Figure 13: A depressional wetland where persistent vegetation is between 1/10 and 1/3 the area of the wetland.

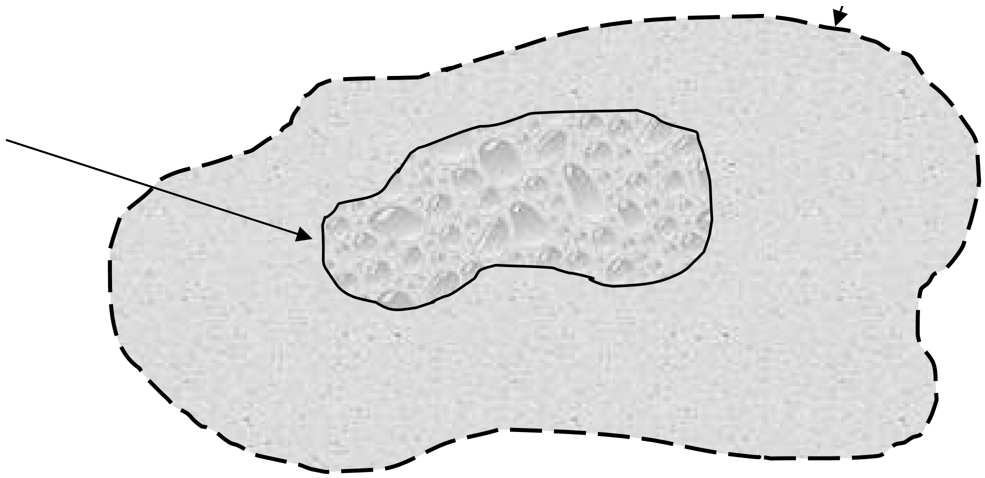
*1.2.4 Characteristics of seasonal ponding or inundation.*

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

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

One way to estimate this area is to make a rough sketch of the wetland boundary, 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 14).

Figure 14: Sketch showing the boundaries of area that is seasonally ponded and permanently ponded. The answer to question 1.2.4 for this wetland is that the area seasonally ponded is more than ½ the total area of the wetland.




The boundary of seasonal ponding will usually coincide with the delineated boundary of the wetland in depressional wetlands of the Columbia Basin. The best indicator of the boundary where ponding lasts for more than two months is the upper edge of the areas where wetland plants are dominant (>50% cover of facultative, facultative-wet, or obligate species). This edge is often very distinct in the Columbia Basin.

There may be periods of time when a depressional wetland is flooded only very briefly during exceptionally heavy rainfall or snowmelt. This area of "brief ponding" should not be counted as "seasonal ponding." For example, if a site is visited during the wet season and wetland vegetation stops before the edge of the area of ponding then the area outside of the wetland vegetation line is probably only "briefly ponded". During the dry season, the boundary of areas ponded for several months (*seasonal ponding*) will have to be estimated by using one or more of the following indicators.

- Water/sediment/debris marks on trees and shrubs (Figure 15). The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.
- Water stained vegetation lying on wetland surface (grayish or blackish in appearance such as downed and fragmented bulrush stems).
- Dried algae left on the stems of emergent vegetation and shrubs and on the wetland surface (Figures 16, 17).

Figure 15: Water mark on tree showing vertical extent of seasonal ponding.

Figure 16: Small depressional wetland covered with algae. The edge of the algae marks the area that is seasonally ponded.

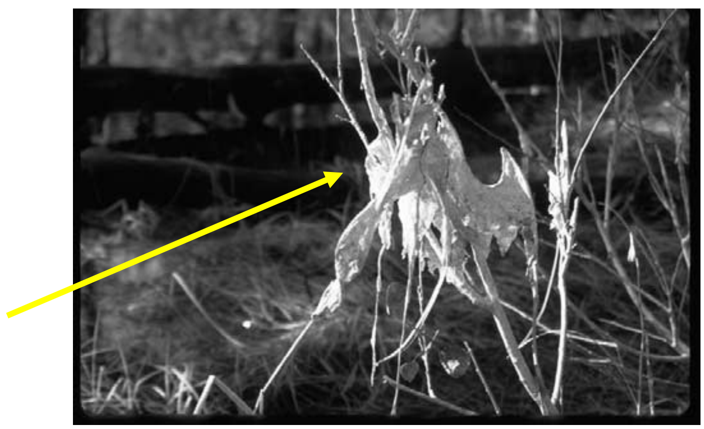


Figure 17: Algae left hanging on vegetation as wetland dried out. The top of the algae marks the vertical extent of seasonal ponding. The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.

**NOTE:** Avoid making visual estimates of area covered by seasonal ponding when standing at the wetland edge. These estimates are usually very inaccurate. A simple sketch, or drawing the boundary on an aerial photograph are much more accurate tools to use for estimating.

The data sheet gives the number of points a wetland should score for the four indicators listed. The scores are based on presence/absence of the characteristics, or some estimate of the area encompassed by that characteristic. Add the scores for the four indicators of function and multiply by [1] or [2] depending on the "opportunity." The total score for the water quality functions should be carried forward to p. 14 of the data sheet.

### 1.3 Questions to Answer for Riverine Wetlands

*1.3.1 Area of surface depressions within 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 et al. 1994), especially when the river floods. Wetlands where a larger part of the total area has depressions are relatively better at removing pollutants 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 wetland boundary and on this superimpose the areas where depressions with surface water present are found. From this you can make a rough estimate of the area that has depressions and determine if this is more than 1/3 or more than 1/10 of the total area of the wetland. Standing or open water is present in the wetland when the river is not flooding are good indicators of depressions. Figure 18 shows a riverine wetland with depressions filled with water. In this case the depressions were created by a beaver.

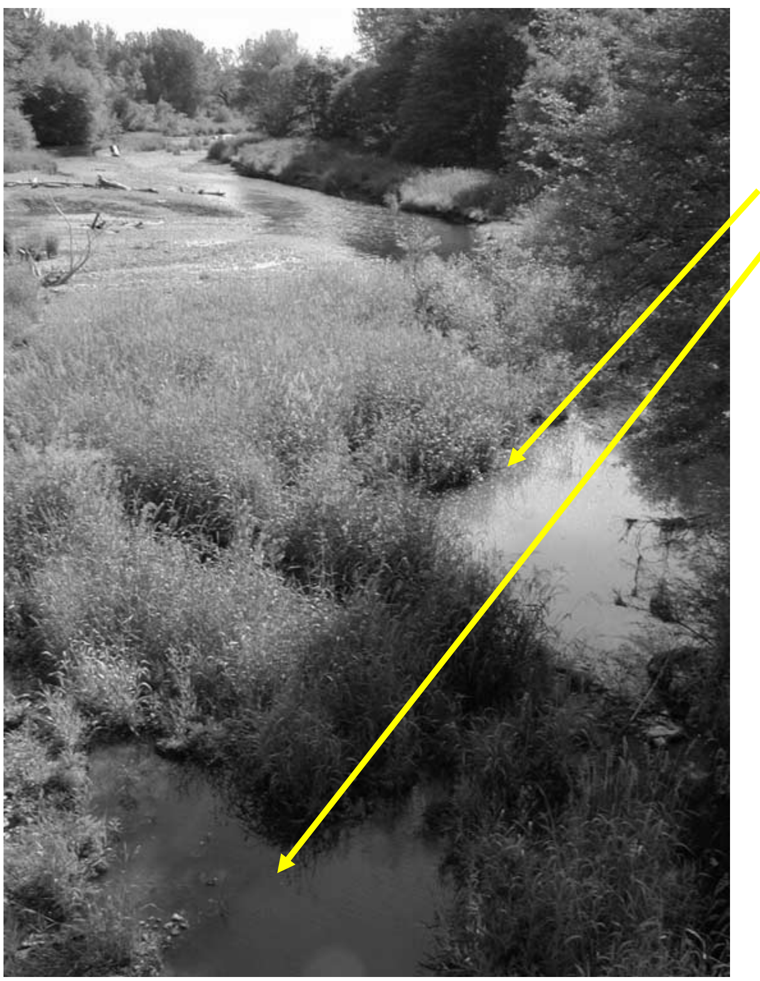


Figure 18: A riverine wetland with two depressions. In this wetland the depressions cover between 1/10 and 1/3 the area of the wetland.

