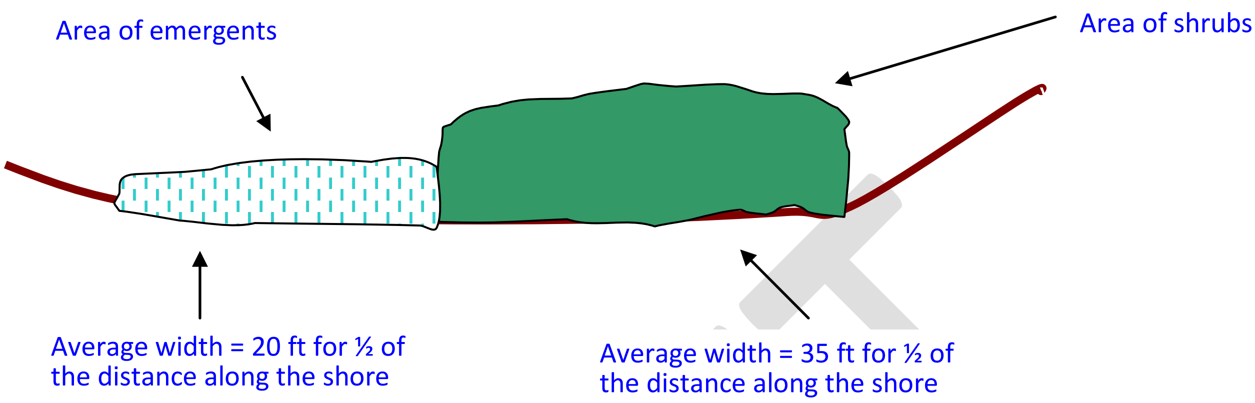


Figure 39: Estimating width of plants types along the shores of a lake. The average width of shrubs is 35 ft for ½ the distance along the shore and the width of emergents is 20 ft for ½ of the distance. This wetland would score 4 points because more than 1/4 distance consists of shrubs wider than 33ft.

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 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.

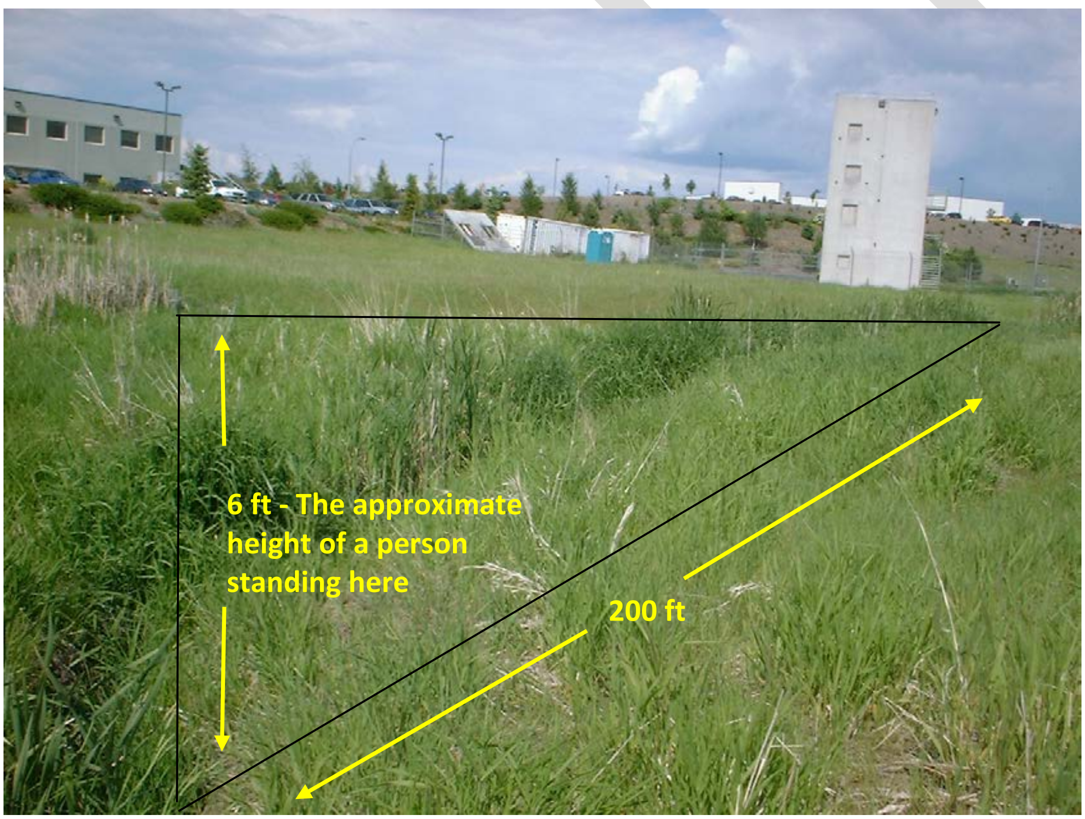
For small wetlands it will be necessary to estimate the vertical drop visually and the horizontal distance by pacing or using a tape measure. Visual estimates of the vertical drop are more accurate if you can find a point of reference near the bottom edge of the wetland. Stand at the upper edge of the 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. If you are not familiar with procedures for identifying clay soils, a key is provided in Appendix C.

> **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.

See the NRCS web page for more descriptions on how to identify organic soils: ftp://ftp-fc.sc.egov.usda.gov/NSSC/Soil_Taxonomy/keys/2010_Keys_to_Soil_Taxonomy.pdf

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

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.

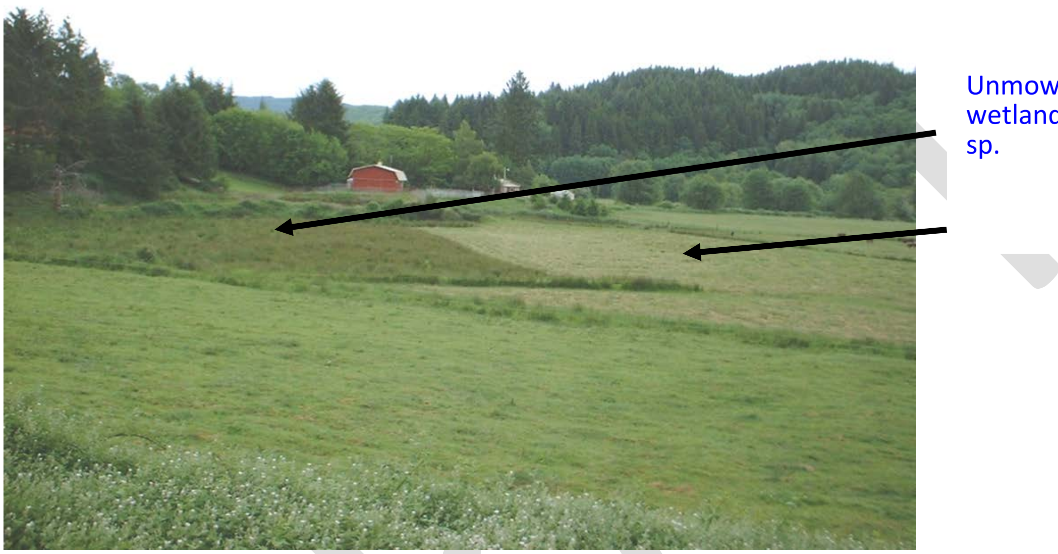


Figure 41: A slope wetland where dense unmowed, plants are between 1/4 and 1/2 the area of the wetland.

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 Category II, 4, or 5 waters and has a surface water channel, ditch or other conveyance of surface water to it.

