

Western Mountains, Valleys, and Coast

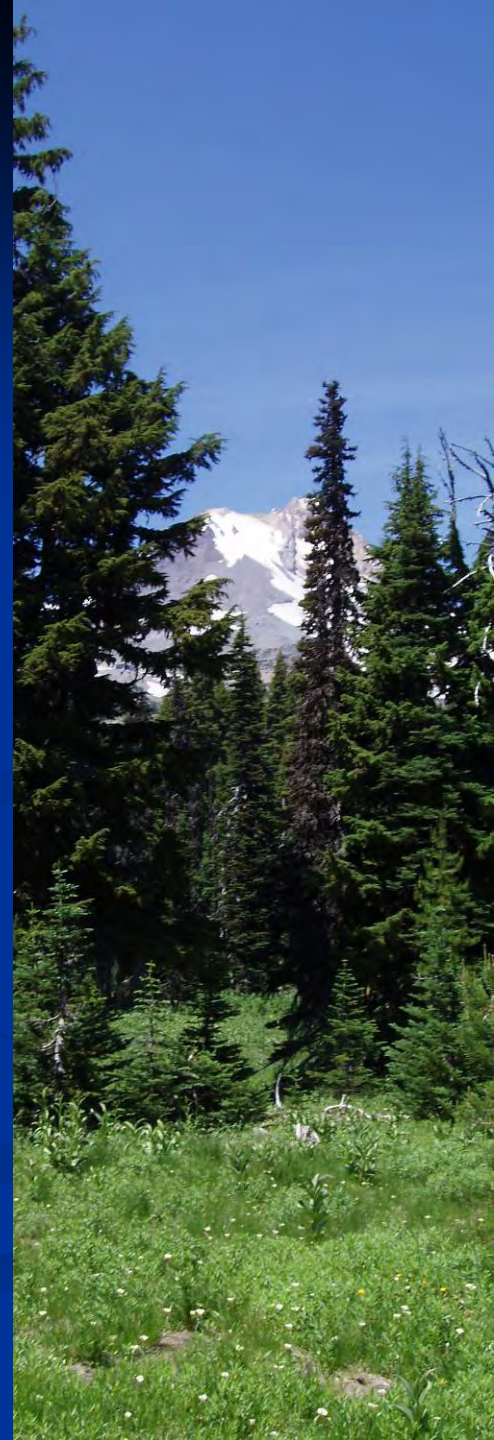
Interim Regional Supplement to the 1987 Wetlands
Delineation Manual

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Agenda

- Introduction to Supplements
- Hydrophytic vegetation & problematic vegetation
- Hydric soils & problematic hydric soils