*1.3.2 Characteristics of the vegetation in the wetland:*

**Rationale for indicator**: Vegetation in a riverine wetland will improve water quality by acting as a filter to trap sediments and associated pollutants. Persistent, multi-stemmed plants enhance sedimentation by offering frictional resistance to water flow (review in Adamus et al. 1991). Shrubs and trees are considered to be better at resisting water velocities than emergent plants and are scored higher. Aquatic bed species or grazed emergent plants are not judged to provide much resistance to water flows and are not counted.

For this question you will need to group the vegetation found within the wetland into three categories – 1) Forest or shrub, 2) ungrazed emergent plants (> 6 inches high), and 3) neither forest, shrub nor emergent.

There are two size thresholds used to score this characteristic – more than 2/3 of the wetland area is covered in either emergent, forest, or shrubby vegetation, and more than 1/3 is covered. These thresholds can usually be estimated visually in small wetlands. Large wetlands, however, may require you to draw the area of vegetation types on a map or aerial photo before you can feel confident that your estimates are accurate.

The data sheet gives the number of points a wetland should score for the two indicators of function listed. The scores are based on some estimate of the area encompassed by that characteristic. Add the scores for the two indicators of function and multiply by [1] or [2] depending on the "opportunity." The total score should be carried forward to page 14 of the data form.

### 1.4 Questions to answer for Lake-Fringe Wetlands

*1.4.1. Average width of vegetation 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 persist throughout the year and provide a vertical structure to trap or filter out pollutants. Wetlands in which the average width of emergent, shrub, or forest vegetation is large are more likely to retain sediment and toxic compounds than where vegetation is narrow (Adamus et al 1991).

If you are familiar with the Cowardin classification of vegetation you are looking for the areas that would be classified as "Emergent", "Shrub/scrub," or "Forested." 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.

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 width of vegetation perpendicular to the shore rather than the area of vegetation. There are three thresholds for scoring the average width of vegetation: 1) > 33 ft (10m), 2) 16 ft (5m)- 33 ft, and 3) 6 ft (2m) – 16 ft.

For large wetlands along the shores of a lake it may be necessary to sketch the vegetation and average the width by segment, and then calculate an overall average. Figure 19 gives an example of such a sketch.

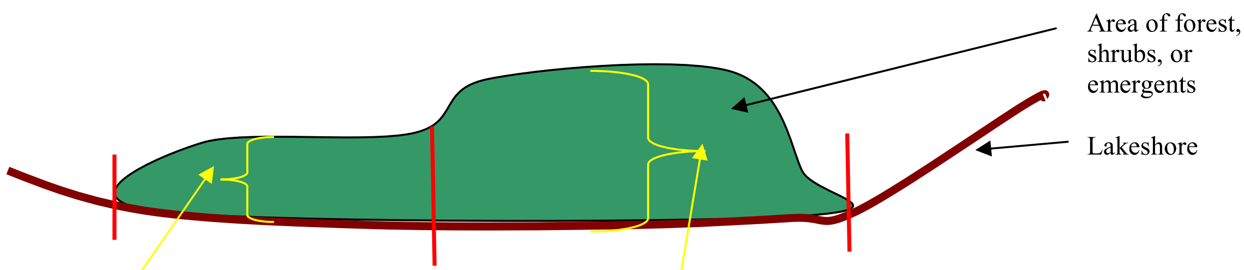



Figure 19: Estimating width of vegetation along the shores of a lake. The average width of vegetation for the entire area is: (20ft x 0.5) + (35 ft x 0.5) = 27.5 ft.

*1.4.2 Characteristics of the vegetation 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. 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). Aquatic bed vegetation is not considered important in sequestering toxic compounds because the toxics will be released in the fall when the plants decompose.

For this question you will need to group the vegetation found within the wetland into three categories – 1) emergent 2) any other persistent vegetation (forest, shrub, or mixture of types), and 3) aquatic bed. These categories of plants are based on the "Cowardin" classification of wetlands (see p. 26).

There are three size thresholds used to score this characteristic – more than 90% of the vegetated area is covered in emergent plants; more than 1/3, or more than 2/3, is covered in either emergent, persistent, or aquatic bed vegetation. These thresholds can usually be estimated visually in small wetlands. Large wetlands, however, may require you to draw the area of vegetation types on a map or aerial photo before you can feel confident that your estimates are accurate. NOTE: In lake-shore wetlands the area of the wetland used as the basis for determining thresholds is only the area that is vegetated. Do not include any open water in determining the area of the wetland covered by a specific vegetation type.

The data sheet gives the number of points a wetland should score for the two indicators of function listed. Add the scores for the two indicators of function and multiply by [1] or [2] depending on the "opportunity." The total score should be carried forward to page 14 of the data form.

## 1.5 Questions to answer for Slope Wetlands

### *1.5.1 Characteristics of average slope of wetland:*

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

For this question you will need to estimate the average slope of the wetland. Slope is measured either in degrees or as a percent (%). In this rating system 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 foot 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 USGS 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. 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 "imaginary" 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 20). NOTE: If you are standing at the upper edge of the wetland looking for a visual marker at the lower edge, do not forget to subtract your height from the total.

