



# Changes and Clarifications For Lowlands of Western WA

February 2001

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This document contains changes and clarifications to the “Methods for Assessing Wetland Functions Riverine and Depressional Wetlands in the Lowlands of Western Washington: Parts 1 and 2” that have been identified since the methods were released in August of 1999.

It is divided into the following sections:

- General changes or corrections
- Additions and corrections to specific pages in Part 1 of the methods
- Additions and corrections to specific pages in Part 2 of the methods
- Changes and clarifications to size thresholds
- Corrections or changes to data forms
- Clarifications by data
- Table listing size thresholds for specific data
- Replacement Pages
- New appendix – Appendix P

Changes and clarifications include only those which are substantive and affect how the methods should be used. Editorial changes have not been included.

We are providing replacements for selected pages. Otherwise, use this document to pencil in the changes and clarifications in your copy of the methods.

There are two page numbers listed for additions and corrections to specific pages. The top one applies to Part 1 of the final methods. The bottom one, in parenthesis, corresponds to the version distributed during the five-day training that took place on July 12-16, 1999. The content for the training draft is essentially the same even though the page numbering is different. The page numbers for Part 2 are the same for both iterations.

## *Changes or Corrections*

### **General Changes or Corrections**

**Thank You EPA** - We failed to acknowledge and thank the US Environmental Protection Agency for providing funding for the project through a number of grants. Without their support, the methods would not have been developed. Please replace the current acknowledgements page with a new one provided in the back of this document.

**Acre or Hectare Points** – Delete reference to using hectare points. Substitute page 16 in Part 1 of both the training and final methods with the replacement page at the back of the document. We no longer recommend that hectare points be used as a performance score to quantify impacts.

**Changes and clarifications  
should be used immediately!**

The August 1999 methods state that you can multiply each index of potential or suitability by the acre of impact, or size of the wetland, and compare the impact of alterations in two different wetlands. At present, however, we do not have enough information to support such comparisons. Based on our initial field tests of the method, we do not think that it is appropriate to say that the level of function of 10 hectares (ha) of a wetland with a low score (e.g. score = 3) is equivalent to three ha of a wetland that scores high (score = 10). [10 ha x (index of 3) = 30 ha points is not the same level of function as 3 ha x (index = 10) = 30 ha points].

**Classification of Wetlands** – Change the terms coastal and estuarine to tidal wherever they appear in the document. These terms are used interchangeably in the documents. Tidal wetlands are those that experience salt or freshwater tidal surges.

**Terms Describing Surface Water** – Some users have found the terms used to describe the presence of surface water (inundation) in a wetland confusing. The changes below are an attempt to create new terms that will be clearer.

**Surface Water** - The term open water was used in several different ways that were not consistent. The concept of surface water in a wetland has been broken down into several different categories as described below. The term “open water,” whether permanent or not, has been changed to reflect the presence or absence of floating and/or emergent vegetation. Therefore, “open water” is now characterized as “open inundation,” “exposed inundation,” or “inundation.” For example, what was called “permanent open water” is now either “permanent open inundation” (POI), “permanent exposed inundation” (PEI), or “permanent inundation” (PI). Areas of inundation characterized with the adjective “permanent” must be inundated for the entire year for most years.

“**Open inundation**” is used to describe areas where surface water is present but that do not have vegetation on or above the surface of the water. Areas of open inundation can, however, have submerged vegetation attached to the bottom.

Permanent open inundation is an area with surface water present throughout the year that does not have vegetation on or above the surface.

“**Exposed inundation**” is used to describe areas where surface water is present, but that do not have erect and persistent vegetation above the surface. This descriptor is more inclusive than “open inundation.” Areas of exposed inundation can have floating vegetation as well as unvegetated areas and/or submerged vegetation. These areas do not have vegetation that emerges above the surface of the water such as emergent, shrub or forest vegetation. Late in the season, some aquatic plants such as Nuphar may extend above the surface of the water when water levels drop. Such areas would still be considered as exposed inundation. Areas of inundation characterized with the adjective “permanent” must be inundated for the entire year for most years.

Permanent exposed inundation is used to describe areas of permanent surface water that do not have erect and persistent vegetation.

“**Inundation**” is used to describe any areas where surface water is present. It can include areas that have vegetation that emerges above the surface of the water as well as open, submerged, or floating vegetation. This descriptor is, therefore, the more inclusive than open or exposed inundation.

Permanent inundation is used to describe any areas with permanent surface water.

Also note that the abbreviation for permanent open water (POW) should be deleted. Using POW is confusing because it is also used as a convention on National Wetland Inventory maps indicating the presence of open water in the palustrine class.

See the list for “Additions and Correction to Specific Pages” and “Corrections or Changes to Data Forms” for places where these terms should be changed in the methods.

**Annual and Seasonal Inundation** – The term “**annual inundation**” is used to represent the area of the assessment unit (AU) that is inundated with surface water for at least 1 month in a year. It includes both the areas permanently inundated and those that are only inundated for part of the year. Areas inundated for only part of the year, but more than 1 month, are called “**seasonally inundated.**” When estimating areas of inundation make sure that “area of permanent inundation + area of seasonal inundation = area of annual inundation.”

**Standing water** – The term “standing water” is still used in a few places. The term “standing water” can be seasonal or permanent and can be vegetated or non-vegetated.

**Flooded** – The term “flooded” is being deleted to reduce confusion between overbank flooding, required for riverine wetlands, and flooding from other sources such as runoff or groundwater. It is replaced by the term “inundated” or “surface inundation.”

## **Additions and Corrections to Specific Pages in Part 1**

*Many of the following changes result from the changes to the terms described above. Most of the changes to the calculation pages are typographical errors in the text. The spreadsheets do not contain these errors.*

Page 51      Model at a Glance – Veffectareal - change “seasonally inundated” to “annually inundated.”  
(Pg. 48)

Page 53      Indicators at top of page – change “seasonal basis” to “annual basis.”  
(Pg. 50)

Scaling at top of page – change “seasonally inundated” to annually inundated in the first and second line.

Page 55      Calculations of Potential Performance – Veffectareal  
(Pg. 52)

Highest: change “seasonally” to “annually.”

Lowest: change “seasonally” to “annually” and delete “ponded.”

- Page 58  
(Pg. 55) Model at a Glance – Veffectarea2 – change “permanent open water” to “permanent exposed inundation.”
- Page 59  
(Pg. 56) Scaling at top of page – change “permanent open water” to permanent exposed inundation.”
- Page 66  
(Pg. 62) First line, change “seasonal basis” to “annual basis.”
- Page 67  
(Page 63) Calculations of Potential Performance – Veffectarea 1  
Highest: change “seasonally ponded or inundated” to “annually inundated.”  
Lowest: change “seasonally ponded” to “annually inundated.”
- Page 72  
(Pg. 68) Vinund/shed – change “seasonally ponded or inundated” to “annually inundated” in the definition, rationale (second paragraph, third line) and scaling (first line.)
- Page 73  
(Pg. 69) Calculations of Potential – Vinund/shed  
Highest: change “seasonally inundated” to annually inundated”  
Lowest: change “seasonally inundated” to annually inundated”
- Page 78  
(Pg. 74) Vinund/shed – change “seasonally ponded or inundated” to “annually inundated” in the definition and rationale (second paragraph.)
- Page 79  
(Pg. 75) Calculation of Potential Performance – Vinund/shed  
Lowest: change “seasonally inundated” to “annually inundated.”
- Page 82  
(Pg. 78) Model at a Glance – Vefectarea2 – Leave “seasonal inundation” and delete “minus permanent open water.”  
Description – Veffectarea2 – Replace the second sentence with the following: “The variable is measured as the percent of the AU that is seasonally inundated. It is calculated as the percent of annual inundation minus the area that has permanent exposed inundation.”
- Page 83  
(Pg. 79) Indicators - change “seasonally inundated” to “annually inundated.”
- Page 84  
(Pg. 80) Calculations of Potential Performance – Veffectarea2  
Highest: change “permanent open water” to “permanent exposed inundation.”  
Lowest: change “ponded” to “inundated”
- Page 90  
(Pg. 86) Vlwd – change “permanent open water” to “permanent exposed inundation” in the definition (second line) and under scaling (first line).
- Page 91  
(Pg. 87) Indicators - Delete the term “flooded” in “permanently flooded or inundated,” “seasonally flooded or inundated,” and “occasionally flooded or inundated.”