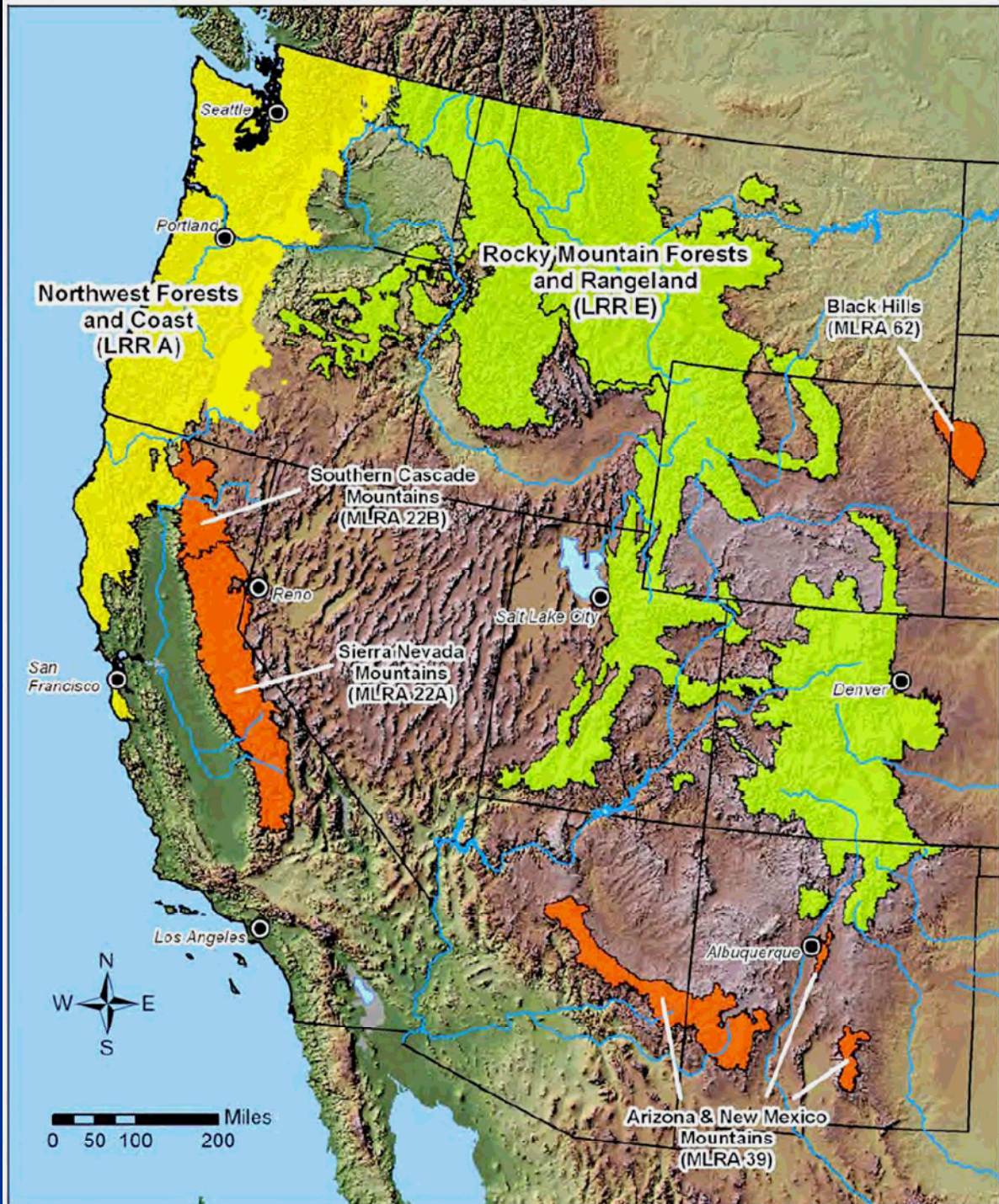
Break

- Hydrology, & wetlands that periodically lack hydrology indicators
- Plant list update
- Review, hints and questions



Applicable Region

- Remainder of region covered by Arid West Supplement (until Great Plains)
- Most, but not all, indicators are applicable throughout the WMVC Region
- Subregion map pg. 55



The Supplements are supplements to 1987 Manual

- Guidance & procedures in 87 manual still pertinent (e.g., atypical situation procedures)
- Supplements provide much more guidance
- Field indicators replaced, and described more fully
- Corps & DSL retain final authority over use & interpretation



Table 1. Sections of the Corps Manual replaced by this Regional Supplement for applications in the Western Mountains, Valleys, and Coast Region

Item	Replaced Portions of the Corps Manual (Environmental Laboratory 1987)	Replacement Guidance (this Supplement)
Hydrophytic Vegetation Indicators	Paragraph 35, all subparts, and all references to specific indicators in Part IV.	Chapter 2
Hydric Soil Indicators	Paragraphs 44 and 45, all subparts, and all references to specific indicators in Part IV.	Chapter 3
Wetland Hydrology Indicators	Paragraph 49(b), all subparts, and all references to specific indicators in Part IV.	Chapter 4
Growing Season Definition	Glossary	Chapter 4, Growing Season; Glossary
Hydrology Standard for Highly Disturbed or Problematic Wetland Situations	Paragraph 48, including Table 5 and the accompanying User Note in the online version of the Manual	Chapter 5, Wetlands that Periodically Lack Indicators of Wetland Hydrology, Procedure item 3(h)

Which Supplement?