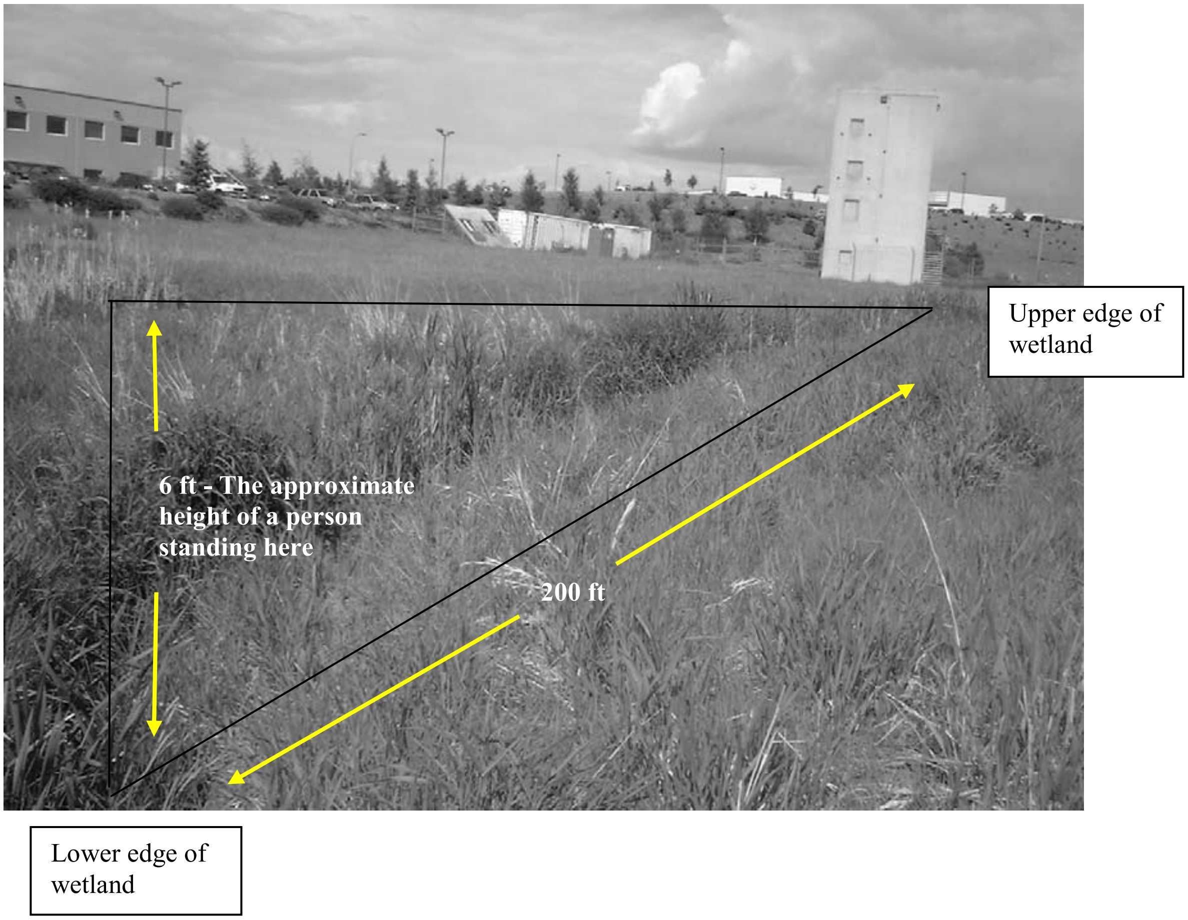



Figure 20. Estimating the slope of a small "slope" wetland. The head of a six foot person is about level with the upper edge of the wetland. The average slope is approximately 6/200 or 3%.

*1.5.2 The soil 2 inches below the surface is clay, organic, or smells anoxic (hydrogen sulfide or rotten eggs).*

**Rationale for indicator**: Clay soils, organic soils, and periods of anoxia in the 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). Anoxic conditions (oxygen absent), on the other hand, are needed to remove nitrogen from the aquatic system. This process, called denitrification, is done by bacteria that live only in the absence of oxygen (Mitsch and Gosselink 1993).

To look at the soil, dig a small hole within the wetland boundary and pick up a sample from the area that is about 2 inches below the surface. 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. First smell the soil and determine if it has a smell or hydrogen sulfide (rotten eggs). If so you have answered the question. If the soil is not anoxic, determine if the soil is organic or clay. If you are unfamiliar with the methods for doing this a key is provided in Appendix B.

*1.5.3 Characteristics of the vegetation 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 vegetation presents 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 vegetation found within the wetland into only two groups: dense, ungrazed, herbaceous vegetation and all other types. NOTE: **The Cowardin vegetation types are not used for this question.** For this question the herbaceous vegetation includes the areas of "emergent" vegetation 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 classification).

The data sheet gives the number of points a wetland should score for the three indicators of function listed. Add the scores for the indicators of function and multiply by [1] or [2] depending on the "opportunity." The total score should be carried forward to page 14 of the data form.

## Section 2: Questions Relating to the Hydrologic Functions

**2.1 Opportunity multiplier** – Does the wetland have the opportunity to protect human and natural resources from damage caused by flooding or erosion from wave action? This question applies to wetland of all HGM classes, but you will need to consider different factors for Lake-fringe wetlands.

> **Rationale for the indicator**: The opportunity for wetlands to reduce the impacts of flooding and erosion is based on the presence of human or natural resources that can be damaged by these processes. The indicators used characterize whether the wetland's position in the landscape will allow it to reduce flooding. We ask if there are resources in the watershed that can be damaged by flooding and erosion. These resources include both human and natural ones.

**For Depressional, Riverine, or Slope Wetlands** the question is: Is the wetland in a landscape position where the flood storage, or reduction in water velocity, it provides reduces damage to downstream property and aquatic resources?

This question requires you to consider the resources that might be impacted by flooding or erosive flows. Are there stream banks that might be eroded, structures that can be damaged, or natural resources that can be damaged in areas downgradient from the wetland?

One way to consider this question is to ask yourself, where would the surface water coming into a wetland go if the wetland were filled? The surface water that would have been stored in the wetland during a summer storm or winter melt-off has to go somewhere. If the additional water can increase flooding or erosion downstream the wetland has the "opportunity" to perform the functions. A USGS topographic map is a good tool to use to answer this question. The map will show buildings, bridges, or other structures in the floodplain of a river or stream. An aerial photograph can also be useful to identify resources that might be impacted by increases in surface flows.

The landscapes in eastern Washington are quite varied and it may be difficult to judge whether a wetland has the opportunity to perform hydrologic functions. The following points are provided as a guide to help you answer this question.

- Many depressional wetlands with no surface water outflow have the opportunity to perform the hydrologic functions because they are upgradient of resources. They are actually performing the hydrologic functions at the highest levels possible. No surface water leaves the wetland to cause downgradient flooding or erosion. The water either infiltrates to groundwater or it evaporates. To answer the "opportunity" 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.
- A wetland has to receive surface water (either storm or snowmelt) in order for it to reduce flooding. If the source of water to a wetland is groundwater only, then it does **not** have the opportunity to perform the function because it receives no surface water that might cause flooding or erosion further downgradient. Generally, alkali wetlands are so dominated by groundwater that they are judged

not to have the opportunity to perform the hydrologic functions defined in this rating system.

- A wetland that receives only return flow from irrigation also does **not** have the opportunity 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.
- A Wetland that are adjacent to, or discharge directly to large reservoirs where water levels are controlled does **not** have the opportunity to perform the hydrologic functions. The reservoir acts to buffer the impacts of the loss of water storage if a wetland were filled. For this reason, riverine, depressional, or slope wetlands that are near to the reservoirs on the Columbia and Snake Rivers are considered not to have the "opportunity."
- At first glance, it may be difficult to understand how slope wetlands even perform the hydrologic functions, and thus have an opportunity. Consider, however, a case where the slope wetland is covered with a parking lot. Surface runoff will leave the parking lot much faster than if the area is covered with a dense growth of emergent plants. It is the physical structure provided by plants and small depressions that act to retard surface flows. This in turn spreads the peak runoff from a storm and decreases downstream flooding or erosion. Slope wetlands have the opportunity to perform the hydrologic functions if there are resources downgradient that can be impacted by flooding or erosive flows.

**For Lake-Fringe Wetlands the question is:** Are there features along the shore that will be impacted if the shoreline erodes?

Lake-shore wetlands provide a vegetated buffer along the shore that reduces the erosive impact of waves. This is especially important in larger lakes where recreational boats generate large waves, or winds can blow large distances over exposed water.

Lake-shore wetlands have the opportunity to protect a shoreline from erosion if there is some resource that could be impacted 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.