- Page 92  
(Pg. 88) Vwintersp - change “permanent open water” to “permanent exposed inundation” in the definition (first line) and scaling (line three.)
- Page 101  
(Pg. 97) Vwintersp - change “permanent open water” to “permanent exposed inundation” in the definition (first line) and scaling (line three.)
- Vlwd - change “permanent open water” to “permanent exposed inundation” in the definition (second line) and under scaling (first line).
- Page 103  
(Pg. 99) Vhydrop – in the indicators, change “permanently flooded, seasonally flooded and occasionally flooded” to “permanently inundated, seasonally inundated and occasionally inundated.”
- Page 108  
(Pg. 104) Model at a Glance – for Vwater, change “permanent water” to “permanent inundation.”
- Page 109  
(Pg. 105) Vwintersp- change “permanent open water” to “permanent exposed inundation” in the definition (first line), in rationale (lines seven and eight) and scaling (line three.)
- Pg. 110 & 111  
(Pg. 106 & 107) Vlwd – change “permanent open water” to to “permanent exposed inundation” in the definition (second line) and under scaling (first line).
- Vwater – change description of variable to “The percent of the AU with permanent exposed inundation.
- In the scaling of the variable change all descriptors as follows:
- Highest – AU has at least 50% permanently exposed inundation  
High – Au has 10 – 49% permanently exposed inundation  
Moderate – AU has no exposed inundation but has permanent inundation in areas with emergent, shrub, or forest vegetation.  
Low – AU has 1 – 9% permanently exposed inundation  
Lowest – AU has no permanent inundation
- Page 113  
(Pg. 109) Calculation of Habitat Suitability – under Vwater, copy the scaling descriptors listed above into the table.
- Page 114  
(Pg. 110) Calculation of Habitat Suitability (Replacement page provided at the back of the document.)
- Vphow - pH of standing water >5.5 – change “0.8” to “1.0”
- Page 116  
(Pg. 112) Second paragraph on page – in the second line, change “permanent water” to “permanent inundation” and in the fifth line, change “permanent open water” to “permanent inundation.”
- Page 151  
(Pg. 147) Third paragraph (fifth line) - change “seasonally inundated” to “annually inundated.”

- Page 152  
(Pg. 148) Model at a Glance – Veffectarea1 – change “seasonally inundated” to “annually inundated.”
- Page 153  
(Pg. 149) Veffectarea1 - change “seasonally inundated” to “annually inundated” in the definition (first line), indicators (second line), and scaling (first and second line).
- Page 155  
(Pg. 151) Calculation of Potential Performance – (Replacement page provided.)
- In: Description of Scaling for Veffectarea1:
- Highest: change “seasonally inundated” to “annually inundated.”
- Lowest: change “seasonally inundated” to “annually inundated.”
- Calculation: change “AU inundated” to “AU annually inundated.”
- In: Index for Primary Production and Export – change “x 2.22” to “x 2.06.”
- Page 167  
(Pg. 163) Veffectarea1 – under scaling, change “seasonally inundated” to “annually inundated” (first and second lines). (Replacement page provided.)
- Page 168  
(Pg. 164) Calculations of Potential Performance (Replacement page provided.)
- In: Description of Scaling for Veffectarea1:
- Highest: change “seasonally inundated” to “annually inundated.”
- Lowest: change “seasonally inundated” to “annually inundated.”
- In: Index for Removing Metals and Toxic Organics – change “x 2.23” to “x 3.23”
- Page 175  
(Pg. 171) Model at a Glance – Veffectarea2 – Leave “seasonal inundation” and delete “minus permanent open inundation.”
- Description – Veffectarea2 – Replace the second sentence with the following: “The variable is measured as the percent of the AU that is seasonally inundated. It is calculated as the percent of annual inundation minus the area that has permanent exposed inundation.”
- Indicators - change “seasonally inundated” to “annually inundated.”
- Page 176  
(Pg. 172) Calculations of Potential Performance –
- In: Description of Scaling for Veffectarea2
- Highest: delete “ponded” and change “permanent open water ” to “permanent exposed inundation”
- Lowest: change “ponded” to “inundated.”
- Page 205  
(Pg. 200) Calculation of Habitat Suitability – Reducer – Score for Variable (Replacement page provided.)
- Vphow – pH of standing water  $\geq 5.5$  – change “0.8” to “1.”

- Page 214  
(Pg. 210) First paragraph, at the top of the page, forth line, delete the sentence “The index for the fish habitat function is added as a variable to reflect the importance fish have in the diet of otters and, to a lesser degree, mink.” There is no fish model for depressional closed. (Replacement page provided.)
- Page 219  
(Pg. 215) Calculation of Habitat Suitability (Replacement page provided.)
- Vemergent2  
Highest: change “2.5 acres” to “1 acre.”
- Vwintersp2  
Highest: change “2.5 acres” to “1 acre.”
- Page 265  
(Pg. 261) Calculation of Habitat Suitability – (Replacement page provided.)
- In: Vhydrop - Highest: change “w or 4” to “3 or 4.”
- Page 282  
(Pg. 278) Under Description and Scaling of Variables - Vflowmods
- Scaling: change “[1]” to “[2].”
- Page 290  
(Pg. 286) Calculation of Habitat Suitability – (Replacement page provided.)
- Index for Habitat Suitability for Resident Fish - change “x 2.00” to “x 1.75.”
- Page 308  
(Pg. 304) Calculation of Habitat Suitability –(Replacement page provided.)
- In: Vassemb - Highest: change “10” to “9.”  
Calculation: change ‘10” to “9.”
- Change “Calculate D20/10 to get result” to “Calculate D20/9 to get result.”
- Page 316  
(Pg. 312) Model at a Glance – Veffectareal – change “seasonally inundated” to “annually inundated.”
- Page 318  
(Pg. 314) Veffectareal – change “seasonal” and “seasonally” to “an annual” and “annually” under indicators (forth line) and under scaling (first and second line).
- Page 320  
(Pg. 316) Calculations of Potential Performance (Replacement page provided.)
- Vstorage
- In: Score for Variable, top box in column, change  $\geq 2.1$  to  $\geq 1.0$
- Calculation, change “Scaling is set as average depth/1” to “Scaling is set as storage/2.1.”
- and change “4. Result = storage /1” to “4. Result = storage/2.1.”

Veffectarea1

Highest: change “seasonally” to “annually.”

Lowest: change “seasonally” to “annually.”

Page 323 Model at a Glance – Veffectarea2 – change measures to “area of seasonal inundation”  
(Pg. 319)

Page 324 Veffectarea2 - indicators 2d line only: change “seasonally” to “annually.”  
(Pg. 320)

Page 329 Model at a Glance – Veffectarea1 - change “seasonally inundated” to “annually inundated.”  
(Pg. 325)

Page 330 Veffectarea1 – change “seasonal” and “seasonally” to “an annual” and “annually” under Indicators (forth line) and under Scaling (first and second line).  
(Pg. 326)

Page 331 Calculation of Potential Performance – Veffectarea1  
(Pg. 327)

Highest: change “seasonally” to “annually.”

Lowest: change “seasonally” to “annually.”

Page 335 Second paragraph, line two. Delete the sentence starting with “The relative index...”  
(Pg. 331)

Page 336 Vinund/shed change “seasonally ponded or inundated” to “annually inundated” in the definition (first line) and “seasonal” to “annual” in the Scaling (first line)  
(Pg. 332)

Page 337 Calculations of Potential Performance – Vinund/shed (Replacement page provided.)  
(Pg. 333)

Highest: change “seasonally inundated” to “annually inundated.”