- Select appropriate regional supplement based on landscape and site conditions, not the map
- In transition areas, use the one with most helpful indicators

Landscape Characteristics	Arid West Regional Supplement	Western Mountains, Valleys, and Coast Regional Supplement
Climate	Generally hot and dry with a long summer dry season. Average annual precipitation mostly <15 in. (380 mm) except along the coast. Most precipitation falls as rain.	Cooler and more humid, with a shorter dry season. Average annual precipitation mostly >20 in. (500 mm). Except near the coast, much of the annual precipitation falls as snow, particularly at higher elevations.
Vegetation	Little or no forest cover at the same elevation as the site and, if present, usually dominated by pinyon pine (e.g., <i>P. monophylla</i> or <i>P. edulis</i>), junipers (<i>Juniperus</i>), cottonwoods (e.g., <i>Populus fremontii</i>), willows (<i>Salix</i>), or hardwoods (e.g., <i>Quercus</i> , <i>Platanus</i>). Landscape mostly dominated by grasses and shrubs (e.g., sagebrush (<i>Artemisia</i>), rabbitbrush (<i>Chrysothamnus</i>), bitterbrush (<i>Purshia</i>), and creosote bush (<i>Larrea</i>)). Halophytes (e.g., <i>Allenrolfea</i> , <i>Salicornia</i> , <i>Distichlis</i>) present in saline areas.	Forests at comparable elevations in the local area dominated by conifers (e.g., spruce (<i>Picea</i>), fir (<i>Abies</i>), hemlock (<i>Tsuga</i>), Douglas-fir (<i>Pseudotsuga</i>), coast redwood (<i>Sequoia</i>), or pine (<i>Pinus</i>) except pinyon) or by aspen (<i>Populus tremuloides</i>). In the Willamette Valley, Oregon ash (<i>Fraxinus latifolia</i>) and bigleaf maple (<i>Acer macrophyllum</i>) often dominate. Open areas generally dominated by grasses, sedges, shrubs (e.g., willows or alders (<i>Alnus</i>)), or alpine tundra.

How do the Arid West and WMVC Supplements Differ?

- Not a lot!
- A few soils indicators differ
- A few hydrology indicators differ
- WMVC includes non-vascular plants (for one wetland type)
- Procedures for mosaics described in WVMC
- Final Arid West likely closer to WMVC



Using the Supplements

- WMVC interim supplement required as of July 4 (OR) or June 26 (WA)
- OR: “grandfathered” reports if data collected before July 4th
- Interim one year “testing” period; may submit comments to National Advisory Team for Wetland Delineation
- Arid West final due out any day
- Always use most current version of Supplements & 87 Manual (plan is for periodic electronic updates)

(Joint Public Notice and Pages 2 – 3)



HYDROPHYTIC VEGETATION INDICATORS

**Western Mountains, Valleys &
Coast Regional Supplement**

Definition

- Corps Manual defines hydrophytic vegetation.
- WMVC Supplement provides field indicators, and additional guidance on sampling and data analysis.

Vegetation Sampling Guidance

- Guidance is intended to supplement Corps Manual guidance.
- Procedures are flexible and should be modified for a particular site.
- Size and shape of sample plots should be modified to adapt to site conditions.
- Wetland boundary plots, in particular, may need to be modified (shape and/or size) to avoid overlapping the wetland boundary.

Vegetation Sampling Guidance

- Sampling techniques should be described in delineation report.
- An area is considered vegetated if it has 5% or more total plant cover.