**To complete the next part of the data form you will first need to classify the wetland into one of the four hydrogeomorphic classes. Answer only the questions that pertain to the HGM class of the wetland being rated.**

## 2.2 Questions to answer for Depressional Wetlands

*2.2.1 Characteristics of surface water outflows from the wetland (this indicator applies to both the water quality and the hydrologic functions):* See the description for question 1.2.1.

> **Rationale for indicator**: Wetlands with no outflow are more likely to alter floodflows than those with outlets, and those with a constricted outlet will more likely alter floodflows than those with an unconstricted outlet (review in Adamus et al. 1991). Wetlands with seasonal flows in eastern Washington are more likely to alter floodflows than those with permanent flows because these wetlands usually dry up between the times water flows out. This means that the water level will fall below the lip of the outlet and additional storage will be created.

This question is answered the same way as question 1.2.1. The difference between 1.2.1 and 2.2.1, however, is in the scores assigned each type of outflow. Differences in scores are based on the difference in importance of the outflow characteristics on the water quality functions and the hydrologic functions.

*2.2.2 Depth of storage during wet periods:*

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

The depth of the water stored during the wet periods can be estimated as the difference in elevation between the upper edge of seasonal ponding/inundation and the low point of the wetland as described below (see figure 21) .

For wetlands that have areas of permanent ponding, the lowest point is the surface of the permanent ponding (as measured at its lowest point, typically in late summer and fall). See Figure 22for an example. You should estimate the height of seasonal ponding above that. For wetlands that have no areas of permanent ponding, locate the lowest point in the wetland and measure the depth of the ponding above that.

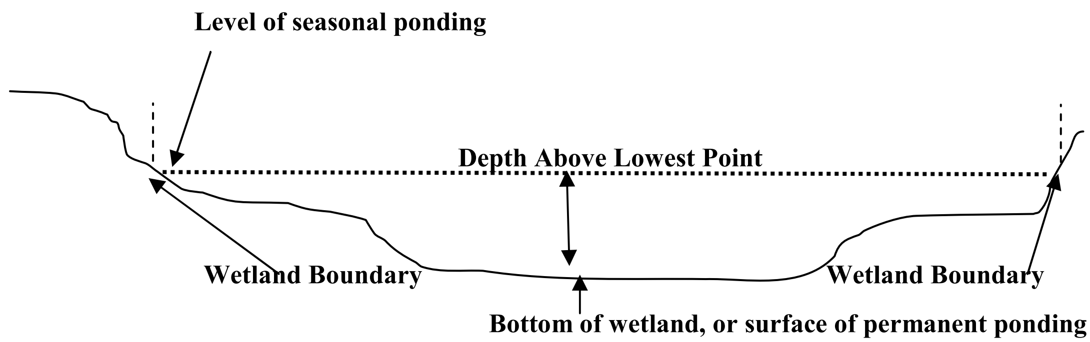



Figure 21 – Measuring maximum depth of seasonal ponding.

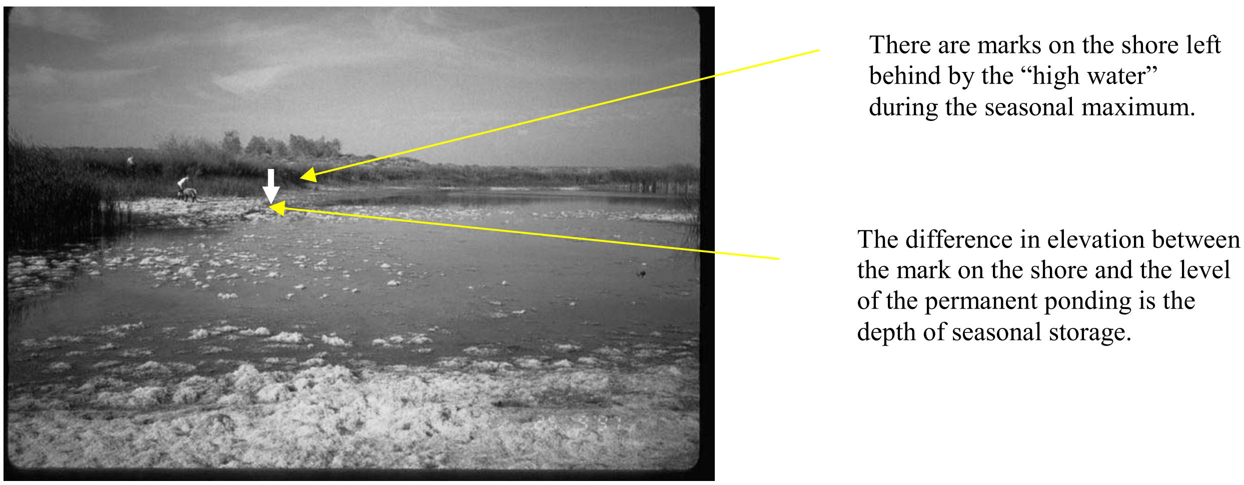



Figure 22: A depressional wetland with permanent water present. This is the maximum extent of summer “drawdown in the wetland. The difference between this level and the seasonal high water mark is more than three feet.

NOTE: During the winter and spring it may be difficult to identify the level to which the water drops during the summer. In general, the level will usually be at the edge of the area dominated by large, obligate emergent plants such as *Scirpus acutus* or *Typha latifolia.*(Figure 23). Use the lower edge of this vegetation as the “bottom” from which to estimate the depth of seasonal ponding. Estimate the difference in elevation between the bottom of the plants and any marks of ponding or inundation along the shore to estimate the depth of seasonal ponding.

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

Figure 23: A depressional wetland with water level close to its seasonal maximum. This is the same wetland as shown in Figure 22 but photographed in March rather than late September.

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

<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 are however, important in reducing peak flows because they slow down and “desynchronize” the initial peak flows from a storm (Brassard, et al. 2000). Their importance in hydrologic functions is often under-rated (statement of Michael L. Davis, Deputy Assistant of the Army, before the committee on Environment and Public Works, Subcommittee on Clean Air, Wetlands, Private Property and Nuclear Safety, United State Senate, June 26, 1997). 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 as least 6 points, out of 8 possible, regardless of the depth of seasonal storage.

To identify if the wetland being rated is a “headwater” wetland, use the information collected in question 2.2.1. If the wetland has a permanent or seasonal outflow but <u>NO</u> inflow from a permanent or seasonal stream, it is probably 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 irrigation practices. Depressional wetlands at the base of dams or edge of irrigation canals are not headwater wetlands, even if they have surface water that flows out of them.

> Headwater wetlands may be the one type of wetland in eastern Washington that contributes water to streams during the late summer and fall (baseflow support). Although this hydrologic function is not judged to be important in other wetlands, it may be in this type of wetland. For this reason, two of the eight points in the score for hydrologic functions in headwater wetlands is assigned for this function.

### 2.3 Questions to answer for Riverine Wetlands

*2.3.1 Characteristics of the flood storage the wetland provides, based on the ratio of the channel width to the width of the wetland.*

**Rationale for indicator**: The ratio of channel width to width of wetland is an indicator of the relative volume of storage available within the wetland. The width of the stream between banks is a good indicator of the relative flows at that point in the watershed. Wider streams will have higher volumes of water than narrower streams. More storage is therefore needed in larger systems to lessen the impact of peak flows. The width 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 the units relative to each other in terms of their overall storage potential.