Lowest: change “seasonally inundated” to “annually inundated.”

Index for Reducing Peak Flows – change “x 5.0” to “x 4.7”

Page 342 Vinund/shed – change “seasonally ponded or inundated” to “annually inundated” in the definition (first line) and “seasonal” to “annual” in the Scaling (first line)  
(Pg. 338)

Page 343 Calculation of Potential Performance – Vinund/shed (Replacement page provided.)  
(Pg. 339)

Lowest: change “seasonally inundated” to “annually inundated.”

Index for Decreasing Downstream Erosion – change “x 3.33” to “x 3.0.”

Page 346 Model at a Glance – Veffectarea2 – change “Measures” to “area of seasonal.”  
(Pg. 342)

Veffectarea2 (text) – change “seasonally inundated” to “annually inundated.”

Page 347 Under Indicators, change “seasonally inundated” to “annually inundated.”  
(Pg. 343)



- Page 348  
(Pg. 344) Calculations of Potential Performance – Veffectarea2 delete “ponded” and change “open water” to “open inundation”.
- Page 363  
(Pg. 359) Vsubstrate – under Rationale, delete the last line starting with “Moreover, those with organic matter...”
- Page 383  
(Pg. 379) Calculation of Habitat Suitability – Vcover (Replacement page provided.)
- Highest: change “AU scored 1 for overhanging veg. And has 6 or more...” to “AU has overhanging vegetation, undercut banks, and has 6 or more...”
- In the last row, change “If D45 <4 calculate D32 + D34 + (D45/6) to get result; if D45 > 6 calculate D32 + D34 + 1 to get result”
- to: “If D45 <6 calculate (D32 + D34 + (D45/6)) x 0.66 to get result; if D45 > 6 calculate 0.66 x (D32 + D34 + 1)/3 to get result.”
- Page 388  
(Pg. 384) Vsubstrate – under Scaling, line 3, change “4 or more” to “5 or more” and change “of the 5 types of substrate” to “of the 8 types of substrate”, and finally on line four, change “(# of types/4)” to “(# of types/5).” (Replacement page provided.)
- Page 389  
(Pg. 385) Calculation of Habitat Suitability (Replacement page provided.)
- Vcover
- Calculation: change “1 for overhang, and 3 for LWD normalized to 4” to “1 for overhang, 2 for banks, and 3 for LWD normalized to 6.”
- Vsubstrate
- Highest: change “at least 4 types of substrate” to “at least 5 types of substrate.”
- Calculation: change “and organic substrate types/4” to “and organic substrate types/5”
- Change “calculate [sum (D46.1 – D46.5)]/4” to “calculate [sum (D46.1 – D46.5)]/5”
- Page 412  
(Page 408) Third paragraph – fifth line. Change “seasonally inundated” to “annually inundated.”
- Page 415  
(Pg. 411) Calculations of Potential Performance – Reducer (Replacement page provided.)
- Vbogs – delete the entire section on bogs as a reducer.
- Index for Primary Production and Export – delete “x Reducer”

## Additions and Corrections to Specific Pages in Part 2

- Page 14 We no longer recommend dividing an AU into subunits. Remove this page and use the replacement page provided. (Replacement page provided.)
- Page 15 In the last paragraph, replace “percent cover” with “percent area.” (Replacement page provided.)
- Page 16 Add “Visual estimates, however, should not be used to estimate percent area covered by a feature” to the second paragraph under “Areal Estimate vs. % Cover. (Replacement page provided.)
- Page 21 For the presence of a channel to count in D4, the channel must be at least 10m (30 feet) long within the boundaries of the AU. Add this to the description for channel. (Replacement page provided.)
- Page 22 The text describing D4.3 should include the presence of a vertical siphon as well as a culvert smaller than 60 cm (2 ft). (Replacement page provided.)
- Page 23 Note 3 at the top of the page should say “the channel in D5 and D7 is the same as the one in D4.”
- Page 23 The text describing D8.1, percent that is annually inundated is missing a definition of annual inundation. The area that is annually inundated includes both the areas permanently inundated and those that are only inundated for part of the year for at least one month. Areas inundated for only part of the year, but more than 1 month, are called “seasonally inundated.” Areas that are only occasionally inundated (for less than one month) are noted in datum D9, but not included in any areal estimates under datum D8, D10, or D12. When estimating areas of inundation make sure that: area of permanent inundation + area of seasonal inundation = area of annual inundation.
- Page 24 Note 2, change the term “seasonal” to “annual.”
- Page 24 For D8.2, change percent of AU with “permanent standing water” to “permanent inundation.”
- Page 24 For D8.3, change percent of AU with “permanent open water” to “permanent open inundation.”
- Page 25 The term “permanent open water” is used in several places on this page. Replace them all with “permanent open inundation.”
- Page 25 Delete the box at the top of the page. The size threshold is being deleted to be consistent with lack of threshold for the other inundation regimes. (Replacement page provided.)
- Page 25 In Note 1 and 3, add “non-persistent aquatic species” as a description for “aquatic bed.” (Replacement page provided.)

- Page 26 For D9, delete the term “flooded” from the inundation/saturation categories “permanently flooded or inundated,” “seasonally flooded or inundated,” and occasionally flooded or inundated.” “Flooded” is being deleted to reduce confusion between over-bank flooding, required for riverine wetlands, and flooding from other sources such as runoff or groundwater. (Replacement page provided.)
- Page 26 In the first paragraph under D9, types of inundation/saturation categories, delete the reference to hydroperiods used in the National Wetland Inventory’s classification. We have changed the names and definitions of the hydroperiods enough that the reference is no longer appropriate.
- Page 26 The description for seasonally inundated at the bottom of the page (D9.2) should say “greater than 1 month” instead of “1 month.”
- Page 27 Delete the note for D9.6. (Replacement page provided.)
- Page 27 Change the term “height” of flooding to “depth” of inundation in the title for D10 and in Note 5. (Replacement page provided.)
- Page 28 For D12, Replace first sentence with: “Identify all the categories of surface water depths listed below that are present in the areas annually inundated in the AU.” (Replacement page provided.)
- Page 32 For D18, text should state that there has to be 75 percent canopy closure of overhanging trees or shrubs. This means the canopy occupies more than 75 percent of the width of the stream at that point. Although 75 percent canopy closure is part of the title, repeat this in the text to clarify. The shrubs should be at least 1 meter (3.3 feet) high to count for canopy closure. (Replacement page provided.)
- Page 34 For “number of vegetation strata present,” change the title for “herbaceous” stratum to “herbaceous/short woody” stratum. The description for this stratum should read “non-woody vegetation, usually less than 2 m tall (except *Typha* spp. And *Phragmites* spp. which may exceed the height limit) and woody vegetation less than 2 m tall (eg. *Kalmia* ssp.)”
- Page 37 For D25, replace “open water” with “permanent exposed inundation.”
- Page 37 For D26.2, delete the term “open water.”
- Page 39 The chart on log decomposition classes applies to logs not snags (D31). It belongs on page 46 and relates to the categories of large woody debris on the AU surface (D44) and in permanent inundation (D45). (Replacement page provided.)
- For D31.1, a decomposed stump greater than 30 cm (12 inches) can qualify as “snags larger than 30 cm.
- Page 40 For D32, overhanging vegetation, replace “permanent open water” with “permanent exposed inundation.” (Replacement page provided.)