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 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*.

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, rigid, ungrazed plants (reed canarygrass and *Juncus* sp., shrubs and trees) over more than 90% of its area. The direction of the slope is from the left of the photograph to the right.

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 D). 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 the plant community:

Rationale for indicator: More habitat niches are provided within a wetland as the number of plant communities increases. The increased structural complexity provided by different plants optimizes potential for breeding areas, escape, cover, and food production for the greatest number of species (Hruby and others 1999). 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 and others 1999). The Cowardin plants classes are used as indicators of different types of structure in the plant community. In addition, the presence of vertical structure in forested communities is considered a characteristic that increases habitat complexity and niches.

For this question you will need to map the "Cowardin" classes of plants in the wetland and whether the forested class has different strata present under the canopy. The plant community is divided into the following habitat types:

- Aquatic bed
- Emergent
- Scrub/shrub (areas where shrubs have >30% cover)
- Forested (areas where trees have >30% cover)
- Multiple strata within the forest class. Do the areas mapped as a Cowardin forested class have at least three out of the five strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover)?

NOTE 1: Each plant class has to cover more than ¼ acre, or if the wetland is smaller than 2.5 acres, the threshold is 10% of the area of the wetland. "Cowardin" plant classes are distinguished on the basis of the uppermost layer of plants (forest, shrub, etc.) that provides more than 30% surface cover within the area of its distribution (see Section 5.2).

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 graze certain species of aquatic bed early in the growing season, you may incorrectly conclude that aquatic bed plants are not present if the field visit is made during this time period**. Therefore, examine the pond bottom in areas of open water for evidence of aquatic bed species that have senesced.** 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.

NOTE 3: If a plant class is distributed in several patches, the patches can be added together to meet the size threshold. However, the patches have to be large enough so that no more than 10 are needed to meet the size threshold. For example, if 15 patches of shrubs are needed to meet the size threshold then the unit does NOT have a scrub/shrub class.

NOTE 4: Count how many strata (i.e., canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) are present in forested areas of the wetland, but only within the polygon you have mapped as forested. If three or more of the five strata are present, record this on the field form.

NOTE 5: Each stratum (canopy, sub-canopy, shrub, herbaceous, or groundcover) has to cover at least 20% of the ground within the polygon identified as "forest" when looking at it from above. If the field visit is during the winter you will have to estimate cover based on your expectation of what the plants would cover when in full leaf.

H 1.2 Hydroperiods

Rationale for indicator: Many aquatic species have their life cycles keyed to different water regimes (e.g., permanent, seasonal, or saturated conditions). A wetland with many different water regimes will potentially support more species than a wetland with fewer water regimes. For example, some species are tolerant of permanent pools, while others can live in pools that are temporary (Wiggins and others 1980).

For this question you will need to identify areas in the wetland with different water regimes. You are looking for areas with different patterns of flooding or saturation. For example, does part of the wetland have surface ponding only for a very short time (we call this occasionally flooded or inundated) or are there areas that have surface water all year (permanently flooded). The purpose is to identify the wettest water regime within different areas of the wetland unit. Thus, an area that is seasonally flooded, but only saturated during the field visit in the summer, would still be categorized as "seasonally flooded." **To count, the water regime has to cover more than 10% of the wetland or ¼ acre.** This includes streams and rivers. Often there is a small stream in a depressional wetland or along the side of a riverine one but it **cannot** be counted because the total area between the banks of the stream that is in the unit or in contact along one side does not meet the size threshold.

The six water regimes that you need to identify are:

Permanently Flooded or Inundated — A polygon you can map in the unit where surface water is present the entire year, in 9 out of 10 years.

> **NOTE:** During high water in the winter and spring, it may be difficult to determine the area that would be permanently flooded during the summer dry period. One indicator of permanent water is an area of open water without plants inside the zone of seasonal inundation. Aerial photos taken during the summer may also show areas of permanent water.

Seasonally Flooded or Inundated — A polygon in the unit where surface water is present for extended periods (for more than 2 consecutive months during a year), especially early in the growing season, but is absent by the end of the season in most years. During the summer dry season it may be difficult to determine the area that is seasonally inundated. Use the indicators described in D1.4 to help you determine areas that are seasonally flooded or inundated.

Occasionally Flooded or Inundated — A polygon you can map where surface water is present for brief periods of less than two months during the growing season, but the water table usually lies below the soil surface for most of the season. Plants that grow in both uplands and wetlands are characteristic of this water regime (facultative).

Saturated — A polygon where the soil is saturated near the surface for long enough to create a wetland, but surface water is never present. The latter criterion separates saturated areas from inundated areas. In this case, there will be no signs of inundation on plant stems or in surface depressions.

Permanently Flowing Stream — The wetland unit contains a river, stream, channel, or ditch with water flowing in it throughout the year within its boundaries or along one edge (most often in a riverine situation). The distance between the banks should be used to estimate if the size thresholds are met. Do not use the area of water in the stream you find during the site visit.

Intermittently Flowing Stream — The wetland unit contains a river, stream, channel, or ditch in which water flow is intermittent or seasonal within its boundaries or along one edge. The distance between the banks should be used to estimate if the size thresholds are met. Do not use the area of water found during the site visit.

Figure 20 shows a hypothetical wetland with two water regimes – permanently flooded and seasonally flooded. Figure 43 shows a photograph of a slope wetland, also with two water regimes - some areas are **occasionally flooded** from sheet flow during storms and the rest is **saturated** from subsurface flows. Figure 44 shows a depressional wetland with three water regimes.

NOTE 1: Wetlands that are classified as **Lake-fringe or Freshwater Tidal Fringe are scored 2 points for this question.** The water regimes in these two types of wetlands do not fit the descriptions above or are too difficult to determine in the field.

NOTE 2: An area (polygon) within a wetland unit being rated can only have one hydroperiod. Different areas within a unit, however, may have different hydroperiods.

NOTE 3: You should map the hydroperiods as they would appear at the wettest time of the year.

NOTE 4: A drawing such as Figure 20 should be made on a copy of the aerial photograph or map outlining the different hydroperiods. Such a drawing will reduce common errors (e.g., failure to confirm the size threshold or counting the same area as having two hydroperiods).

NOTE 5: Depressional wetlands often have their water regimes in concentric rings. In addition to permanently ponded and seasonally ponded, a wetland could have an additional ring that is occasionally ponded and then even just saturated. To count, however, each of these hydroperiods needs to meet the size threshold. Slope wetlands often have only a saturated hydroperiod and if they get surface runoff then they have "occasional" surface inundation as well. Thus, for depressional, riverine, or lake fringe wetlands that are joined to slope wetlands you need to record the hydroperiods of the area classified as slope as well as those with another classification.

NOTE 6: Many streams in wetlands however cannot be counted because the distance between banks within the unit or immediately adjacent to do not meet the size threshold.