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

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

- If the vegetated wetland lies within the banks of the stream or river, the ratio is estimated as the average width of the "delineated" wetland / average distance between banks. Figure 24 shows a wetland where vegetation fills the entire distance between the banks. In this case the ratio is 1. Figure 25 shows a small vegetated wetland on a gravel bar where the distance between banks is much greater than the width of the wetland. In this case the ratio is < ¼.

Distance between banks is the same as the width of the wetland perpendicular to stream flow. The ratio is 1.

Figure 24. A riverine wetland where the width of the wetland is the same as the distance between banks.


Figure 25: A riverine wetland where the ratio of the width of the wetland to the distance between banks is less than ¼ (30 ft / 150 ft = 0.2).

- If the wetland lies outside the existing banks of the river you may need to estimate the distances using a map or aerial photograph. Riverine wetlands in old oxbows may be some distance away from the river banks. Instead of trying to estimate a width for the wetland and the distance between banks in feet or yards, it may be easier to estimate the ratio directly. Ask yourself if the average width of the wetland is more or less than the distance between banks. If it is more, is it more than twice as wide? If not the ratio is between 1-2. If the width of the wetland is less than the distance between banks, use the same process: is it less than ¼, or is it less than ½? Figure 26 shows a riverine wetland in an old oxbow where the ratio was judged to be between 1-2.

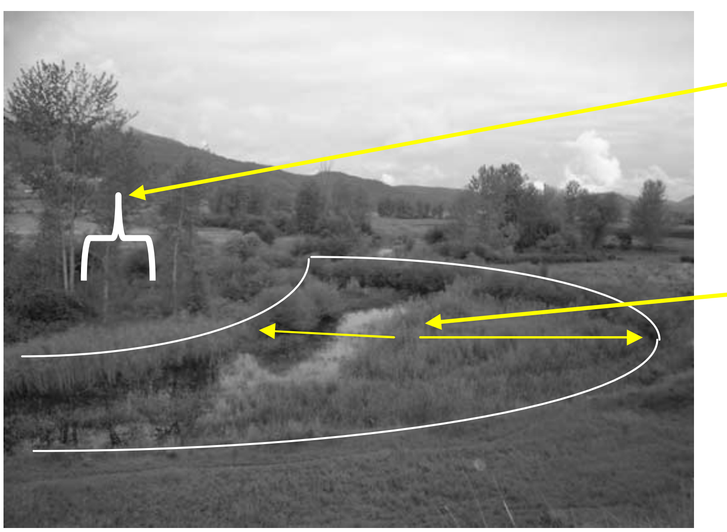



Figure 26: A riverine wetland in an old oxbow of the Colville River where the ratio of width of wetland to distance between banks is between 1 – 2.

*2.3.2 Characteristics of vegetation that slow down water velocities during floods.*

**Rationale for indicator**: Riverine wetlands play an important role during floods because the their vegetation acts 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 (called flood desynchronization). The potential for desynchronization will be greatest where the density of wetland vegetation and other obstructions is greatest and where the rigidity of the obstructions is adequate to resist flood velocities (Adamus et al. 1991). The indicator used in the rating system 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 vegetation found within the wetland into two categories – 1) emergent, and 2) forest and/or shrub. These categories of plants are based on the "Cowardin" classification of wetlands (see p. 24).

There are five size thresholds used to score this characteristic – 1) Forest or shrub for more than 2/3 the area of the wetland, forest or shrub for >1/3 area OR Emergent plants > 2/3 area, and forest or shrub for > 1/10 area OR Emergent plants > 1/3 area.

NOTE: If the wetland is covered with downed trees, you can treat large woody debris as "forest or shrub".

**2.4 Question to answer for Lake Fringe Wetlands**

*2.4.1. Average width, and characteristics, of vegetation 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 et al. 1991). Wetlands that have extensive, persistent (especially woody) vegetation provide protection from waves and currents associated with large storms that would otherwise penetrate deep into the shoreline (Adamus et al 1991). Emergent plants provide some protection but not as much as the stiffer shrubs and trees.

If you are familiar with the Cowardin classification of vegetation you are looking for the areas that would be classified as "Shrub/scrub," or "Forested."

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 vegetation found only within the area of shrubs, trees, and emergents. There are two thresholds for scoring the average width of vegetation: 33 ft (10m) and 6 ft (2m).

For large wetlands along the shores of a lake it may be necessary to sketch the vegetation types and average the width by type. Figure 27 gives an example of such a sketch.

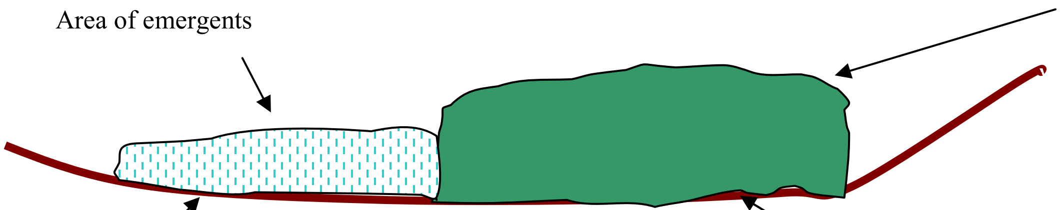



Figure 27: Estimating width of vegetation types along the shores of a lake. The average width of shrubs is 35 ft for ½ the wetland and emergents is 20 ft for ½ of the wetland. This wetland would score 4 points because more than 1/4 of the vegetation is shrubs greater than 33ft. wide.

## 2.5 Questions to answer for Slope Wetlands

### *2.5.1 Characteristics of vegetation 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. Vegetation 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). The importance of vegetation on slopes in reducing flows has been well documented in studies of logging (Lewis et al. 2001) though not specifically for slope wetlands. The assumption is that vegetation in slope wetlands plays the same role as vegetation in forested areas in reducing peak flows.

For this question you will need to estimate the area of two categories of vegetation found within the wetland: dense, ungrazed, rigid vegetation and all other vegetation. This indicator of vegetation 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. **Ungrazed** means that the height of the vegetation has not been reduced significantly by grazing. "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 are three size thresholds used to score this characteristic: dense, ungrazed, erect vegetation for more than 90% of the area of wetland (see Figure 28), ½ the area, and ¼ the area. The wetland in Figure 29 was grazed over much of its area, except where the *Juncus sp.* was growing. The grazed vegetation was less than 6 in. high, so the only plants that were included for this indicator were the Juncus. The wetland in Figure 29 has less than ¼ of its area with dense, ungrazed, erect vegetation.

Figure 28: A slope wetland with dense erect, ungrazed vegetation (bulrushes) over more than 90% of its area.

*2.5.2 Characteristics of slope wetland that hold back small amounts of flood flows.*

**Rationale for indicator**: The intent of this question is to characterize how much of the wetland is covered by small depressions that can hold back surface flows. Depressions are an important indicator of the ability to retain flood-waters (review in Adamus et al. 1991). Slope wetlands usually do not have large depressions within their boundaries, but several slope wetlands in eastern Washington were found with small depressions that were judged to be large enough to provide some water retention (3 ft across and 6-10 inches deep).

To answer this question you will have to walk throughout the wetland and note the topography of the surface. If the slope wetland has depressions they will usually be dispersed throughout most of the wetland area. Depressions may be found near clumps of different vegetation, boulders, or in swales where the slope changes (Figure 29). Heavily grazed slope wetlands often have small depressions created by the cattle. For this question you will need to estimate if the depressions cover more or less than 10% of the total wetland area.