- Page 40 For D33, in the box, change “open water” to “exposed inundation.” (Replacement page provided.)
- Page 41 “For egg-laying structures for amphibians,” delete the box at the top of the page. Use thresholds in the key on the data form. (Replacement page provided.)
- Page 41 For D35, egg-laying structures, change “exposed water” to “exposed inundation” and “open water” to “exposed inundation.” (Replacement page provided.)
- Page 42 For D38, replace title with “Interspersion between persistent vegetation and exposed inundation,” and the first line with “If the AU has a “permanent open inundation” water regime or “aquatic bed.....” (Replacement page provided.)
- Page 43 For D41, change the first sentence of the second paragraph to read: “Observe the different heights of vegetation structure on each side of the AU boundary.” Don’t use Cowardin vegetation classes when determining the height differences in D41 because it doesn’t include a moss and ground cover as a type of structure.
- Also add: “**NOTE 3:** Edges of the AU that are bounded by open inundation on one side should be treated as if there is no difference in vegetation structure.” (Replacement page provided.)
- Page 45 For D44, large woody debris on AU surface, change outside area of “permanent open water” to “permanent inundation.” (Replacement page provided.)
- Page 46 For D45, large woody debris “in permanent open water,” change “permanent open water” to “permanent inundation.” (Replacement page provided.)
- Page 46 There is a minimum size threshold for categories of surface composition to be counted. Within these areas, for each category, at least 50% of the surface must be covered with that composition type. Add this threshold to the text. (Replacement page provided.)
- Page 47 Add a new soils check off table that makes it easier to determine the extent of different soil types in the A horizon. The new form, labeled “Appendix P,” is provided at the back of the document.
- Page 47 For D47, first line, look at the top 15 cm for soils in the A horizon, not the top 10-15 cm.
- Page 48 Change Note 1 to “Always dig the hole to a depth of 60 cm (24 in), examining the top 15 cm for D47 and the soil at 60 cm for D48.” (Replacement page provided.)
- Page 48 Change text in box at the top of the page to read : “To collect data for both D47 and D48, locate all of your sampling points in the areas that are annually inundated for depressional AUs, or in the interior of a riverine AU where the frequent flooding occurs.” (Replacement page provided.)
- Page 48 Delete Note 3 at the top of the page and replace with the following. “**NOTE 3:** Record the percentage of each soil type only as a percent of the area inundated annually. For example, the AU has only 20% of its total area inundated annually, but all the soils within this area are

mineral, the correct number to record is a [3] (100% of the area is mineral soil).”  
(Replacement page provided.)

Page 63      Change the title for Figure 5 to “AU contained within dikes.” The figure is an illustration that helps when answering D4.2 on the Riverine Flow-through data form.

## **Changes and Clarifications to Size Thresholds**

A number of changes and clarifications have been made regarding the size thresholds that need to be met for particular data. We have created a chart that lists all including any new/changed thresholds.

We have been asked to clarify when small patches of a particular feature can be added together to meet the minimum size threshold. Guidance regarding this issue is also provided in the chart. In general, however, a maximum of ten small patches can be combined when it is allowable to combine patches to meet the size threshold. The chart clarifying size thresholds is attached to this document.

## **Corrections or Changes to Data Forms**

- D0      Change 1/0 to 0/1.
- D4.2    On Riverine Flow-through data form, add a 0/1 and a line to enter your response.
- D8.2    Change percent of AU with “permanent standing” to “permanent inundation.”
- D8.3    Change percent of AU with “permanent open water” to “permanent open inundation.”
- D8.5    Add term “larger contiguous” to beginning of the datum – “Larger contiguous unvegetated bars....”
- D9      In D9.1-9.3 replace the term “flooded” with “inundated” for D9.1-9.3.
- D12    Delete “flooded” from “inundated/flooded.”
- D12    Add the clarification “ not areas occasionally inundated” to the data form.  
Delete “flooded” from “inundatd/flooded.”
- D21    Change “in any plant assemblage” to “in a particular assemblage.”
- ~~D25    Replace “open water” with “permanent exposed inundation.”~~
- D25    Replace “aquatic bed” with non-persistent vegetation
- D26.2   Delete the term “open.” Standing includes all types of water for it can be vegetated or not vegetated.
- D29    Change the text “Open field: AU is within 5 km (3 mi) of an open field (agriculture or pasture) >16 ha (40 acres)” to “Large field or pasture: AU is within 5 km (3mi) of a large field or pasture > 16 ha (40 acres).”
- D32    Change “open water” to “exposed inundation.”

- D33 Change “open water” to “exposed inundation.”
- D35 Change “open water” to “exposed inundation.”
- ~~D35 Change “open water” to “exposed water.”~~
- D35 In key for rating egg-laying structures, delete the words “no more than a” from step 3 and step 6. Also in steps 3 and 6, replace "open water" with "exposed inundation."
- D35 Change the word “emergent” to “erect” in the key for rating egg-laying structures for amphibians.
- D38 Change the word “erect” to “persistent.”
- D38 Replace “permanent open water” with “permanent exposed inundation” and delete “(POW + AB).”
- D44 Change outside of “permanent open water” to “permanent inundation.”
- D45 Change “permanent water” to “permanent inundation.”
- D46 Delete “broad-leaved.”
- D46 Note on the data form that within 10 square meter areas for each category, at least 50% of each area must be covered in that surface composition.
- D47 Soil box goes with D48 not D47.
- D47 The percents used to answer D47 should be the percent of the area of annual inundation *not* the percent of the entire AU. Change “[1] if 1-49% area of AU, [2] if 50% to 95%, [3] if >95%” to “[1] if 1-49% of area annual inundation, [2] if 50% to 95% or area of annual inundation, [3] if >95% of area of annual inundation.”

A new form for this datum has been developed to assist with recording the datum. It is applicable to D47 on the Depressional Outflow/Riverine Impounding data forms and the Depressional Closed forms. If you use the new form, you will record the correct scores on the data form. The new form, labeled “Appendix P,” is provided at the back of the document.

**NOTE:** There is no place to record logs “inside permanent water” on the single page provided to quickly record snags and logs as they are observed in the field. You can divide the column for logs outside permanent water into two and label one outside permanent inundation and one inside permanent inundation.

## *General Clarifications by Data*

- D3 For land uses within 1 km of the AU, ball fields should be placed in the category “agriculture.”
- D12 Do not consider areas that are “occasionally inundated,” as described in D9, when collecting data on water depths.

- D16 The understory under forest or scrub/shrub areas has to be rooted in the AU.
- D20 Co-dominance in a plant assemblage (20%-50%) can be based on the cover of the plant in any stratum.
- D26.2 Standing water can be seasonal or permanent and can be vegetated or non-vegetated.
- D35 For egg laying structures for amphibians, “thin-stemmed” vegetation includes the stems of herbaceous plants as well as thin twigs. The herbaceous plants should be those that grow in an erect form, and don’t have to be “emergent.” The vegetation or twigs must occur in areas that are annually inundated.
- D42 When rating the buffer of the AU, you can add patches of the edge together to meet the 50% requirement. The 50% does not have to be continuous. **Follow the rule for adding patches for size threshold; a maximum of 10 patches can be added together to meet the requirement.**
- D42 Recent chemical applications of herbicides can be considered a disturbance to the buffer of the AU.
- D44/45 Category 1 includes downed logs that have not begun to decay yet. Woody debris consisting of small logs jammed into a mass does not count.
- D46 Gravels and cobbles can be rounded, angular or irregular. Gravels ranges from .2 – 7.6 cm diameter and includes fine, medium and coarse gravels. Cobbles ranges from 7.6 – 25 cm in diameter.

# Size Thresholds for Data

The following is a list of all the size thresholds required in the methods. It also indicates that small, noncontiguous patches can be combined to meet the size thresholds. Minimum thresholds for percent cover are not included.

NOTE: A maximum of ten small patches can be combined when it is allowable to combine patches to meet the size threshold. An \* indicates that the size threshold was not in the previous guidance.