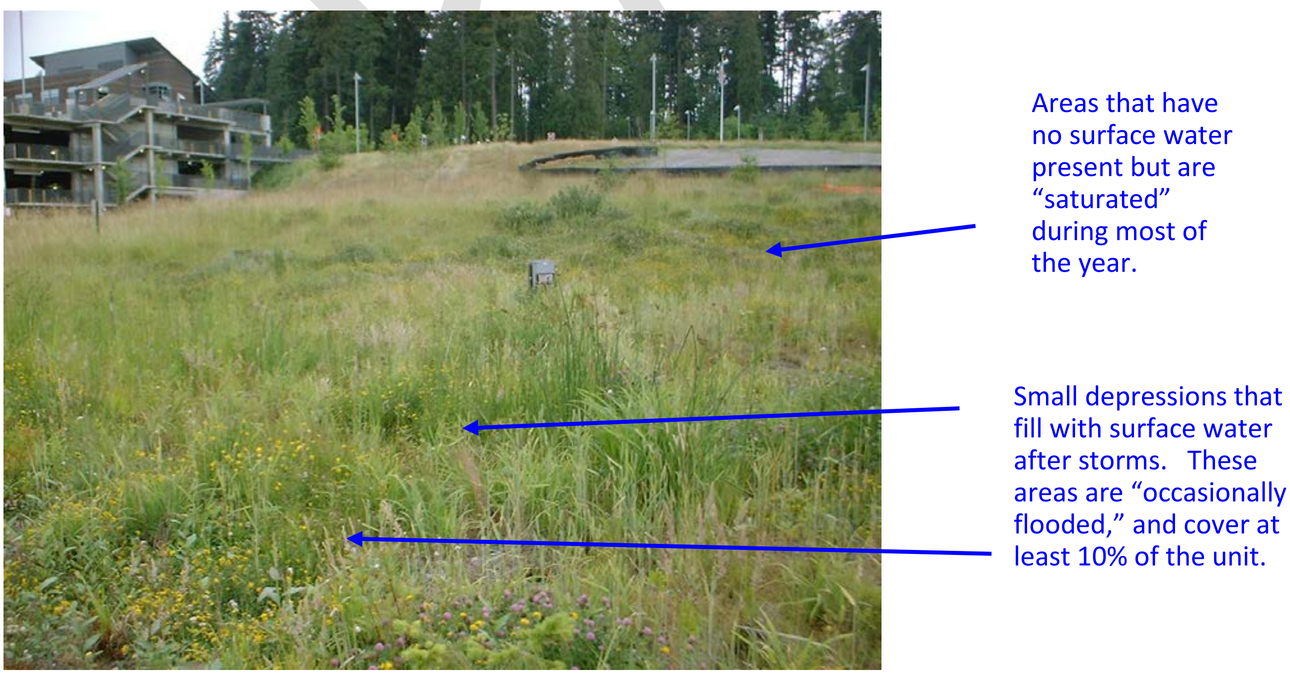


Figure 43: Slope wetland with two water regimes.

Figure 44: A large depressional wetland with three water regimes: permanently flooded, seasonally flooded, and occasionally flooded. The areas that are seasonally and occasionally flooded are found around the outer edge of the wetland.

H 1.3 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 1999). 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 four aggressive 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 unit keep a list of the patches of different plant species you find. You should count both wetland and upland plants. However, you include only species that form patches that cover at least 10 square feet within the unit. 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. There are 3 thresholds to keep in mind: 20 or more species, 5-19, and less than 5 species. If you count more than 19 species you do not need to continue identifying plants.

For this question the following species are **NOT TO BE INCLUDED** in the total: Eurasian water-milfoil (*Myriophyllum spicatum*), reed canarygrass (*Phalaris arundinaceae*), Purple Loosestrife (*Lythrum salicaria*), and Canadian thistle (*Circium arvense*). These species were judged to reduce the number of niches present in a wetland by the team of wetland scientists who developed this indicator.

H 1.4 Interspersion of Habitats:

Rationale for indicator: In general, interspersion among different physical structures (e.g., open water) and classes of plants (e.g., aquatic bed, emergent plants, shrubs) increases the suitability for different guilds of wildlife by increasing the number of ecological niches (Hruby and others 1999). 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 Cowardin plant classes are present in the unit being rated. This question uses this information and also asks you to identify if there are any areas of open water in the unit (open means without plants on or above the water surface during the spring, summer, or fall). You are asked to rate the "interspersion" between these structural characteristics of the wetland. The diagrams on the field form show what is meant by ratings of High, Medium, Low, or None. Each polygon with a different shading represents a different plant class or open water.

To answer this question first consider if the interspersion falls into the two "default" ratings. If the wetland has only one class of plants present (question H 1.1) and no open water, it will always be rated as NONE (see Figure 45). If the wetland has four plant classes (from question H 1.1), or three plant classes and open water it will always be rated as HIGH. Figure 44 is a depressional wetland with open water, emergent, aquatic bed, shrub, and forest classes. Thus, it automatically rates a HIGH. The only time you will have to make a decision is when the wetland has two or three types of structure that provide habitat.

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 plants).
- A wetland with a meandering, unvegetated, stream (seasonal or permanent) that does not meet the size threshold (10% or ¼ acre) should be rated LOW if it has only one plant class. If however, the area of the unvegetated stream is greater than the threshold size, the interspersion is MODERATE.
- Several isolated patches of one structural category (e.g., patches of open water) should be considered the same as one "patch" with many lobes.

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.

Figure 45: A depressional wetland with only one class of plants and no open water. The interspersion is rated as NONE.

H 1.5 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 1999). These special features include:

1) Large downed woody debris in the wetland that provides major niches for decomposers (i.e., bacteria and fungi) and invertebrates,
2) Snags that provide perches and cavities for birds and other animals,
3) Undercut banks that provide protection for fish and amphibians,
4) Stable, steep banks of fine material that might be used by aquatic mammals for denning,
5) Thin-stemmed plants that provide structure on which amphibians can lay their eggs, and
6) A plant community that does not have aggressive (invasive) species. This indicates the wetland unit is relatively undisturbed.

Record the presence of any the following special habitat features within the wetland on the Rating Form:

- Large woody debris within the wetland that is more than 4 inches in diameter at the base and more than 6 ft long (Figure 46).

- Snags present in the wetland that are more than 4 inches in diameter at breast height (Figure 46). **The snag has to have been "rooted" in the wetland to count**. Fence posts or other vertical posts that meet the size threshold can be counted. Also, dead branches of more than 4 inches diameter on large trees count as snags.

- 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 47). Evidence of grazing or activity 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.

- At least ¼ acre of thin-stemmed persistent plants or woody branches that are in areas that are permanently or seasonally inundated. These plants provide egg-laying structures for amphibians. A ¼ acre of such plants provide optimal conditions for egg-laying (K. Richter, personal communications), and a unit will score a point only if this criterion is met. This does not mean that a wetland does not provide amphibian habitat in the absence of this; just that a wetland provides better habitat if these conditions are present.

- The cover of aggressive, opportunistic plants is less than 25% within EACH stratum present in the unit. The five possible strata are canopy, sub-canopy, shrub, herbaceous/emergent, and ground-cover. For example, a forested wetland with a 100% canopy of alder or cottonwood but with an understory of reed canarygrass that covered 70% of the ground would not qualify for this characteristic. The species that are considered aggressive for answering this question are as follows:

  Circium arvense (Canadian thistle)
  Rubus laciniatus (evergreen blackberry)
  Rubus armeniacus (Himalayan blackberry)
  Fallopia japonina (Japanese knotweed)
  Fallopia sachalinense (giant knotweed)
  Fallopia cuspidatum x sachalinense (hybrid of Japanese and giant knotweeds)
  Lysimachia vulgaris (garden loosestrife)
  Lythrum salicaria (purple loosestrife)
  Myriophyllum spicatum (Eurasian milfoil)
  Phalaris arundinaceae (reed canarygrass)
  Phragmites australis (common reed)
  Tamarix spp.(either *Tamarix ramosissima* and/or *T. parviflora*, salt cedar).

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

Check off each habitat feature on the data form. Add the total number of checks and record that as a score in the right-hand column.