Wetland Indicator Status

- Wetland indicator status found in Reed (1988 plus 1993 Supplement, or latest approved list) for Region 9.
- Five basic levels of wetland indicator status are used: OBL, FACW, FAC, FACU and UPL. No plus (+) or minus (-) modifiers.
- If listed as NI or NO, use status for adjacent region.
- If none, do not use the species in calculations.
- Nomenclature changes & NO mean some species are not listed that are not UPL; see Chapter 5.

Wetland Non-Vascular Plants

- Table 4 lists 7 bryophyte species highly associated with western hemlock (FACU) forested wetlands
- Understory often very sparse except for well-developed bryophyte ground cover
- List includes only those species that are:
 - common & “relatively easy to identify”
 - if one or more of these species comprise 50% or more of total bryophyte cover, indicator has > 90% probability of association with wetlands (procedure on page 33)

WMVC Strata

- **Tree** – woody plants equal or greater than 3 inches DBH
- **Sapling /Shrub** – woody plants less than 3 inches DBH, regardless of height
- **Herb** – all non-woody plants, regardless of size
- **Woody Vines** – all woody vines regardless of height

Changes from 1987 Manual:

1. Short woody shrubs placed in sapling/shrub stratum; herb stratum includes only non-woody species
2. A stratum is not counted unless there is at least 5% total plant cover; if less than 5% include in another stratum

Seasonal Considerations

- To extent possible, base decisions on plant community normally present during wet portion of GS in normal precipitation year (see Chapter 5)
- If site is covered in snow, reschedule delineation when conditions improve and plants are identifiable.
- If delineation cannot be postponed, attempt to do preliminary determination using existing and off-site information; confirm and delineate when conditions improve

87 Manual/WMVC Supplement

Hydrophytic Vegetation Indicators

87 MANUAL	SUPPLEMENT
> 50 % of the dominant species across all strata are OBL, FACW, or FAC (excluding FAC-)	Dominance Test (50/20 Rule): > 50% of dominant species across all strata are OBL, FACW or FAC (including FAC-)
Not used	Prevalence Index: PI equals 3 or less.
Visual observation of plant species growing in areas of prolonged inundation and/or soil saturation	Not an indicator. See Difficult Situations
Morphological Adaptations	Morphological Adaptations. Indicators of hydric soil and wetland hydrology must be present
Not used	Non-vascular plants. Limited to western hemlock forests in PNW
Technical Literature	Not an Indicator. See Difficult Situations
Physiological Adaptations	Not Used
Reproductive Adaptations	Not Used

Procedure & Indicators Overview

- **Indicator 1: Dominance Test (DT)**

The basic hydrophytic vegetation indicator that is applied first in every determination.

- **Indicator 2: Prevalence Index (PI)**

Used when plant community fails DT but has hydric soil and wetland hydrology indicators. Includes all species, not just dominants.

- **Indicator 3: Morphological Adaptations/Non-Vascular Plants**

Used when plant community has failed DT and PI but has hydric soil and wetland hydrology indicators.

- If no indicators met, vegetation is not hydrophytic or it's a problematic wetland situation (Chapter 5)

Indicator 1: Dominance Test

- DT is met and the plot/area has a hydrophytic plant community if $> 50\%$ of the dominant plant species across all strata have indicator status of OBL, FACW, and/or FAC
- Must use 50/20 “rule” to identify dominant species from each stratum
- Changed: use absolute % cover, not relative % cover
- All dominants must be identified to species

Indicator 2: Prevalence Index

- Used when indicators of hydric soils and wetland hydrology are present but vegetation fails the DT.
- Uses same vegetation data used for DT.
- PI is a weighted average of indicator status for all species in plot where:
(OBL = 1, FACW = 2, FAC = 3, FACU = 4, UPL = 5)
- PI value of 3.0 or less is a hydrophytic plant community.
- PI requires at least 80% of the total vegetative cover be identified to species and all species have an assigned indicator status (or are UPL)

PI Example

Table 6. Example of the prevalence index using the same data as in Table 5.