Data by Number	Size Threshold	Can Small, Noncontiguous Patches Be Combined to Meet the Size Threshold?
<b>D4 Channel within AU</b>	10 meters (33 feet) in length*	No
<b>D8.5 Larger Unvegetated Bars or Mudflats</b>	Unvegetated bars or mudflats must be at least 100m <sup>2</sup> in size	No
<b>D9 Types of Inundation Categories</b>	For AUs equal to or greater than 1.0 ha (2.5 ac), you need a minimum of 0.1 ha (0.25 ac) of the total AU for this datum. For AUs less than 1.0 ha, the threshold is 10% of the AU.	Yes
<b>D12 Water Depths</b>	AUs equal to or greater than 1.0 ha (2.5 ac), you need a minimum of 0.1 ha of the total AU present for at least 1 month. AUs less than 1.0 ha, the threshold is 10% of the AU.	Yes
<b>D14 Cowardin Vegetation Classes</b>	For AUs equal to or greater than 1.0 ha (2.5 ac), you need a minimum of 0.1 ha (0.25 ac) of the total AU for this datum. AUs less than 1.0 ha, the threshold is 10% of the AU.	Yes
<b>D20 Plant Assemblages</b>	For AUs equal to or greater than 1.0 ha (2.5 ac), you need a minimum of 0.1 ha (0.25 ac) of the total AU for this datum. AUs less than 1.0 ha, the threshold is 10% of the AU.	Yes



<b>D22 Mature Trees</b>	<p>Western Hemlock - greater than 45 cm (18 in)</p> <p>Western Red Cedar - greater than 45 cm (18 in)</p> <p>Douglas Fir - greater than 45 cm (18 in)</p> <p>Sitka Spruce - greater than 45 cm (18 in)</p> <p>Black Cottonwood - greater than 45 cm (18 in)</p> <p>Big-leaf Maple - greater than 45 cm (18 in)</p> <p>Red Alder - greater than 30 cm (12 in)</p> <p>Oregon Ash - greater than 30 cm (12 in)</p> <p>Lodgepole Pine - greater than 30 cm (12 in)</p> <p>Pacific Willow - greater than 30 cm (12 in)</p>	No
<b>D30 Woody Browse</b>	For AUs equal to or greater than 1.0 ha (2.5 ac), you need a minimum of 0.1 ha (0.25 ac) of the total AU for this datum. For AUs less than 1.0 ha, the threshold is 10% of the AU.	Yes
<b>D31 Decomposition Stages</b>	Snags and stumps can be counted only if their DBH is at least 10 cm (4in.) or 10 cm at the base for decayed stumps. There is no height threshold.	NA
<b>D32 Overhanging Vegetation</b>	Overhang has to extend 1 m (3.3 ft) from the edge and 10m (33 ft) along the edge of the area with permanent exposed inundation or the stream.	No
<b>D33 Upland Islands</b>	Upland islands must be larger than 10 m <sup>2</sup> (1000 ft <sup>2</sup> ) and they need to be surrounded by at least 30 m (100 ft) of exposed inundation deeper than 1 m (3.3 ft).	No
<b>D33.1 Snags Greater than 30 cm DBH</b>	Snags must have a DBH greater than 30 cm (12 in).	No
<b>D34 Undercut Banks</b>	Area of undercutting must extend at least 2 m (6.6 ft).	No
<b>D35 Egg Laying Structures</b>	<p>Refer to the key on the data form.</p> <p>For AUs equal to or greater than 1.0 ha (2.5 ac), you need a minimum of 0.1 ha (0.25 ac) of the total AU of thin-stemmed vegetation or thin branches (less than 8 mm [5/16 inch) in permanently or seasonally exposed,</p>	No

	inundated areas. For AUs less than 1.0 ha, the threshold is 10% of the AU with thin stems.	
<b>D36 Tannins</b>	Waters with high tannin content must extend over at least 10% of the areas of standing water.	Yes
<b>D37 Steep Banks</b>	A bank must be greater than 30 degrees steep, greater than 10 m (33 ft) long, more than 0.6 m (2 ft) high, and consist of fine material.	No
<b>D43 Corridors From AU</b>	Refer to key on data form.  Any vegetated corridor must be a minimum of 5 m in width.	No
<b>D44 Large Woody Debris on Surface</b>	Logs must be at least 2 m (6.6 ft) long with a minimum of 10 cm (4 in) diameter at the widest part.	N/A
<b>D45 Large Woody Debris in Permanent Inundation</b>	Logs must be at least 2 m (6.6 ft) long with a minimum of 10 cm (4 in) diameter at the widest part.	N/A
<b>D46 Composition of the Surface</b>	Patches of any category must be at least 10 square meters to be counted.	No
<b>D49.1 and 49.2 Substrate of Permanently Flowing Stream</b>	There must be at least 1 m (3.3 ft) of the streambed, in the direction of flow, with these substrates.	No

# Part 2 Replacement Pages

many of the other functions may be interconnected. For example, an impact to wetland processes in a pastured area may have a significant impact on processes in the hydrologically contiguous, adjacent forested area.

### **AUs and Property or Project Boundaries**

Property boundaries or a project footprint should also not be used to define an AU, unless some of the circumstances described above apply. For example, a project may be proposed that would fill two acres of a 10-acre wetland. The entire 10-acre wetland should be assessed as one unit to determine the performance or suitability index. The index is a score “per acre or hectare,” as described in Part 1, Chapter 2. You would calculate the function being lost to fill by multiplying the index for each function by the two acres to be impacted.

### **AUs and Proposed Alterations**

A wetland should not be divided into AUs by different proposed or actual alterations. As long as the AU is one subclass and has no hydrologic breaks, the entire wetland should be the AU even if only a small part is proposed for filling or alteration.

### **Assessing Sub-units of Larger AUs**

Under some circumstances a wetland of one subclass may have no hydrologic breaks, but has areas that are dramatically different visually. An example is a wetland in which one part is a grazed pasture and the other is a complex mosaic of mature forest, sedge meadow, and shrub swamp. We recommend that you **DO NOT** subdivide the assessment unit into smaller units. The assessment methods were developed to assess an entire hydrologic unit, and do not provide an accurate assessment of sub-units. When the methods were tested on smaller sub-units of a hydrologically distinct wetland unit, the scores obtained did not match the judgments of the assessment team.

If a percent area of the AU is requested on the data sheet, it should be recorded as a number between 0 and 100, not as a fraction or using the % symbol. The term “percent cover,” however, means the percent of the ground surface covered by a specific vegetation type, as described below.

## Areal Estimates vs. % Cover

Areal estimates are easily confused with % cover. Percent cover is usually estimated to describe the amount of ground covered by a particular species or vegetation class as viewed from above. Therefore, in a given area, several plants or vegetation classes can cover the same percentage of the ground if they overlay each other or occur in different strata. Percent cover is used, for example, when determining the “Cowardin” vegetation classes present in an AU. “Cowardin” vegetation classes are identified by the vegetation type that occupies the upper most stratum and covers at least 30% of the ground in that stratum as seen from above.

Estimates of % cover can also be done using the dot or grid method or visual estimates. Appendix 2- I provides a Vegetation Profile Board that can assist you with making visual estimates. Visual estimates, however, should not be used to estimate percent area covered by a feature.

Identifying features that are of special importance to society, such as the presence of endangered and threatened species or locally rare plant communities is not a part of this assessment. Note all such features and record on the “Summary of Methods Results.”

## Step 8: Complete Data Sheet

After completing your field work, use your field notes and photo maps to record the data that you have not already noted on the data sheet during your reconnaissance. Also record the following information on the data sheet at the top of the data sheet. Make sure you include the dichotomous key used to help determine the AU’s classification.

Wetland name

AU identification number

Date of field visit

Time spent in office

Time spent in field

Names of those collecting the data

maps. We recognize that using topographic maps to determine land uses is crude and that it is difficult to determine, for instance, the actual land uses taking place in the white areas. Use other sources of information where possible, such as land use maps developed by local governments.

Percentages can be estimated by using the “dot” method or a planimeter without actually calculating the area involved. The ratio of (#dots per land use/#dots in 1 km circle) x 100 = percent area.