Figure 46: Large woody debris and snags in wetland

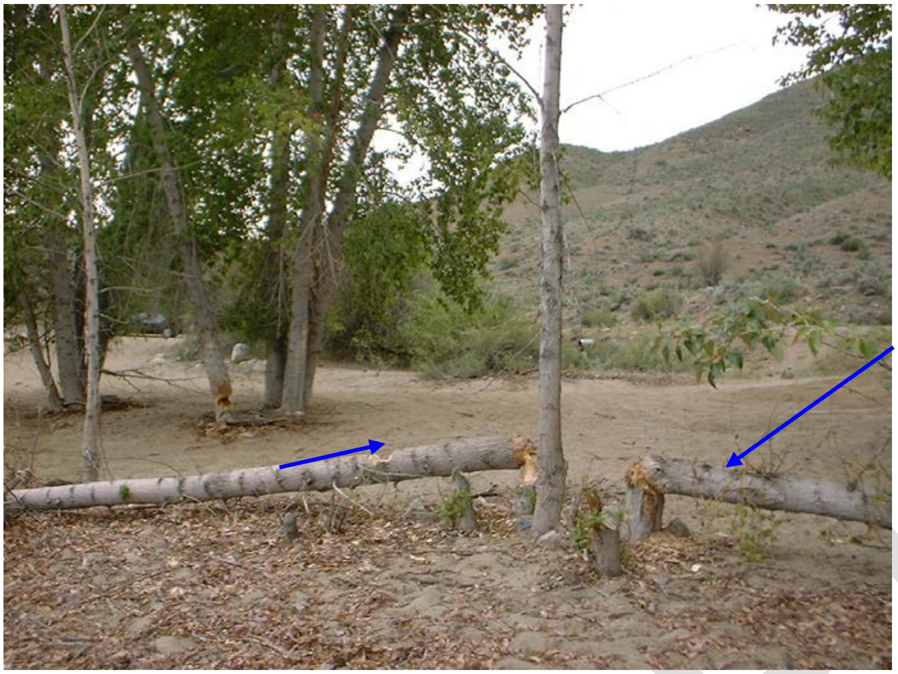


Figure 47: Evidence of beaver activity. Note the conical shape of the cut.

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?

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 48). 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.

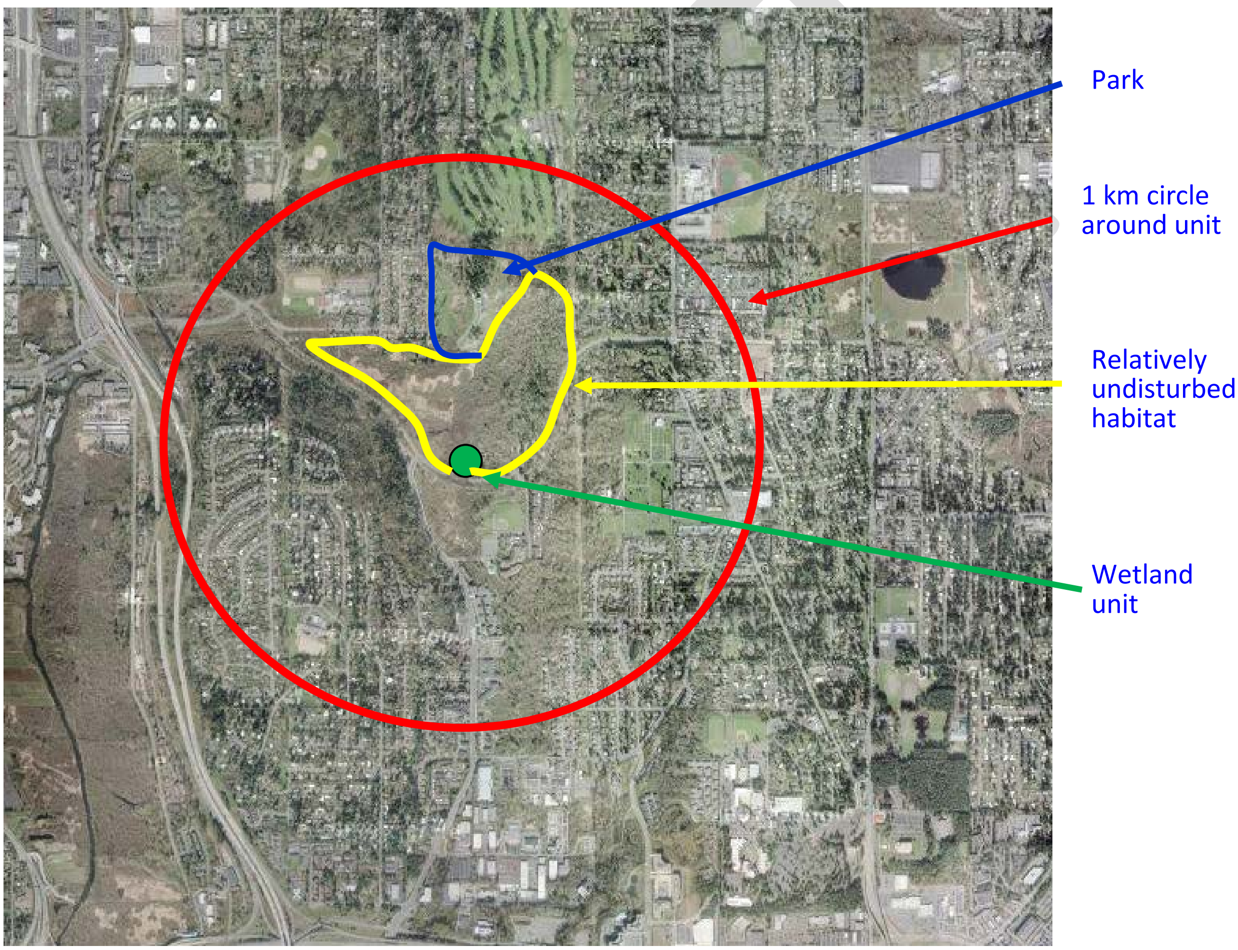


Figure 48: A 1 km circle around a wetland unit showing the Accessible Habitat. Accessible Habitat is 10 – 25 % of the total area of the 1 km polygon.

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.

- 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.**

Questions to identify wetlands with special characteristics:

SC 1.0 Estuarine wetlands

SC 1.1. Estuarine wetlands are vegetated, tidal fringe, wetlands where the concentration of salt in the water is greater than 0.5 parts per thousand (see p. 23). Estuarine wetlands of any size within National Wildlife Refuges, National Parks, National Estuary Reserves, Natural Area Preserves, State Parks, or Educational, Environmental or Scientific Reserves designated under WAC 332 30 151 are rated a Category I.

SC 1.2 Estuarine wetlands in which the salt marsh vegetation extends over more than 1 acre, and **that meet at least two of the following three criteria** are rated a Category I.

- The wetland is relatively undisturbed. This means it has no ditching, filling, cultivation, grazing, and the vegetation has less than 10% cover of non-native plant species. NOTE: If non-native *Spartina* spp. cover more than 10% of the wetland, then the wetland can be given a dual rating (I/II). The area of *Spartina* would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of *Spartina* in determining the size threshold of 1 acre.
- At least ¾ of the landward edge of the wetland has a 100 ft buffer of ungrazed pasture, shrub, forest, or relatively undisturbed freshwater wetland. A relatively undisturbed dike with vegetation that is not cut or grazed annually can count as an undisturbed buffer.
- The vegetated areas of the wetland have at least two of the following structural features: tidal channels, depressions with open water, or contiguous freshwater wetlands.