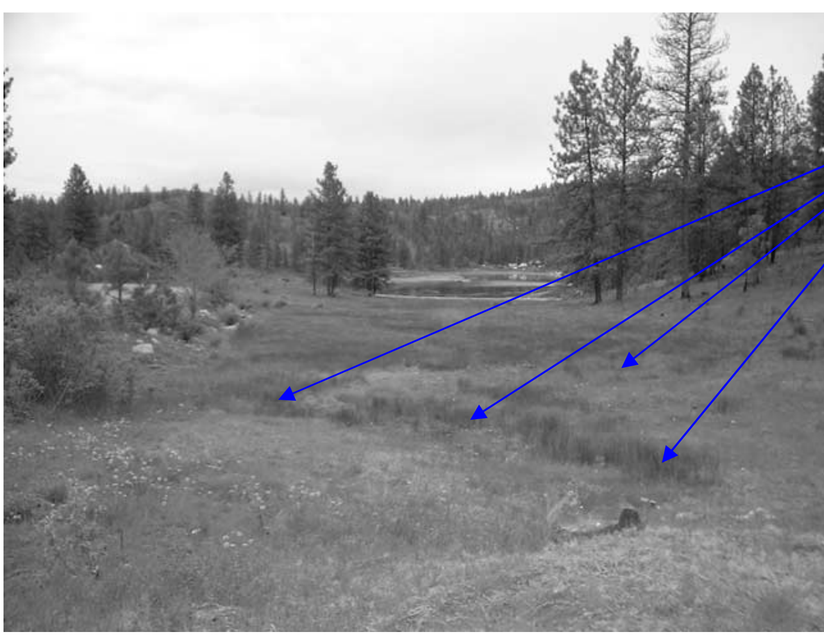



Figure 29: Slope wetland with numerous small depressions created by changes in slope and heavy grazing. The depressions in the wetland pictured in Figure 33 covered about 15-20% of the wetland and met the criterion of >10% of the area.

## Section 3: Questions Relating to Habitat Functions

Questions 3.1 to 3.6 relate to indicators that the wetland has the **potential** to provide habitat. Questions 3.7 to 3.10 relate to indicators that the wetland has the **opportunity** to provide habitat. Question 3.11 asks about an indicator of "reduced" function and its score is negative.

*3.1 Vegetation structure:*

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

**NOTE 1: Each vegetation class or height category of emergent species has to cover more than ¼ acre, or 10% of the wetland for wetlands smaller than 2.5 acres, to be counted.**

"Cowardin" vegetation classes are distinguished on the basis of the uppermost layer of vegetation (forest, shrub, etc.) that provides more than 30% surface cover within the area of its distribution (see p. 25).

**NOTE 2**: Aquatic Bed plants do not always reach the surface and care must be taken to look beneath the water's surface. Because waterfowl can heavily graze certain species of aquatic bed early in the growing season, it can be incorrectly concluded that aquatic bed is not present if the assessment is made during this time period**. Therefore, examine the substrate in open water areas for evidence of last year's growth of aquatic bed species.** If a wetland is being rated very late in the growing season, when either the standing water is gone or very limited in extent, examine mudflats and adjacent vegetated areas for the presence of dried aquatic bed species (Figure 30).

**NOTE 3:** If a vegetation type is distributed in several patches, the patches can be added together if the patches are large enough that 10 or less of them are needed to meet the size threshold (average patch size is greather than 10% of threshold).

Figure 30. Aquatic bed plants that have been bleached by the sun and left stranded as the water levels receded during the summer.

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

Do not count the actual vertical height of vegetation that is broken or lying down when identifying structure categories. Use the estimated vertical height of vegetation before it was knocked down. Figure 31 shows a wetland with three concentric rings of emergent plants of different heights.

**NOTE 1**: You cannot assume that a plant species will always be of the same height category. Reed Canary grass is a good example. This species will grow to be 6 ft. tall in nutrient rich wetlands, but it will be less than 40” tall if it is stressed by too much water. The same can be said for *Juncus effusus* which is usually 12-40” tall but can reach 5 feet in some wetlands.

**NOTE 2**: If a category is patchy, patches can be added together when 10 patches or less are needed to meet the size threshold (average patch size is greater than 10% of threshold).


Figure 31: A depressional wetland with three height classes of emergent plants.

*3.2 Is one of the vegetation types "aquatic bed?"*

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

Add one point to the habitat score if the wetland was categorized as having aquatic bed vegetation in 3.1 above.

*3.3 Surface Water:*

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

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

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

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

- If the entire central (or deepest) part of the wetland is covered with large species such as cattails and bulrushes (see Figure 31), you can assume the wetland **does not** have open water.
- If the wetland still has standing water outside the zone of emergent plants in July or October, you can assume the wetland **does** have open water during the spring and late summer (see Figure 30).
- If the wetland has exposed areas of "mudflats" without any vegetation (Figure 32), you can assume the wetland **does** have open water.

Figure 32: A mudflat indicates the presence of open water earlier in the season.

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

*3.3.2 Does the wetland have an intermittent or permanent stream within its boundaries or along one side that has an unvegetated bottom (answer only if 3.3.1 is NO)?*

Consider this question only if the wetland does not have any open water as defined in 3.3.1. Some riverine wetlands or depressional wetlands without "open" water may have a stream or river adjacent or within it. The open water provided by the stream plays a similar ecological role as the "open" water defined above. If you answered NO to 3.3.1 you will need to determine if there is a permanently or seasonally flowing stream or river in the wetland. To answer "yes" for this question the stream or river needs to have defined banks with a bottom that is not vegetated and cover at least 10% of the wetland area. Also answer "yes" if the wetland is along the side of a stream or river with an unvegetated area that is at least 17 ft (5m) wide.

*3.4 Richness of Plant Species:*

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

As you walk through the wetland or do your delineation, keep a list of the patches of different plant species you find. You do not have to record individual plants, only species that form patches on the landscape that cover at least 10 square feet. Different patches of the same species can be combined to meet the size threshold.

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

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

*3.5 Interspersion of Habitats:*

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

In question 3.1 you determined how many different vegetation types are present in the wetland being rated and in question 3.3 you determined if there was any open water present. This question uses the information from both questions and asks you to rate the "interspersion" between all these structural characteristics of the wetland. The diagrams on the data form show what is meant by ratings of High, Medium, Low, or None. Each area with a different shading represents a different habitat structure, either a vegetation type or open water.

To answer this question first consider if the interspersion falls into the two "default" ratings. If the wetland has only one vegetation category present (question 3.3.1) and no open water, it will always be rated as NONE (see Figures 6, 7). If the wetland has four vegetation categories (question 3.3.1), or three categories and open water (question 3.3.3) it will always be rated as HIGH. The only time you will have to make a decision is when the wetland has two or three categories of structure.

For example, the wetland in Figure 31 has three concentric rings of different size emergent plants and no open water. This wetland is rated as Moderate for interspersion (see the fourth diagram on the data form). The wetland in Figure 33 has one vegetation type and open water in a concentric system. It is rated as LOW (see the second diagram on the data form).

Additional points for determining the rating are:

- Lake-shore wetlands will always have <u>at least</u> two categories of structure (open water and one type of vegetation).
- A wetland with a meandering, unvegetated, stream (seasonal or permanent) should be rated MODERATE if it has only one vegetation category, or HIGH if it has two or more.

- Several isolated patches of one structural category (e.g. patches of open water) should be considered the same as one "patch" with many lobes (see the last diagram on the data form).