Indicator Status Group	Species Name	Absolute Percent Cover by Species	Total Cover by Group	Multiply by: ¹	Product
OBL species	None	0	0	1	0
FACW species	<i>Deschampsia caespitosa</i>	30	88	2	172
	<i>Carex unilateralis</i>	15			
	<i>Poa trivialis</i>	10			
	<i>Juncus tenuis</i>	1			
	<i>Fraxinus latifolia</i> ²	30			
FAC species	<i>Parentucella viscosa</i>	15	35	3	105
	<i>Agrostis capillaris</i>	5			
	<i>Crataegus douglasii</i>	15			
FACU species	<i>Danthonia californica</i>	10	35	4	140
	<i>Crataegus monogyna</i>	25			
UPL species	None	0	0	5	0
Sum			158 (A)		417 (B)
Hydrophytic Vegetation Determination		Prevalence Index = B/A = 417/158 = 2.67 Therefore, the prevalence index is less than 3.0 and this community is hydrophytic by Indicator 2.			

¹ Where OBL = 1, FACW = 2, FAC = 3, FACU = 4, and UPL = 5.

² *Fraxinus latifolia* was recorded in two strata (i.e., tree and sapling/shrub) (see Table 5), so the cover estimates for this species were summed across strata.

Indicator 3: Morphological Adaptations

- This indicator may be used if the plot/site has hydric soil and wetland hydrology indicators but failed the DT and PI.
- Common adaptations include but are not limited to adventitious roots, tussocks & buttressing.
- These adaptations may occur on FACU species, indicating those individuals are functioning as hydrophytes in that setting.

Morphological Adaptations Procedure

1. Confirm that the adaptation is present mainly in the potential wetland area and is not common in adjacent non-wetlands.
2. Estimate percentage of individuals of the FACU species exhibiting the adaptation. Record % on data form.
3. If $> 50\%$ of the individuals exhibit the adaptation, that species is considered a hydrophyte; change indicator status to FAC for that site.
4. Recalculate DT and/or PI using FAC indicator status.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)	
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
_____ = Total Cover					
Sapling/Shrub Stratum (Plot size: _____)					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
_____ = Total Cover				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is $\leq 3.0^1$ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: _____)					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
_____ = Total Cover				Hydrophytic Vegetation Present? Yes _____ No _____	
Woody Vine Stratum (Plot size: _____)					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
_____ = Total Cover					
% Bare Ground in Herb Stratum _____					

Remarks:

Chapter 5: Difficult Wetland Situations in WVMC Region

- Includes regional examples of “problem area wetlands” & “atypical situations” as defined in 1987 Manual
- Includes other situations that can make delineation more challenging
- Examples in chapter is not exhaustive; other situations may exist in region
- *WDs on difficult or problematic sites must be based on best information available, interpreted in light of professional experience & knowledge of ecology of wetlands in the region*

Basic Procedure

- Step 1:** Verify that indicators of hydric soil and wetland hydrology are present (or problematic)
- Step 2:** Verify that area is in landscape position likely to collect or concentrate water
- Step 3:** Use one or more approaches in:
- Step 4:** Specific Problematic Hydrophytic Vegetation Situations; or
- Step 5:** General Approaches to Problematic Hydrophytic Vegetation (pg. 108)

Specific Problematic Situations

Temporal Shifts in Vegetation

Seasonal or Drought: Wetland types typically most influenced include vernal pools, wet prairies, interdunal wetlands

Seasonal shifts in plant communities

1. Re-examine vegetation during wet portion of the growing season.
2. Look for identifiable plant remains (live or crunchy) or similar evidence of wet season community.
3. Use offsite data sources (previous reports; interviews; early season aerials).
4. Use wetland reference site if vegetation substantially the same (see 5b page 109).