SC 1.3 Any estuarine wetland that does not meet the criteria above for a Category I becomes a Category II wetland.

Note: Eel grass beds do not fall within the definition of vegetated wetlands used in the rating system. They are an important aquatic resource but they do not fall within the purview of this rating system.

SC 2.0 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 2.1 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 2.2 and SC 2.3). 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 3.0 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 planifoli*a	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 4.0 Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meet the ecological criteria for the Department of Fish and Wildlife's old-growth or mature forests?

To answer this question you will need to map out the areas of the wetland that are forested using the Cowardin classification (see question H 1.1 on p. 72). You will then have to determine if the forest ecosystem meets the criteria for priority habitats listed below.

- <u>Old-growth forests</u>: (west of Cascade crest) - stands having at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) that are > 81 cm (32 in) dbh or > 200 years of age; and > 10 snags/ha (4 snags/acre) over 51 cm (20 in) diameter and 4.6 m (15 ft) tall; with numerous downed logs, including 10 logs/ha (4 logs/acre) that are > 61 cm (24 in) diameter and > 15 m (50 ft) long. High elevation stands (> 762m [2500ft]) may have lesser dbh [> 76 cm (30 in)], fewer snags [> 0.6/ha (1.5/acre)], and fewer large downed logs [0.8 logs/ha (2 logs/acre) that are > 61 cm (24 in) diameter and > 15 m (50 ft) long].

  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).

- Mature forests: (west of the Cascade Crest) 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.

  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)*

If you have one acre of old-growth or mature forest the wetland is Category I. If only part of the wetland meets the requirements for a Category I forested wetland, and its category as based on functions is II or III, the wetland may be assigned a dual rating as described in Section 4.7.

SC 5.0 Wetlands in Coastal Lagoons

Coastal lagoons are shallow bodies of water, like a pond, partly or completely separated from the sea by a barrier beach. They may, or may not, be connected to the sea by an inlet, but they all receive periodic influxes of salt water. This can be either through storm surges overtopping the barrier beach, or by flow through the porous sediments of the beach. Coastal lagoons may have freshwater flowing into one side that dilutes the salinity below the 0.5 ppt. The seaward edges of the lagoons, however, always contain some salt water at or near the bottom.

Does the wetland meet all of the following criteria for a wetland in a coastal lagoon?

To be rated as a wetland in a coastal lagoon, a wetland and its associated lagoon has to meet all of the following criteria.

— The vegetated wetland lies in a depression with open water for at least part of the year that is adjacent to marine waters. This depression is wholly or partially separated from those marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks along part of its circumference (see Figures 42, 43). The banks can be vegetated or bare.

— The unvegetated areas of the lagoon contain water, in at least some parts of the lagoon, that is saline or brackish (> 0.5 ppt) during most of the year *(needs to be measured near the bottom).*

—The lagoon retains some of its surface water at low tide during spring tides.

The categorization of wetlands in coastal lagoons is based on the size and level of disturbance in the wetland and its buffers. If a wetland in a coastal lagoon meets all three of the following criteria it is Category I. If the criteria are not met it is a Category II wetland.

— The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic, plant species (see list of species on p. 91).
— At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. NOTE: The landward edge of the lagoon may represent a small section of the buffer as in Figure 43.
— The wetland is larger than 1/10 acre (4350 square feet)

Figure 42: A coastal lagoon on Hood Canal with associated wetlands that is separated from the ocean by a vegetated bar of gravel and sand. The lagoon has no surface-water connection to the ocean. Salt water, however, can enter the lagoon through the bar or over the top during storms.

Figure 43: A coastal lagoon with a surface-water connection to Puget Sound. In this case there is a salt marsh separating the lagoon from the ocean as well as a sand bar.

SC 6.0 Interdunal Wetlands

Is the wetland west of the 1889 line known as the Western Boundary of Upland Ownership or WBUO?

Interdunal wetlands form in the "deflation plains" and "swales" that are geomorphic features in areas of coastal dunes. These dune forms are the result of the interaction between sand, wind, water and plants. The dune system immediately behind the ocean beach (the primary dune system) is very dynamic and can change from storm to storm (Wiedemann 1984). These wetlands provide critical habitat in this ecosystem (Wiedemann 1984) but many of the more recently formed wetlands cannot be characterized using the questions on the field form .

Wetlands located west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO) along the coast are considered interdunal wetlands because they have formed only in the last century. These wetlands all have formed as a result of accretions of the beach westward since 1889.

In practical terms that means the following geographic areas:

- Long Beach Peninsula- lands west of SR 103
- Grayland-Westport- lands west of SR 105
- Ocean Shores-Copalis- lands west of SR 115 and SR 109

Interdunal wetlands greater than 1 acre that rate highly for habitat (score 8 or 9 for site potential for habitat) are placed in Category I because they provide numerous habitat niches in this ecosystem that is little understood . Other interdunal wetlands that are 1 acre or larger, or are in a mosaic that is larger than 1 acre, are a Category II. Isolated wetlands between 0.1 and 1 acre are Category III, and smaller ones (< 0.1 acres) are Category IV. **If the interdunal wetland unit is larger than one acre, the Habitat questions on the rating form need to be answered to determine if the wetlands have enough habitat structure to be categorized as a Category I.**

NOTE: Small interdunal wetlands often form a mosaic behind the primary dunes (see Figures 44, 45). If the interdunal wetlands meet the criteria for wetlands in a mosaic (see p. 15) and described below, then the category should be based on the overall size of the mosaic not an individual patch.

- Each patch of wetland is less than 1 acre (0.4 hectares), and
- Each patch is less than 100 ft (30 m) apart, on the average, and
- The areas delineated as vegetated wetland are more than 50% of the total area of both the wetlands and dunes.

Figure 44: Interdunal wetlands along the Pacific Coast.

Interdunal wetlands that are larger than 1 acre. Individual wetland areas may be smaller than 1 acre, but they form a mosaic that is larger than 1 acre.

Figure 45: Interdunal wetlands along the Pacific Coast.

Mosaic of wetlands less than 0.1 acres in size

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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.** # of figures included_______
[Depressional (7 figures) Riverine (8 figures) Lake-fringe (7 figures) Slope (5 figures)]

OVERALL WETLAND CATEGORY _____ (based on functions___ or special characteristics___)

1. Category of wetland based on FUNCTIONS

_______**Category I** - Total score = 23 – 27
_______**Category II** - Total score = 20 - 22
_______**Category III** - Total score = 16 - 19
_______**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	**TOTAL**
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
Estuarine	I II
Wetland with high conservation value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	

HGM Classification of Wetlands in Western Washington

For questions 1-7 the criteria described must apply to the entire unit being rated.

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 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?
YES – Freshwater Tidal Fringe **NO – Saltwater Tidal Fringe (Estuarine)**
If your wetland can be classified as a Freshwater Tidal Fringe use the forms for ***Riverine*** *wetlands. If it is Saltwater Tidal Fringe it is an* ***Estuarine*** *wetland and is not scored. This method* ***cannot*** *be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.
NO – go to 3 **YES** – The wetland class is **Flats**
If your wetland can be classified as a "Flats" wetland, use the form for ***Depressional*** *wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 acres (8 ha) in size;
___At least 30% of the open water area is deeper than 6.6 ft (2 m)?
NO – go to 4 **YES –** The wetland class is **Lake-fringe** (Lacustrine Fringe)

4. 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.
____The water leaves the wetland **without being impounded**?