#### **D4: Channel within AU**

Record a [1] on the data sheet if the AU contains a channel. Record a [0] if the AU does not have a channel. The channel must be at least 10 m (33 ft.) in length within the AU to count.

A channel is defined as a distinct linear depression with identifiable bank edges that have been shaped by flowing water and have a definable outlet. Both banks have to be within the boundary of the AU to answer a “yes” for this datum. Man-made ditches are also categorized as channels. In this case the bank edges are not natural. Also grassy swales that intermittently carry slow-moving water, without distinct bank edges, can be considered a channel.

See guidance in Step 6 for when to include and exclude the stream or river from the AU.
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The banks can be a few inches high. It is hard to identify channels if the wetland is flooded. They can be identified during periods of flooding by a linear break in the vegetation, or from aerial photos taken during the dry season.

**D4.1** Try to determine if there is water flowing in the stream or channel for the entire year. You may assume that the flow is permanent if you observe flow during the summer months (July-September). You will have to use your judgement to answer this question during other times of the year. Check aerial photos (most of which are taken during the summer), refer to topographic maps, ask local residents, or judge the permanence of flow from the size, depth, and substrate of the channel. Establishing flow may be difficult in some cases such as riverine impounding AUs that have formed in old stream channels. The impounded open water in the AU may follow the old stream channel and may be present all year around. Such channels, however, usually do not have flowing water.

**D4.2** *This datum is used only for AUs that are classified as riverine flow-through.* Note whether the channel or stream is contained within dikes. Answer a “1” to datum 4.2 if the average distance of the dike to the nearest channel/stream bank is less than 4 times the average distance between the channel banks. Estimate the average distance of the dike to the channel and the channel width only within the boundaries of the AU you have chosen (Figure 5).

**NOTE 2:** Be sure to record the channel length as the numerator. A common mistake is to record the channel as the denominator and the length of the AU as the numerator.

**NOTE 3:** The channel in D5 is the same as the one in D4. If the channel is not continuous through the unit, for example the channel intersects a few areas of open water, the length of the channel would include the length of the open water as if the channel were continuous.

**NOTE 4:** If the AU curves into an L shape, estimate the length of AU along the “longest axis” by summing the length of both parts of the L.

## **D8: Areas of different types of inundation**

### **D8.1: Percent of the AU that is annually inundated**

The total area of the AU that has surface water present for at least 1 month each year (in most years) is one of the more important characteristics used in the assessment. It is, however, one of the more difficult to determine during the dry season.

During the wet season, the area of inundation can be drawn directly on a “photo” map during the field reconnaissance, and the relative percent of the AU determined by using either the dot method or a planimeter. On the data form record the total percent of the AU that is inundated every year (including areas of permanent inundation) as a number between 0 and 100.

Inundation has to be present for at least one month to be considered for this datum. It includes both the areas that are seasonally inundated and those that are permanently inundated.

During the dry season, however, the area of annual ponding or inundation will have to be estimated by using one or more of the following indicators.

- Water marks on trees or vegetation
- Drift lines of debris on the ground
- Water stained leaves (grayish or blackish in appearance)
- Scoured areas on the surface
- Areas where aquatic bed vegetation is present even though the ground may not be inundated
- Adventitious roots
- Level at which moss begins to grow on trees

To determine the area of annual inundation, walk in from the AU edge to the location where one or more of the indicators appear and mark the location on a “photo” map. Repeat this process at least four times at points that are about equidistant along the AU boundary (collect soil data at these four locations also).

For the purposes of this method, the area of permanent open water is similar to the areas of unconsolidated bottom (UB) and “rock bottom” (RB) classes that have the “permanent water” modifier in the Cowardin classification.

Draw the outline of the permanent **open inundation** on the “photo” map and estimate its extent as a percent of the total AU.

**NOTE 1:** Permanent open inundation may include "non-persistent" aquatic species areas if they cover less than 0.1 hectares for AUs equal to or less than 1.0 hectare (2.5 acres) or 10% of AUs less than 1.0 hectare. If the non-persistent aquatic species cover a larger area they should be classified as “aquatic bed”, and recorded in D14.

**NOTE 2:** Discontinuous areas of permanent open inundation can be added together to estimate the total percent of the AU occupied by permanent open water.

**NOTE 3:** At certain times of year it may be difficult to determine if permanent open inundation (with or without non-persistent aquatic species) is present. During the winter the area of open inundation will include the area that is only seasonally open as well. A good indicator of permanent open inundation is the area without any emergent vegetation or the remains of non-persistent aquatic species. Also, most aerial photos are taken in summer months. Areas of open water visible on these photos can be considered permanent open inundation.

**NOTE 4:** If the AU contains a stream that does **not** have overhanging vegetation, the area covered by the stream can be counted as part of the open water component.

**NOTE 5:** Riverine flow-through wetlands are categorized as having permanent open water only if they have a permanent stream without an overhead canopy. The same size threshold is to be used.

#### **D8.4: Percent of the AU with unvegetated bars or mudflats**

Some vegetated wetlands may contain small sand-bars or mudflats within their boundaries. Record unvegetated bars or mudflats as a percent of the total AU. **Bars and mudflats are counted only if they**

An area is considered “unvegetated” if the total cover of plant material is less than 30%.

**are above the surface of permanent water.** Areas permanently under water should be included in the previous datum. There are no size thresholds for this datum. The goal is to account for the entire AU within data D8 and D14.

**NOTE:** It will be difficult to determine if mudflats are present during the winter and spring when the AU is full of water. If possible use aerial photos taken during the summer to identify the presence of mudflats.

#### **D8.5: Presence of unvegetated bars or mudflats**

Record unvegetated bars or mudflats that are at least 100 m<sup>2</sup> in size. **Bars and mudflats are counted only if they are above the surface of permanent water.** In



large AUs you may find that the bars and mudflats are less than 1% of the area and would be recorded as a zero in the previous datum, but may meet the size threshold for this datum.

## D9: Types of inundation/saturation categories present in AU

Identify the different types of inundation/saturation categories present in the AU using the descriptions below. Record a [1] on the data sheet for **all** the inundation that might apply. Remember that different parts of an AU may have different regimes.

For AUs equal to or greater than 1.0 ha (2.5 acres), an inundation/saturation category must occupy, at least, 0.1 ha (1/4 acre) of the total AU to be recorded. For AUs less than 1.0 ha, the threshold is 10% of the total area of the AU.

The purpose is to **identify the wettest water regime within areas of the AU**. Thus, an area that is seasonally inundated, but only saturated to the surface during a field visit in the summer, would be categorized as “seasonally inundated,” **not** “saturated” to the surface.

**D9.1 Permanently Inundated** — Surface water covers the land surface throughout the year, in most 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 vegetation inside the zone of seasonal inundation. Aerial photos taken during the summer may also show areas of permanent water.

**D9.2 Seasonally Inundated** — Surface water is present for extended periods (for more than 1 month 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 D6 to help you determine areas that are seasonally flooded or inundated.

**D9.3 Occasionally Inundated** — Surface water is present for brief periods of less than one month 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 the temporarily flooded regime.

**D9.4 Saturated** — The substrate is saturated to the surface for long enough to create a wetland, **but surface water is seldom present**. The latter criterion separates saturated areas from inundated areas. In this case, there will be no signs of inundation on plant stems or surface depressions.

**D9.5 Permanently Flowing Stream** — The AU contains a river, stream, channel, or ditch with water flowing in it throughout the year.

**D9.6 Intermittently Flowing Stream** — The AU contains a river, stream, channel, or ditch in which water flow is intermittent or seasonal.

## **D10: Average depth of inundation above the lowest point of outflow (estimating live-storage)**

Locate the outlet of the AU and identify its lowest point, or the top of any permanent outflow present. Estimate the difference in elevation between this low point and the marks of annual inundation observed for D8.1. This will provide an estimate of the depth of live-storage during the seasonal high water. Try to find inundation marks as close to the outlet as possible so you can make visual estimates of the height from the outlet. Record the difference in elevation between the lowest point of the outlet and the level at which you noted marks of inundation. Record to the nearest 0.3 m (1 ft.)