Specific Problematic Situations

Sparse & Patchy Vegetation

- Interdunal swales, some tidal marshes & other areas that may be a mix of vegetated wetlands and unvegetated areas with indicators of hydric soil and wetland hydrology
- Area is vegetated if has at least 5% areal cover during peak of growing season.
- Unvegetated areas less than 5% cover may be waters of the U.S./state (within OHW line or high tide line)
- Site specific analysis must be used to identify wetland, water and upland components of mosaics (pgs 123-125)

Specific Problematic Situations

Riparian Areas

- Often include hydrophytic vegetation, upland vegetation, unvegetated areas or a combination of all 3
- Soils are frequently Entisols & lack hydric soil indicators
- Phreatophytes (e.g., cottonwood) may establish during high water or previous conditions and persist, tapping into groundwater too deep to support wetlands
- If overstory is hydrophytic and understory is non-hydrophytic, and soils are Entisols and/or wetland hydrology is problematic, place more emphasis on the understory.
- Must also consider OHW line for non-wetland areas

Specific Problematic Situations

Areas Affected by Grazing

- Grazing can cause shifts in dominant species through soil compaction and selective grazing or avoidance of certain plant species.
- When vegetation is considered unreliable or misleading due to effects of grazing:
 1. Examine ungrazed nearby reference site with similar soil and hydrologic conditions.
 2. Remove grazers or fence enclosure & allow time for vegetation to recover; examine next growing season.
 3. If grazing initiated recently, use offsite data sources
 4. If ungrazed vegetation cannot be determined, make determination based on soil and hydrology indicators.

Specific Problematic Situations

Managed Plant Communities

- Examples: clearing woody vegetation, discing, plowing, mowing, planting, irrigation, use of herbicides
- If the vegetation determination may be unreliable:
 1. Examine undisturbed nearby reference site with similar soil and hydrology conditions.
 2. Leave cleared or plowed area alone for at least one normal growing season w/normal rainfall and reevaluate.
 3. Consider off site data including aerial photos, NWI maps, interviews.
 4. If the unmanaged vegetation condition cannot be determined, make the wetland determination based on soil and hydrology indicators.

Specific Problematic Situations

Aggressive Invasive Plants

- Native & non-native FACU or UPL plant species with aggressive growth habits often outcompete other species.
- Examples: *Rubus discolor*, *Hedera helix*, pasture grasses such as *Anthoxanthum odoratum*
- To use procedure, must be evidence of the species' invasive nature such as literature or inclusion on a state or local list of invasive plants
 1. Examine nearby similar reference site
 2. If feasible, remove invasive species & reevaluate next growing season (see cautions)
 3. If 1 & 2 not feasible, make wetland determination based on indicators of soil & hydrology

Specific Problematic Situations

Areas Affected by Fire, Floods, etc.

- If vegetation has been removed or made unidentifiable by a recent fire, flood, or other natural disturbance, similar procedures to determine whether the vegetation present before the disturbance was hydrophytic.
- Refer to 1987 Manual (atypical situations) for additional guidance.

Specific Problematic Situations

Vigor & Stress Responses

- Many plants develop stress-related features such as stunting and browning or yellowing when subjected to long periods of saturation in the root zone
- Some species may show increased abundance or vigor when growing on wet sites, especially later in GS.
- Caution: stress & vigor responses may be due to factors other than wetness, e.g., variation in salinity, fertilizers, etc.

Specific Problematic Situations

Vigor & Stress Procedure

1. Compare & describe size, vigor or other stress-related characteristics of affected species in potential wetland and adjacent upland (emphasize features that can be measured and/or photographed). Most individuals of affected species must show vigor/stress in the wet area.
2. Observe & describe trends in stress or vigor related to presence of hydric soil, wetland hydrology indicators, topography, or landscape conditions.
3. Consider areas with hydric soil, wetland hydrology & evidence of plant stress or vigor to be wetland.