NO - go to 5 **YES –** The wetland class is **Slope**

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 <3 ft diameter and less than 1 ft deep).

5. 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 two years.

NO - go to 6 **YES** – The wetland class is **Riverine**

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

6. 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 7 **YES –** The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES –** The wetland class is **Depressional**

8. 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. GO BACK AND 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 the wetland unit being scored.

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 along stream within boundary of depression	Depressional
Depressional + Lake-fringe	Depressional
Riverine + Lake-fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable 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.*

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DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality.

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: *Provide photo or drawing* Unit is a depression or "flat depression" (Q. 7 on key) with no surface water leaving it (no outlet) points =3 Unit has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Unit has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Unit is a "flat" depression (Q. 7 on key), whose outlet is a permanently flowing ditch. points = 1	Figure ___
D 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES: points = 4 NO: points = 0	
D 1.3 Characteristics of persistent plants (emergent, shrub, and/or forest Cowardin class) *Provide map of plant classes* Unit has persistent, ungrazed, plants ≥ 95% of area points = 5 Unit has persistent, ungrazed, plants ≥ 1/2 of area points = 3 Unit has persistent, ungrazed plants ≥ 1/10 of area points = 1 Unit has persistent, ungrazed plants <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 the wetland unit that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 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?	
D 2.1 Does the Wetland unit receive stormwater discharges? Yes = 1 No = 0	
D 2.2 Is more than 10% of the buffer within 150 ft of wetland unit in land use generating pollutants Yes = 1 No = 0	
D 2.3 Are there septic systems within 250 ft of the wetland unit? Yes = 1 No = 0	
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? 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?	
D 3.1 Does the unit discharge directly (i.e.. within 1 mile) to a stream, river, or lake that is on the 303d list? Yes = 1 No = 0	
D 3.2 Is the unit in a basin or sub-basin where an aquatic resource is on the 303(d) list? 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 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 AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation.

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: *Provide photo or drawing* Unit is a depression or "flat depression" (Q. 7 on key) with no surface water leaving it (no outlet) points =4 Unit has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Unit is a "flat" depression (Q. 7 on key), whose outlet is a permanently flowing ditch. points = 1 Unit has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	Figure ___
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 if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland" points = 3 Unit is flat (yes to Q. 2 or Q. 7 on key) but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 inches) points = 0	
D 4.3 Contribution of unit to storage in the watershed *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself. Provide map of contributing basin* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire unit is in the FLATS class points = 5	Figure ___
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?	
D 5.1 Does the unit receive any stormwater discharges? Yes = 1 No = 0	
D5.2 Is >10% of the land use within 150 ft of the wetland in a land use that generates runoff? 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 (residential at >1 residence/acre, urban, commercial, agriculture, etc.)? 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 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 reduction 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), o Damage occurs in sub-basin that is immediately down-gradient of unit. points = 2 o Damage occurs in a sub-basin further down-gradient. points = 1 • Flooding from groundwater is an issue in the sub-basin. 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 pag*

Wetland name or number _____

RIVERINE AND FRESHWATER TIDAL FRINGE WETLANDS

Water Quality Functions - Indicators that site functions to improve water quality

R 1. 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 > ½ of area of unit draw polygons on aerial photo or map* Depressions cover >3/4 area of wetland Depressions cover > 1/2 area of wetland Depressions present but cover < 1/2 area of wetland No depressions present	 points = 8 points = 4 points = 2 points = 0	Figure ___
R 1.2 Characteristics of the plants in the unit (areas with >90% cover at person height): *Include photo or map showing polygons of different plants types* Trees or shrubs > 2/3 area of the unit Trees or shrubs > 1/3 area of the unit Herbaceous plants (> 6" high) > 2/3 area of unit Herbaceous plants (> 6" high) > 1/3 area of unit Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit	 points = 8 points = 6 points = 6 points = 3 points = 0	Figure ___
Total for R 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*

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 Other sources _____________________	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 within one mile? Yes = 1 No = 0 R 3.2 Does the river or stream have TMDL limits for nutrients, toxics, or pathogens anywhere downstream? Yes = 1 No = 0	
R 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 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 AND FRESHWATER TIDAL FRINGE WETLANDS

Hydrologic Functions - Indicators that site functions to reduce flooding and stream erosion

R 4.0 Does the wetland unit have the potential 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 20 points = 9 If the ratio is between 10 – 20 points = 6 If the ratio is between 5 - <10 points = 4 If the ratio is between 1 - <5 points = 2 If the ratio is < 1 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. These are NOT Cowardin classes):* *Provide photo or map showing polygons of different plants types* Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area points = 7 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 4 Plants do not meet above criteria points = 0	Figure ___
Total for R 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*

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 =	
R 5.2 Does the contributing basin 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 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 sub-basin further down-gradient. points = 1 No flooding problems anywhere downstream. points = 0	
R 6.2 Has the site 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*

LAKE-FRINGE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality.	
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 33 ft (10m) wide points = 6 Plants are more than 16 ft (5m) wide and <33ft points = 3 Plants are more than 6 ft (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. Herbaceous does not include aquatic bed.* *Provide map with polygons of different plants types* Cover of herbaceous plants are >90% of the vegetated area points = 6 Cover of herbaceous plants are >2/3 of the vegetated area points = 4 Cover of herbaceous plants are >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*

L 2. Does the landscape have the potential to support the water quality function at the site?	
L 2.1 Is the lake used by power boats? Yes = 1 No = 0	
L 2.2 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	
L 2.3 Does the lake have problems with algal blooms or excessive plants such as milfoil? Yes = 1 No = 0	
Total for L 2 Add the points in the boxes above	

Rating of Landscape Potentia: If score is: **2 or 3 = H** **1 = M** **0 = L** **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 303(d) 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? (*answer YES if there is a TMDL for the lake 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*

LAKE-FRINGE WETLANDS

Hydrologic Functions - Indicators that the wetland unit functions to reduce shoreline erosion

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 (any type except aquatic bed) points = 2 Plants are less than 6 ft (2m) wide (any type except 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?	
L 5.1 Is the lake used by power boats with more than 10 hp? Yes = 1 No = 0	
L 5.2 Is the fetch on the lake 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*

NOTES and FIELD OBSERVATIONS:

SLOPE WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

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 ft vertical drop in elevation for every 100 ft horizontal distance)* Slope is1% 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 > ½ of area points = 3 Dense, woody, plants > ½ of area points = 2 Dense, uncut, herbaceous plants > ¼ 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 support the water quality function at the site?	
S 2.1 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 R 2.1 – R 2.4 Other sources _________________ 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 303(d) 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*

Wetland name or number _____

SLOPE WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream erosion	
S 4.0 Does the wetland unit have the potential 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	

Rating of Site Potential 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	

Rating of Landscape Potential 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 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*

NOTES and FIELD OBSERVATIONS:

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat.

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

H 1.1 Structure of plant community – *indicators are Cowardin classes and layers in forest.* Check the Cowardin plant classes in unit – *Polygons for each class must total ¼ acre, or more than 10% of the unit if it is smaller than 2.5 acres.* *Add the number of structures checked.* *Provide map of Cowardin plant classes*

Figure__

____Aquatic bed	4 structures or more	points = 4
____Emergent plants	3 structures	points = 2
____Scrub/shrub (areas where shrubs have > 30% cover)	2 structures	points = 1
____Forested (areas where trees have > 30% cover)	1 structure	points = 0

If the unit has a forested class check if:

___The forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon

H 1.2. Hydroperiods

Figure__

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count (*see text for descriptions of hydroperiods*).