**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 AU can be used to establish the low point.

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

**NOTE 3:** This datum does not apply to riverine flow-through wetlands since they do not hold back water longer than the flood event.

**NOTE 4:** Sometimes the lowest point of the outlet is flooded or flowing. In these cases, measure from the bottom of the outlet to the level of marks of average annual flooding. A common mistake is to measure from the current water level in the outlet to the marks of flooding.

**NOTE 5:** It can be difficult to extrapolate the height of flooding above the lowest point of the outlet in large AUs where the flood marks are distant from the outlet.

## **D17: Percent of AU with a canopy closure of woody vegetation**

Identify the areas that are covered by the forested and scrub-shrub classes using the photo map of Cowardin classes developed above (D14). Within these areas, outline the areas where the forests and shrubs cover at least 75% of the ground (this is more restrictive than the 30% requirement for the Cowardin classes.) The shrub component must be at least 1m (3.3 feet) high. Estimate the % of the AU that has this denser canopy.

**NOTE 1:** Some small AUs may have a canopy cover that is a result of trees rooted outside the AU. For this datum the canopy closure estimate **should** include the canopy provided by trees and shrubs rooted outside the AU.

**NOTE 2:** Most people have difficulty in visually estimating % canopy closure in the field. An estimate from the aerial photo is usually more accurate.

## **D18: Percent length of stream with a 75% canopy closure**

*Used only for Riverine Flow-through subclass*

If the AU does not have a stream within its boundaries, record a [0]. If the AU does have a stream, determine if any part of the stream within the AU has a canopy closure of overhanging trees or shrubs that is greater than or equal to 75%. For this datum, record the length of the stream that has a 75% canopy cover, or greater, as a percent of the total length of the stream within the AU. For example, if the AU has 40 m of stream within its boundaries and 20 m of that length has a canopy cover that occupies 75% of the width of the stream, record 50 as the number in D16.

**NOTE:** The canopy has to be at least 1m (3.3ft) high above the stream to count for this datum

## **D19: The number of plant species present**

As you walk in and around the AU, keep a list of the different number of plant species you find. It is best to keep two lists, one for native species and one for non-natives. You should try to identify plants to genus or species level if possible. If identification is not possible, your list can distinguish different plants by listing species 1, species 2, species 3 etc. Of the plants that you observed at the time of the site visit, the goal is to identify at least 80% to genus and species. Appendix L provides a list of common wetland plants in the Northwest.

We recognize that the number of species you observe will vary with the season. Therefore, if you see species that are dead but are recognizably different than the other species present, record them as “species 1” etc.

**2. Areas where several co-dominants are present** — A different plant assemblage should be identified if there is no single dominant but several species are common that can be considered co-dominant. Co-dominance is defined as species that cover between 20-50 % of surface of the ground. Thus, assemblages defined by co-dominant species can have between 2 and 5 co-dominants.

**3. Areas where no single species or group of co-dominants are present** — A different plant assemblage is recognized if there are no species with cover greater than or equal to 20% of the surface of the ground, or if only one species has a cover >20% but no other species meet this criterion.

**4. Areas where different species are dominant or co-dominant in the understory** — A different plant assemblage should be counted if different species are dominant or co-dominant in the understory of forest or scrub-shrub vegetation. For example, an alder forest may have an understory of stinging nettle in one area and an understory of salmonberry in another. These two areas should be identified as two different plant assemblages.

**NOTE 1:** Transition zones between plant assemblages may be considered as separate assemblages based on criterion #3 if they meet the minimum size threshold.

**NOTE 2:** Aquatic bed species can be considered in your identification of assemblages.

## **D21: Number of vegetation strata present**

As you observe the plant assemblages present (D20), identify the one with the most strata (vegetation layers) present and record the number of strata on the data sheet. To be counted, a stratum must cover at least 20% of the ground within the boundary of its plant assemblage, and be rooted in the AU.

A maximum of six strata can be present in any one assemblage. Do not include aquatic bed vegetation since that is addressed in D25. The strata being assessed are:

1. **Mosses and other ground cover**
2. **Herbaceous/short woody** — non-woody vegetation, usually less than 2m tall (*Typha spp.* and *Phragmites spp.* may exceed the height limit), and woody vegetation less than 2 m tall (e.g. *Kalmia spp.*).
3. **Shrub** — Woody vegetation taller than 2m (6ft) consisting of shrubs, or young trees. The shrub stratum rarely exceeds 6 m (20 ft) in height.
4. **Sub-canopy** — Young or small trees growing under a canopy that range between 6-12 m (20-40ft).
5. **Canopy** — The highest vegetation stratum in an assemblage. It consists of large trees that may extend over the other four strata. It is usually higher than 12-15 m (40-50 ft).

species. Estimate if the total area covered in and around the AU is at least 1.0 ha (2.5 acres). If so, record it as a [1] in the field data sheet. If the area is less, record a [0].

**NOTE:** If there is an area where a preferred species is co-dominant (cover 20-49%) with a non-preferred species, divide the total area of that assemblage in half to determine if the 1 hectare threshold is met.

## **D31: Decomposition stages of snags and stumps**

As you collect data, observe the snags and stumps present in the AU. Categorize each snag and stump with regard to how much it has decayed. Use the diagrams on the data sheet and the table of decomposition characteristics below to help discern decomposition categories. When you see a snag or stump of the minimum diameter or larger (see box) and appropriate amount of decay, circle it on the diagram. At the end of the field reconnaissance, record the number of diagrams circled in row D31 of the data sheet.

Snags and stumps can be counted only if their DBH is at least 10 cm (4 in.) or 10 cm at the base for decayed stumps, and they are rooted in the AU. There is no height threshold.

**NOTE:** Stumps that have not decayed are not counted (e.g. when recently cut).

### **D31.1 Snags larger than 30 cm.**

Record a [1] if at least one of the snags above (D31) has a DBH greater than 30 cm (12").

### **D35: Egg laying structures for amphibians**

Assess the interspersions between exposed inundation and thin-stemmed vegetation (or twigs and branches) in areas that are permanently or seasonally inundated. Use the dichotomous key in the data sheet. If characteristics in an AU do not match those described, use the rating that best represents the actual characteristics and record the appropriate score on the data sheet. In this case areas of aquatic bed vegetation can be treated as exposed water in judging interspersions.

**NOTE:** There are two stem-size thresholds for vegetation in this datum. The first question in the key asks if the AU has thin-stemmed vegetation that is between 1 – 8 mm. The other questions in the key ask if the vegetation is between 1-4 mm. Amphibians prefer smaller stem-sizes, but some species will use vegetation between 4-8 mm. The presence of the larger diameters in an AU will score less than the smaller ones.

### **D36: Tannins in surface water**

Note if any areas of open or standing water have a brown, clear color. This color is an indicator of the presence of tannins in the water. If clear, brown water is present, determine if the area with tannins occur over a minimum of 10% of the total open and standing water in the AU. Record a [1] on line D36 of the data sheet if it does AND meets the color criteria described below.

To record a [1] on the data sheet the water should be the color often found in peat bogs. For those of you not familiar with the color of water in peat bogs, mix equal parts of water and a cola drink. The resulting colored water is a good approximation of water with a high tannin content. You may wish to take a sample of the diluted cola with you and an extra bottle of the same size for sampling for your site visit. Collect a sample of the water in the AU and compare it with your “cola standard.” If the water in the AU is the same or darker, record a [1] for this datum.

The waters with high tannin content must extend over at least 10% of the areas of open and standing water.
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**NOTE:** The water has to be clear and brown. If the water is cloudy and brown it is probably carrying sediments and presence of tannins can't be determined.