General Approaches to Problematic Hydrophytic Vegetation

- General procedures for identifying hydrophytic vegetation in difficult situations not necessarily associated with specific vegetation types or management practices, including wetlands dominated by FACU, NI, NO or unlisted species functioning as hydrophytes.
- Reminder: used only where indicators of hydric soil and wetland hydrology are present (or absent due to disturbance or problem situation).

General Approaches to Problematic Hydrophytic Vegetation

- Examples: western hemlock, ponderosa pine, salal, Himalayan blackberry
- a. Direct hydrologic observations

Hydrophytic vegetation is present, and site is wetland, if there is surface water present and/or water table is 12 inches or less from surface for at least 14 consecutive days during the growing season in a normal or dry year. Visit site at 2-3 day intervals during wet portion of growing season.

General Approaches to Problematic Hydrophytic Vegetation

b. Reference sites

Site may be considered wetland if the landscape setting, topography, soils and vegetation are substantially the same as those on a nearby wetland reference site having documented wetland hydrology.

Hydrologic characteristics of reference sites should be documented by long-term monitoring or repeated application of procedure in 5a.

c. Technical literature

Available scientific literature may support a decision to treat specific FACU, NI, NO or unlisted species as hydrophytes or certain plant communities as hydrophytic.

Now, on to Soils . . .



Western Mountains, Valleys, and Coast

**Interim Regional Supplement to the Corps
1987 Wetland Delineation Manual**

HYDRIC SOIL INDICATORS

Kathy Verble, CPSS

Oregon Department of State Lands

FIELD INDICATORS OF HYDRIC SOILS

- *Field Indicators of Hydric Soils in the United States*
 - Regional supplements' indicators are subsets
 - Indicators approved by the NRCS and the National Technical Committee for Hydric Soils (NTCHS) for use in identifying, delineating, and verifying hydric soils in the field
 - Indicators are regionally specific
 - List of indicators is dynamic; changes and additions with new research and field testing
- Any change to NTCHS's indicators represents a change to the supplements' subsets. Current Version 6.0
- For updates see: <http://soils.usda.gov/use/hydric/>

FIELD INDICATORS OF HYDRIC SOILS

- Indicators are based on morphological properties (resulting from biogeochemical processes) known to be associated with soils that meet the **definition** of a hydric soil
- Some hydric soils do not have any of the currently listed indicators – absence of any listed indicator does not preclude the soil from being hydric

FIELD INDICATORS OF HYDRIC SOILS

- Indicators are not intended to replace or modify the requirements contained in the **definition** of a hydric soil
 - **Hydric Soils** – soils formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, July 13, 1994)
- A soil that meets the **definition** of a hydric soil is hydric whether or not it exhibits indicators

PROCEDURES FOR SAMPLING SOILS

- **Observe and Document the Site** (pg 38)
 - Should be considered at any site:
 - Hydrology, slope, slope shape, landform, soil materials, vegetation
 - How water moves across the site
- **Observe and Document the Soil** (pg 39)
 - Pay attention to changes in microtopography over short distances
 - Look for changes in parent material and restrictive layers that can affect the hydrologic properties of the soil
 - Examine soil colors immediately after sampling – if reduced Fe is present, it can oxidize rapidly

PROCEDURES FOR SAMPLING SOILS

■ Soil Pits:

- In general, dig to 20 in.
- Dig to the depth needed to document an indicator or to confirm the absence of indicators
- **Caution:** digging shallow pits for some indicators
- A12-Thick Dark Surface: may need to examine to 40 in. or more
- May need deeper pits to understand the variability and hydrologic relationships or identify disturbed soils

DOCUMENT SOILS – DATA FORM

■ Profile Description

- Matrix %
- Redox features
 - Contrast – document in Remarks
 - Location
 - **Pore Linings:** zones of accumulation
 - Occur as coatings on ped faces, pores surfaces, root channels, roots of plants
 - Occur as impregnations of the matrix adjacent to the ped or pore