Provide map of polygons with different hydroperiods

____Permanently flooded or inundated	4 or more types present	points = 3
____Seasonally flooded or inundated	3 types present	points = 2
____Occasionally flooded or inundated	2 types present	points = 1
____Saturated only	1 type present	points = 0

____Permanently flowing stream or river in, or adjacent to, the wetland

____Seasonally flowing stream in, or adjacent to, the wetland

____Lake-fringe wetland = 2 points

____Freshwater tidal wetland = 2 points

H 1.3. Richness of Plant Species

Count the number of plant species in the wetland unit that cover at least 10 ft^2.

Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle***

If you counted:	> 19 species	points = 2
	5 - 19 species	points = 1
	< 5 species	points = 0

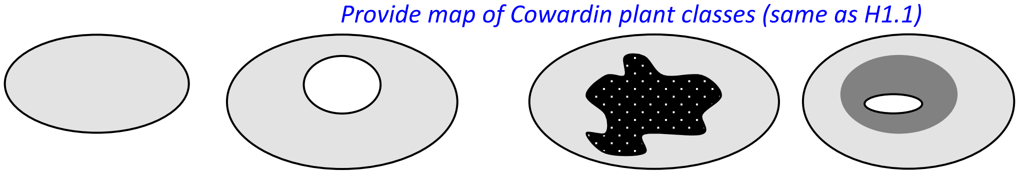
H 1.4. Interspersion of habitats

Figure__

Decide from the diagrams below whether interspersion between Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.

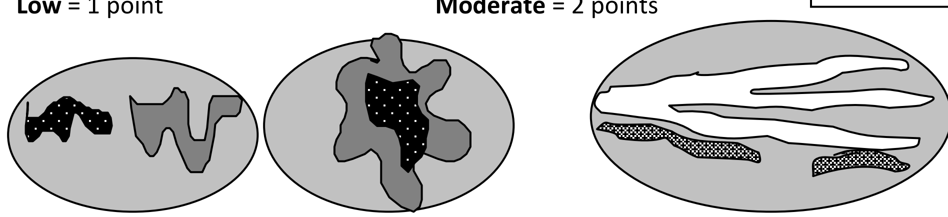
Provide map of Cowardin plant classes (same as H1.1)

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



None = 0 points **Low** = 1 point **Moderate** = 2 points

All three diagrams in this row are **HIGH**



H 1.5. Special Habitat Features: Check the habitat features that are present in the wetland. *The number of checks is the number of points* ____Large, downed, woody debris within the unit (>4 inches diameter and 6 ft long). ____Standing snags (diameter at the bottom > 4 inches) within the unit ____Undercut banks are present for at least 6.6 ft (2m) **and/or** overhanging plants extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ acre of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated.*(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	
H 1. TOTAL Score - potential for providing habitat	

Rating of Site Potential: If score is **15 - 18 = H** **7 – 14 = M** **0 – 6 = 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 (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat **+** [(% moderate and low intensity land uses)/2] = ________ *Provide map* If total accessible habitat is: > 1/3 (33.3%) of 1 km circle *(~100 hectares or 250 acres)* points = 3 20 - 33% of 1 km circle points = 2 10 - 19% of 1 km circle points = 1 <10% of 1 km circle points = 0	Figure__
H 2.2 Undisturbed habitat in 1 km circle around unit. 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	
H 2.3 Land use intensity in 1 km circle. If: > 50% of circle is high intensity land use points = (- 2) < =50% of circle is high intensity 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 only 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 the 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 next page) • 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*

WDFW Priority Habitats

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*).

____**Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

____**Old-growth/Mature forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. **(**Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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 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.

____**Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

____**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.

____**Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

____**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.

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

Wetland name or number _____

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	**Category**
SC 1.0 Estuarine wetlands Does the wetland unit meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt. **YES = Go to SC 1.1** **NO ___ *not an estuarine wetland***	
SC 1.1 Is the wetland unit within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? **YES = Category I** **NO go to SC 1.2**	**Cat. I**
SC 1.2 Is the wetland unit at least 1 acre in size and meets at least two of the following three conditions? **YES = Category I** **NO = Category II** — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 21) — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II**
SC 2.0 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 3.0 Bogs ***(see p. 87)*** Does the wetland unit (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the 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 Q. 3** **No - go to Q. 2** 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 a lake or pond? **Yes - go to Q. 3** **No - Is not a bog for purpose of rating** 3. Does the unit 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: You may substitute this criterion by measuring the pH of the water seeping into a 16" hole. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. 4. Is the unit 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** **No___ Is not a bog for purpose of rating**	**Cat. I**

SC 4.0 Forested Wetlands

Does the wetland unit have at least 1 contiguous acre of forest that meet one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.*

— **Old-growth forests**: (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more.

— **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 inches (53cm).

YES = Category I NO ___not a forested wetland for this section

Cat. I

SC 5.0 Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

— The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

— The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*

YES = Go to SC 5.1 NO___ not a wetland in a coastal lagoon

SC 5.1 Does the wetland meets all of the following three conditions?

— The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74).

— At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

— The wetland is larger than 1/10 acre (4350 square feet)

YES = Category I NO = Category II

Cat. I

Cat. II

SC 6.0 Interdunal Wetlands

Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)?

YES - go to SC 6.1 NO __ not an interdunal wetland for rating

If you answer yes you will still need to rate the wetland based on its habitat functions.

In practical terms that means the following geographic areas:

- Long Beach Peninsula- lands west of SR 103
- Grayland-Westport- lands west of SR 105
- Ocean Shores-Copalis- lands west of SR 115 and SR 109

SC 6.1 Is the wetland one acre or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)?

YES = Category I NO – go to SC 6.2

SC 6.2 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger?

YES = Category II NO – go to SC 6.3

SC 6.3 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre?

YES = Category III NO – Category IV

Cat I

Cat. II

Cat. III

Cat. IV

Category of wetland based on Special Characteristics

Choose the "highest" rating if wetland falls into several categories, and record on p. 1.

If you answered NO for all types enter "Not Applicable" on Summary Form

Appendix B. Salt tolerant plants

Salt sensitivity rating of the estuarine wetland and associated uplands flora of the Pacific Northwest (*=estimated) from Hutchinson (1991). Some species names have changes since 1991. New names as of 10/7/2013 from the 2013 National Wetland Plant List website version 3.1) http://rsgisias.crrel.usace.army.mil/NWPL/index.html# . Names that have not changed are labeled (NC).