## **D40: Structures in the AU that create eddies**

*Used only for riverine flow-through subclass.*

Determine if the AU contains any of the following structural characteristics that would create eddies in flowing water. If you have difficulty determining if the structure is large enough, look for the presence of finer sediments just downstream of the structure.

A gravel or sand bar (may be vegetated or unvegetated)

Large logs (>50 cm diameter), or

Large rocks (>60 cm in diameter).

If any of these are present record the datum as present [1] on the data sheet.

## **D41: The characteristics of the edge between AU and uplands or adjacent wetlands**

This datum assesses the structural complexity of the vegetation found at the edge between the AU and adjacent areas. It combines two different structural characteristics: 1) the sinuosity of the edge in the AU and 2) the presence of different vegetation levels along the edge.

Observe the different heights of vegetation structure on each side of the AU boundary. Vegetation height classes include mosses, emergent (or herbaceous), shrub, and forest. Also observe the sinuosity of the AU boundary. Choose the verbal description that best fits those characteristics of the edge and record the appropriate score.

If the vegetation structure and sinuosity are not consistent around the entire edge, characterize the conditions that occur for at least 50% of the circumference. If conditions are not consistent for a minimum of 50% of the edge, choose one of the last two options in the list below.

**NOTE 1:** Treat unvegetated dikes or roads at the edge of the AU as if they were the same vegetation class found within the AU (i.e. they do not provide any complexity to the edge habitat).

**NOTE 2:** Tilled fields without vegetation should be considered as “emergent/herbaceous.”

**NOTE 3:** Edges of the AU that are bounded by open water on one side should be treated as if there is no difference in vegetation structure.

**Choose the description that best fits the characteristics of the AU edge.**

**0** = If there are **no differences** in vegetation classes on each side of the AU for more than 50% of the circumference, **record a [0] regardless of the sinuosity**. Examples: emergent (or herbaceous) to emergent (or herbaceous), shrub to shrub, forest to forest.

**NOTE 1:** Woody debris must be seen to be counted. Don't make assumptions about areas you are unable to access.

Logs in permanent open water must be at least 2 m (6.6 feet) long to count, with a minimum of 10 cm (4 in.) diameter at the widest part.

**NOTE 2:** If large woody debris is half out of and half in permanent inundation, count it for both D44 and D45.

Log Characteristics	Log Decomposition Classes		
	Class 1	Class 2	Class 3
<i>Bark</i>	Intact	Intact	Trace
<i>Twigs &lt;3 cm (1.18 in)</i>	Present	Absent	Absent
<i>Texture</i>	Intact	Intact to partly soft	Hard, large pieces
<i>Color of Wood</i>	Original color	Original color	Original color to faded
<i>Portion of Log on Ground</i>	Log elevated on support points	Log elevated on support points but sagging slightly	Log is sagging near ground

### D45: Large woody debris in permanent inundation

As you collect data, assess the number of different types of woody debris present **in** the **permanent inundation** areas of the AU using the diagrams on the data sheet. (See instructions above.) The same size classes apply for D44 and D45. At the end of the field visit, record the number of boxes checked for woody debris in permanent inundation in row D45.

### D46: Composition of AU surface

Note the type of non-living surfaces present on the ground, between stalks or stems of plants and in unvegetated, exposed areas. Record a [1] on the data sheet for every category present in the **areas that are not permanently inundated**. This datum does not apply to the substrate of permanently inundated areas. The categories are:

The minimum size threshold for any category to be counted is 10 m<sup>2</sup>. Patches smaller than this should not be recorded. Within a patch, the substrate type must cover at least 50% of the surface.

- D46.1 broad-leaved deciduous leaf litter
- D46.2 other plant litter
- D46.3 decomposed organic matter (plant source cannot be identified, including exposed muck soils)
- D46.4 exposed cobbles
- D46.5 exposed gravel
- D46.6 exposed sand
- D46.7 exposed silt
- D46.8 exposed clay



**NOTE 1:** Areas covered by mosses or other bryophytes have no exposed surface visible, and therefore have no non-living surface layer exposed.

**NOTE 2:** Appendix II M provides some guidance on characteristics that can be used to identify differences between organic soils, sands, silts, and clays.

**NOTE 3:** Bare earth from animal tunnels does NOT count.

**NOTE 4:** D46.1, D46.2, D46.3 are commonly called the “duff” layer.

## **D47: Soils present in the A horizon.**

Determine the extent of different soil types present in the top 15 cm (3-4 in.) of the AU surface in the areas that are inundated and then dry out every year. This area extends from the edge of permanent inundation to the upper edge of water marks along the AU boundary. The soil categories used in this assessment are peat, organic muck, mineral, and clay. Figure 11 (Appendix M) provides guidance on identifying soil types.

**D47.1** peat

**D47.2** organic muck

**D47.3** mineral with clay fraction <30%

**D47.4** mineral with clay fraction >30% (clay soils)

The data sheet categorizes areal extent into four categories. Record a [0-3] to indicate which category applies to the soil types present. You can use the data form in Appendix P to simplify the data collection.

**0** = <1% of the area between permanent inundation and the edge of water marks.

**1** = 1% - 49%

**2** = 50% - 95%

**3** = >95%

To start, refer to a soil survey map and identify if the AU contains any soil series identified as a peat or muck. Soil surveys often accurately identify organic soils. It is a good idea, however, to verify the presence of peat or muck, as well as mineral soil, when you conduct the reconnaissance of the AU.

Sample the soil at a minimum of four points in the AU. Sample points should be within the interior of the AU, not along the edge, but within the area that is inundated annually. If may be necessary to sample other areas also (see NOTE 1 and the box below.)

To sample the soil, dig a hole, or use a soil auger, and characterize the soil down to 15 cm (3-4”) below the level of the ground surface, into one of the four soil categories. Some guidance of field indicators for different soil types is given in Appendix 2 N.

Record 0-3 for the appropriate percentage category of the extent for each soil type present **only in the areas that are annually inundated.**

**NOTE 1:** Always dig the hole to a depth of 60 cm (24 in.), and examine the soil in the top 15 cm for D47 and the soil between the surface and 60 cm for D48.

**NOTE 2:** It may be necessary to sample more than four locations if the AU is large (i.e. more than 4 ha, 10 acres), highly irregular, or if significant changes in plant assemblages indicate changes in soil types. As you walk through the AU, you will have to judge whether four sampling points provide an adequate mapping of the soils.

**NOTE 3:** Record the percentage of each soil type only as a percent of the area inundated annually. For example, the AU has only 20% of its total area inundated annually, but all the soils within this area are mineral, the correct number to record is a [3] (100% of the area is mineral soil).

To collect data for both D47 and D48, locate all of your sampling points in the areas that are annually inundated for depressional AUs, or in the interior of a riverine AU where the frequent flooding occurs.

## D48: Infiltration rate of soils

You will also need to rate the infiltration rate of the soils in the parts of **depressional** AUs that are **seasonally inundated**, and in the **interior of riverine** AUs. If your AU is depressional and does not have any areas of annual inundation (i.e. D8.1=0), record a [0] for all categories of infiltration rate.

**Record the infiltration rate of the soils with greatest areal extent in the area that is seasonally inundated (depressional) or in the interior portion of AUs that are riverine.**

Choose several locations in the areas specified above depending on the class of the AU. Dig a soil hole 60cm deep (2 ft) or use a soil auger to determine the type of soil present between the surface and 60 cm (24 in.). Determine which infiltration rate rating applies following the key in Appendix II M. Record a [1] on the data sheet for the appropriate rating.

**D48.1 FAST** If gravel, cobbles, or large rocks are >50% of a sandy soil, the infiltration rate is judged to be “fast.”

**D48.2 MODERATE** If sand is the dominant constituent of the soil, the infiltration rate is judged to be “moderate.”

**D48.3 SLOW** If clays, silts, or organic matter (fines) are more than 25-30% of the soil, the infiltration rate is considered to be “slow.”

**NOTE 1:** The infiltration rate may be assessed in conjunction with the soil types. See previous guidance for D47.