Figure 33: A depressional wetland with one height category of emergent plants and open water. The interspersion is rated as LOW.

*3.6 Special Habitat Features:*

**Rationale for indicator**: There are certain habitat features in a wetland that provide refuge and resources for many different species. The presence of these features increases the potential that the wetland provides a wide range of habitats (Hruby et al. 2000). These special features include: 1) rocks within the area of surface ponding, 2) large downed woody debris in the wetland, 3) cattails or bulrushes as indicators of long periods of ponding, 4) snags, 5) emergent or shrub vegetation in areas permanently ponded, and 6) steep banks of fine material that might be used by aquatic mammals for denning.

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

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

- Rocks > 4 inches (10cm) in diameter within the area that is seasonally or permanently ponded (Figure 34).
- Large woody debris within the wetland that is more than 4 inches in diameter at the base (Figure 35).
- Presence of cattails (*Typha* sp.) or Bulrushes (*Scirpus acutus*).
- Snags present in the wetland, or in the first 30 ft of the buffer, that are more than 4 inches in diameter at breast height.
- Steep banks of fine material for denning, or evidence of use of the wetland by beaver or muskrat. Look for banks that are at least 33 ft long, 2 ft. high within or

immediately adjacent to the wetland and determine if they have the following characteristics: steep bank of at least 45 degrees slope, with at least a 3 foot depth of fine soil such as sand, silt, or clay.  Recently cut trees and shrubs where the cuts are conical are good evidence of beaver use (Figure 36).

Figure 34: Rocks within area of surface ponding.

Figure 35: Large woody debris in wetland.

Figure 36: Evidence of beaver activity.  Note the conical shape of the cut.

Make a check on the data sheet next to the description of each habitat feature.  When you have checked for the presence of each, add the total that are present and record that as a score in the left hand column.

**The previous seven indicators were all related to the potential a wetland has to provide habitat for a wide range of species. The next four questions relate to the opportunity a wetland has to provide habitat.**

*3.7 Buffers:*

**Rationale for indicator**: The condition of the buffer affects the ability of the wetland to provide appropriate habitat for a wide range of wetland dependent and upland species. Undisturbed buffers provide access (i.e. opportunity) to the wetland, thereby increasing the suitability of the wetland itself as habitat. For a review of how buffers affect the opportunity of a wetland to provide habitat see McMillan (2000).

Determine the condition of the buffer around the wetland using the descriptive key in the data form. If the condition of the buffer does not match the description exactly, use the category that most closely matches. The categories focus on the width of the relatively undisturbed areas and its relative length along the circumference of the wetland. The buffer areas adjacent to the wetland may be wetland, deep open water, or upland areas.

First determine if there are any relatively undisturbed areas of forest, shrub-steppe, grassland (not currently grazed or tilled), or open water in the buffer. The buffer is defined as the area within 330 ft (100 m) of the edge of the wetland.

NOTE: The criteria for categorizing the buffer are hierarchical. This means that you determine if the buffer meets the first criterion. If it does, it is scored 5 points. If it does not have a relatively undisturbed area of 330 ft (100 m) or more for more than 95% of its circumference, you determine if it matches the criterion for a buffer with a score of 4. If none of these criteria can be met, go to the criteria for the third category and assign 3 points if they are met, etc.

Figure 37: A wetland with no vegetated buffer. It scores a 0 on the buffer question.

*3.8 Wet Corridors:*

Answer these questions in sequence. If you answer YES record the appropriate points and go to question 3.9. You only get one set of points for this question, even if more than one of the indicators is present.

**Rationale for indicator**: Creeks and other drainages, especially in the drier portions of eastern Washington, have been shown to be important dispersal and foraging areas for both terrestrial and aquatic species including amphibians, mammals, and birds. Corridors provide areas for hibernation, foraging, and migration and dispersal for some amphibians (Nussbaum and others 1983, Seaburn 1997, W. Leonard, personal communications). The presence of natural corridors with water in them increases a wetland's opportunity to provide habitat because there is a larger pool of species that can use the wetland (Hruby et al. 2000). In the absence of corridors with water in them, a wetland still has a better opportunity to provide habitat if there are other aquatic resources nearby. Reasons include: 1) a variety of upland habitat niches interspersed with different water sources results in greater habitat partitioning; 2) more opportunities for refuge, food and migration; and 3) more opportunity for re-colonization by wildlife species in years of drought (Hruby et al. 2000).

*3.8.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor with surface water or flowing water throughout most of the year (> 9 months/yr)?*

Start by looking for streams or channels coming into the wetland or leaving it. Man-made ditches with flowing water can count as "wet" corridors. Generally, this is the same as a "riparian" corridor, but this term is not being used because of its many definitions. The term "wet" is used rather than "riparian" to avoid confusion with the many definitions of the latter term.

The next question is to determine if the water flows, or is present, for most of the year or only seasonally. If you visit the wetland during the summer and fall (dry season) and find flowing water you can assume the flow occurs throughout most of the year (unless the primary source of water is irrigation). If, however, you find water in the channel or stream during the spring, it may be harder to determine whether flow continues throughout most of the year. Ask local residents to determine if the flow is only seasonal. This may be the easiest way to determine the question. If this is not possible, you will have to use your judgment and base your answer on your interpretation of the landscape, size of watershed, annual rainfall, presence of irrigation, etc.

**NOTE 1:** The wet corridors must be relatively undisturbed, unbroken, and vegetated (at least 30% cover of any vegetation) to score points. Potential breaks in a wet corridor include road grades without culverts, paved roads, dams, heavily used gravel roads, fields tilled to the edge of stream, or pasture to edge of stream. Disturbances include residential areas within 100 ft of the stream or heavy to moderate grazing. Gravel roads that are not often used can be considered as "relatively undisturbed." If, however, the gravel road crosses the corridor on a dike or berm without any culvert it should be considered as a "break" in the wet corridor.

**NOTE 2:** The lake adjacent to a Lake-fringe wetland is not considered a "wet" corridor because it is not vegetated. If your wetland is a lake-fringe wetland, answer question 3.8.2 as YES and add 2 points to the score rather than 4.

**NOTE 3**: The status of some riverine wetlands may be hard to determine. If the riverine wetland has a surface water connection to the main river, or one side of the wetland is adjacent to the river, answer YES for question 3.8.1. If, however, the wetland lies in the floodplain and is "connected" to the river only during floods answer NO to question 3.8.1 and YES to question 3.8.2.

*3.8.2 Is the wetland part of a relatively undisturbed and unbroken, vegetated corridor, with water flowing seasonally **OR** a Lake-fringe wetland?*

If there is a stream or channel connecting the wetland to other aquatic resources and you know the surface water there is only seasonal, answer YES to this question. The other case where you answer YES is if the wetland is classified as a Lake-fringe wetland or a riverine wetland without direct water connection to the river except during floods.

*3.8.3 Is the wetland within a 1/2 mile of any permanent stream, seasonal stream, or lake (do not include man-made ditches)?*

If there are no "wet" corridors connecting to the wetland, determine if there are streams, rivers, or lakes nearby within ½ mile. A wetland with a broken, unvegetated, or disturbed wet corridor should be scored YES for this question.

*3.9 Near or adjacent to other priority habitats listed by WDFW:*

**Rationale for indicator**: The Washington State Department of Fish and Wildlife has identified special habitats with unique or significant value to a diverse assemblage of species. The presence of these habitats increase a wetland's opportunity to provide important habitat resources because the unique species found in these priority habitats will use the wetland for foraging and water. The importance of a wetland as a habitat resource in the landscape increases if it is used by the unique, critical, or rare species associated with the priority habitats.