OLD NAME	NEW NAME
Very Sensitive	
Tsuga heterophylla	NC
Angelica arguta	NC
Berberis aquifolium	Mahonia aquifolium
Caltha asarifolia	Caltha palustris
Carex rostrata	NC
Equisetum fluviatile	NC
Galium cymosum	Galium trifidum
Habenaria dilatata	Platanthera dilatata
Heracleum lanatum	Heracleum maximum
Hypericum formosum	Hypericum scouleri
Iris pseudoacorus	NC
Juncus nevadensis	NC
Lysichitum americanum	Lysichiton americanus
Mentha arvensis	NC
Mentha piperata	Mentha aquatica
Myosotis laxa	NC
Pichea sitchensis	NC
Rumex acetosella	NC
Sensitive	
*Aira praecox	NC
*Alnus rubra	NC
*Angelica lucida	NC
*Anthoxanthum odoratum	NC
*Athyrium felix-femina	NC
*Calamagrotis nutkaensis	NC
*Carex obnupta	NC
*Cornus stolonifera	Cornus alba
*Equisetum arvense	NC
*Glyceria grandis	NC
*Holcus lanatus	NC
*Hypochaeris radicata	NC
*Lonicera involucrata	NC
*Maianthemum dilatatum	NC
*Physocarpus capitatus	NC
*Polystichum munitum	NC

*Potentilla palustris	Comarum palustre
*Pteridium aquilinum	NC
*Ribes sanguineum	NC
*Vaccinium spp.	NC
Alisma plantago-aquatica	NC
Bidens cernua	NC
Bromus mollis	Bromus hordeaceus
Juncus articulatis	NC
Juncus oxymeris	NC
Lathyrus japonicus	NC
Menyanthes trifoliate	Menyanthes trifoliata
Pyrus fusca	Malus fusca
Rosa gymnocarpa	NC
Rosa nutkana	NC
Rubus spp.	NC
Rumex conglomeratus	NC
Sagittaria latifolia	NC
Scirpus microcarpus	NC
Sium suave	NC
Typha latifolia	NC

Moderately Sensitive

*Ammophila arenaria	NC
*Lathyrus palustris	NC
*Phargmites communis	Phragmites australis
*Rumex crispus	NC
*Salix hookeriana	NC
*Vicia gigantea	Vicia nigricans ssp. Gigantea
Achilea millefolium	NC
Agropyron repens	Elymus repens
Cicuta douglasii	NC
Dactylis glomerata	NC
Limosella aquatica	NC
Lotus ulignosus	Lotus pedunculatus
Lythrum salicaria	NC
Plantago lanceolata	NC
Poa pratensis	NC
Scirpus acutus	Schoenoplectus acutus
Scirpus validus	Schoenoplectus tabernaemontani
Sonchus arvensis	NC
Trifolium spp.	NC

Moderately Tolerant

*Elymus mollis	Leymus mollis
*Hordeum brachyantherum	NC
*Oenanthe sarmentosa	NC
*Phalaris arunidacea	Phalaris arundinacea
*Scripus cernuus	Isolepis cernua
Agrostis alba	Agrostis gigantea

Aster subspicatus	Symphyotrichum subspicatum
Eleocharis acicularis	NC
Eleocharis palustris	NC
Eleocharis parvula	NC
Festuca arundinacea	NC
Festuca ruba	NC
Lolium perenne	NC
Lotus corniculatus	NC
Potentilla pacifica	Potentilla anserina
Ranunculus cymbalaria	NC
Scripus americanus	Schoenoplectus americanus
Trifolium wormskjoldii	Trifolium wormskioldii

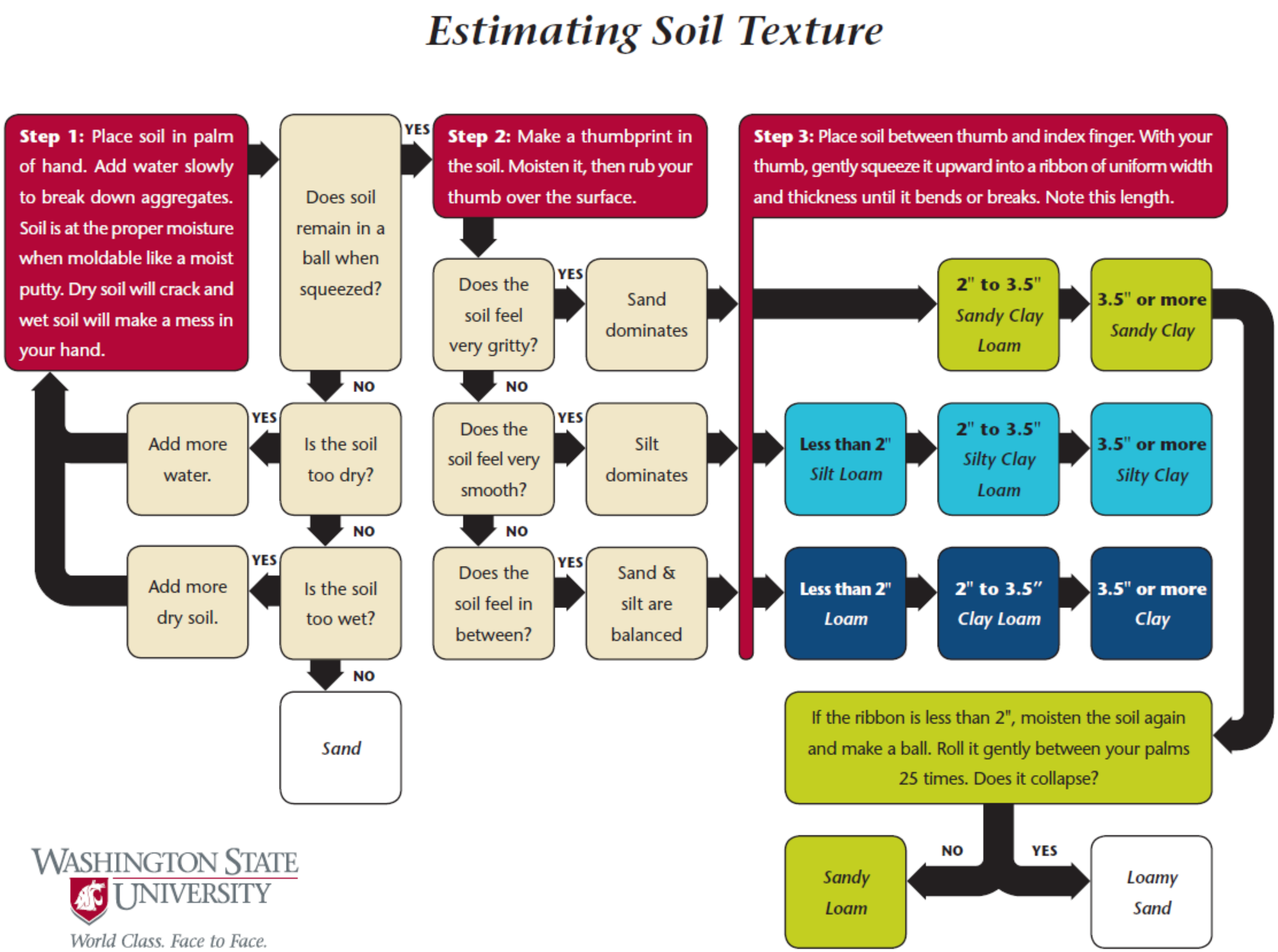
Tolerant

*Orthocarpus castillejoides	Castilleja ambigua
*Typha angustifolia	NC
Carex lyngbyei	NC
Deschampsia caespitosa	NC
Glaux maritima	NC
Hordeum jubatum	NC
Juncus gerardii	NC
Liliaeopsis occidentalis	NC
Scripus maritimus	Schoenoplectus maritimus
Stellaria humifusa	NC

Very Tolerant

*Grindelia integrifolia	NC
*Suaeda maritima	NC
*Triglochin concinnum	Triglochin concinna
*Triglochin maritimum	Triglochin maritima
Atriplex patula	NC
Cotula coronopifolia	NC
Distichlis spicata	NC
Jaumea carnosa	NC
Juncus balticus	Juncus arcticus
Plantago maritima	NC
Salicornia europea	Salicornia depressa
Salicornia viginica	Salicornia depressa
Spergularia canadensis	NC
Spergularia marina	NC

Appendix C. Estimating Soil Texture



Appendix D

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 Western Washington (Ecology publication #04-06-025). 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 western 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 #99-115, #99-116) and as described in Hruby 1999, and Hruby 2009. 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).