You are asked to determine if any of the following terrestrial priority habitats are within 330 ft of the wetland (100m). The descriptions of the habitats are copied directly from WDFW and any updates are available on the department's web page - http://www.wa.gov/wdfw/hab/phspage.htm.

**Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres).

**Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 1524 m (5000 ft).

**Old-growth east of Cascade crest:** Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 25 trees/ha (10 trees/acre )> 53 cm (21 in) dbh, and 2.5-7.5 snags/ha (1 - 3 snags/acre) > 30-35 cm (12-14 in) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered.

Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions.

**Mature forests**: Stands with average diameters exceeding 53 cm (21 in) dbh; 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 and 80 - 160 years old east of the Cascade crest.

**Prairies and Steppe:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community.

**Shrub-steppe:**

Large Tracts: Tracts of land >259 ha (640 ac) consisting of plant communities with one or more layers of perennial grasses and a conspicuous but discontinuous layer of shrubs. Large tracts of shrub-steppe contribute to the overall continuity of the habitat type throughout the region because they are relatively unfragmented, contain a substantial amount of interior habitat, and are in close proximity to other tracts of shrub-steppe. These tracts should contain a variety of habitat features (e.g., variety of topography, riparian areas, canyons, habitat edges, plant communities). Another important component is habitat quality based on the degree with which a tract resembles a site potential natural community, which may include factors such as soil condition and degree of erosion; and distribution, coverage, and vigor of native shrubs, forbs, grasses, and cryptogams.

Small Tracts: Tracts of land <259 ha (640 ac) with a habitat type consisting of plant communities with one or more layers of perennial grasses and a conspicuous but discontinuous layer of shrubs. Although smaller in size and possibly more isolated from other tracts of shrub-steppe these areas are still important to shrub-steppe obligate and other state-listed wildlife species. Also important are the variety of habitat features and habitat quality aspects as listed above.

**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.

**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages (including associated dendritic tubes, cracks, and fissures) which occurs under the earth in soils, rock, ice, or other geological formations, and is large enough to contain a human. Mine shafts may mimic caves, and those abandoned mine shafts with actual or suspected occurrences of priority species should be treated in a manner similar to caves. A mine is a man-made excavation in the earth usually used to extract minerals.

**Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%; or where total canopy coverage of the stand is <25%, but oak accounts for at least 50% of the canopy coverage present. The latter is often referred to as oak savanna. East of the Cascades, priority oak habitat consists of stands 2 ha (5 ac) in size. In urban or urbanizing areas, single oaks or stands < 0.4 ha (1 ac) may also be considered a priority when found to be particularly valuable to fish and wildlife.

*3.10 Landscape*

**Rationale for indicator**: This indicator addresses two aspects of a wetland's position in the landscape that affect its opportunity to provide habitat. The first is rainfall. Wetlands in low rainfall areas are an oasis for birds, amphibians and terrestrial wildlife. The importance and suitability of a wetland within the overall ecosystem increases with a decrease in annual precipitation since wetlands play a relatively more important role in maintaining habitat for all species (Hruby et al. 2000). The opportunity is reduced, however, in an arid landscape where there is a significant input of water through irrigation or dams. Wetlands in arid areas, where the amount of surface water is increased through human activities, are not considered as important because the lack of rainfall is augmented by human sources.

The second factor in the landscape is proximity to other wetlands (often called a wetland mosaic). The presence of adjacent wetlands increases the opportunity that the wetland can provide suitable habitat for a large number of species. Reasons include: 1) a variety of upland habitat niches interspersed with different water sources results in greater habitat partitioning; and 2) more opportunities for refuge, food and migration; and 3) more opportunity for re-colonization by wetland-dependent wildlife species in years of drought (Hruby et al. 2000).

For this question you will need to choose the description of the landscape around the wetland that best fits. If several descriptions apply, use the one that gives the most points.

*The wetland is in an area where annual rainfall is less than 12 inches, and its water regime is not controlled by irrigation practices, dams, or water control structures?*

If you do not know the average annual rainfall at or near the wetland you can access this information on the Internet. The USGS maintain rain gauges throughout the state, and the agency summarizes the annual rainfall data for over 100 sites on their web site (http://www.wrcc.dri.edu/summary/climsmwa.html). To determine if the rainfall at the wetland being rated is more or less than 12 inches per year, access the data for the gauge that is closest to the wetland.

If you determine that the wetland is in an area that receives less than 12 inches of rain a year, you will have to determine that the water regime is NOT dominated by water from the following activities before the wetland can be scored the 5 points for this question:

- Irrigation practices - irrigation return flows on the surface or shallow subsurface
- Dams - the wetland is in a backwater of a dam or reservoir

Generally, this means the wetland is outside the boundaries of reclamation areas, irrigation district, or reservoirs.

*There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing and lake shore OK, but connections should NOT be bisected by paved roads, fill, fields, or other development).*

Aerial photographs, NWI maps, or local wetland inventory maps can be useful in answering this question. If these data are not available, a visual survey of the surrounding countryside may be necessary. For this question you are looking only for vegetated wetlands. Other aquatic resources (e.g. streams, unvegetated lakes, etc.) are not to be counted.

"Relatively undisturbed" is used in the same way as in question 3.8. It means that the connections between the wetlands are naturally vegetated (does not, however, have to be native species), and free of regular disturbances such as:

- Tilling and cropping
- Residential and urban development
- Moderate to heavy grazing
- Paved roads or frequently used gravel roads
- Mowing

*There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed.*

In this case the wetland only needs to be within ½ mile of three other wetlands. The connections between the wetland being rated and the others are disturbed.

*There is at least 1 wetland within ½ mile*

In this case the wetland only needs to be within ½ mile of only one wetland, and the connections can be either disturbed or undisturbed.

*There is no wetland within ½ mile*

If there are no wetlands within ½ mile and the wetland is in an area with more than 12 inches of rain a year, the wetland does not receive a score for its position in the landscape.

*3.11 Indicator or reduced habitat functions – Do the areas of open water in the wetland have a resident population of carp?*

**Rationale for indicator**: The carp's foraging behavior disturbs the submerged bottom to such an extent that emergent and aquatic bed vegetation are reduced. This in turn limits the number of habitat niches for invertebrates and reduces the food available for aquatic birds. The constant disturbance also re-suspends sediment and reduces water quality. The carp's foraging behavior disturbs the submerged bottom to such an extent that emergent and aquatic bed vegetation are reduced and this further reduces habitat structure. (Hruby et al. 2000)

Indicators for the presence of carp include shallow open water areas devoid of emergent vegetation, suspended sediment in water column, carp scales and bones along the edge of the AU, and direct observation of carp in the water or jumping. Also use interviews with local fisheries biologists and fishermen to determine if fish are present.

If carp are present, the overall score for the habitat functions is reduced by five points.

### Calculating the Score and Category Based on Functions

Add the points in the second column of the habitat questions and record them at the end of the section. Record your total for the Habitat functions as well as the totals for the Water Quality Improvement functions and the Hydrologic functions in the appropriate rows. Add all three scores together and determine the category for the wetland. Wetlands that are Category I based on functions need to score more than 70 points. Total scores between 51-69 are Category II; 30-50 are Category III, and less than 30 are Category IV.