DOCUMENT SOILS – DATA FORM

- **Hydric Soil Indicators**
 - If soil is hydric but does not meet an indicator,
 - Use “Indicators for Problematic Hydric Soils”
 - Other (Explain in Remarks)
 - Do not check an indicator if the soil profile description does not support the indicator

TERMINOLOGY

- **Depleted Matrix** (pg 132 & Illustration pg 133)
 - Has to have one of the listed combinations of value/chroma and redox (if applicable)
 - High value/low chroma due to reduction and translocation of Fe from the soil horizon – soil particles no longer coated
- For the indicators, the occurrence of **Reduced Matrix** (pg 135) is included in the concept of depleted matrix
 - High value/low chroma due to reduced Fe in the soil water (Fe not translocated out of horizon)

TERMINOLOGY

- **Reduced Matrix** (pg 135)
 - High value/low chroma is due to the reduced Fe in the soil water (Fe not translocated out of horizon)
 - Has to have one of the listed combinations of value/chroma and redox (if applicable) as defined under **Depleted Matrix**
 - Soil may change color when exposed to air. See procedures and requirements on page 114
 - Test with **alpha,alpha-dipyridyl dye** for presents of reduced Fe. See procedures and requirements on page 115
- **Point:** color change or positive dye reaction may occur in **reduced matrix** but cannot occur in **depleted matrix**

TERMINOLOGY

- **Alpha, alpha-dipyridyl dye** (pg 114 -115)
 - Test to determine if reduced (ferrous) Fe is present
 - May provide evidence that a soil is hydric when it lacks other indicators
 - Lack of a positive reaction does not preclude the presence of a hydric soil
 - Specific information about use found in NRCS Hydric Soils Technical Note 8 at http://soils.usda.gov/use/hydric/ntchs/tech_notes/index.html
 - Source: Oregon State University Soils Club
 - Extension Soil Science 541-737-5712
 - Advisor Will Austin at will.austin@oregonstate.edu

TERMINOLOGY

- **Gleyed Matrix** (pg 134)
 - Has to have one of the listed combinations of hue, value, and chroma



Figure A2. For hydric soil determinations, a gleyed matrix has the hues and chroma identified in this illustration with a value of 4 or more. Due to inaccurate color reproduction, do not use this page to determine soil colors in the field. Background image from the [Munsell Soil Color Charts](#) reprinted courtesy of [Munsell Color Services Lab](#), a part of X-Rite, Inc.

TERMINOLOGY

- NRCS:
 - *Field Indicators of Hydric Soils in the United States*
<http://soils.usda.gov/use/hydric/>
 - Information for Soil Scientists
<http://soils.usda.gov/scientists.html>
 - Technical Info
<http://soils.usda.gov/technical/>
 - *Keys to Soil Taxonomy*
http://soils.usda.gov/technical/classification/tax_keys/
- Soil Science Society of America
<https://www.soils.org/sssagloss/?check>

HYDRIC SOIL INDICATORS

- For indicator purposes, nodules and concretions are not considered to be redox concentrations unless otherwise noted
- Soil Colors: Document if between chips (i.e. chroma 2+). However, do not round colors to qualify as meeting an indicator (i.e. 2+ does not meet indicator requiring chroma 2)
- Depths in the indicators are measured from:
 - Muck surface or from the mineral soil surface if a muck surface is absent
 - For indicators A1 (Histosols), A2 (Histic Epipedon), and A3 (Black Histic), depths are measured from the top of the **organic soil materials**

ORGANIC ACCUMULATION

- Soil materials high in organic carbon: **organic, mucky modified mineral, mineral**
 - Estimation method (pg 36)
- **Organic soil materials:**
 - Sapric (muck), Hemic (mucky peat), Fibric (peat)
 - Two methods for determining (pg 37-38)
 - First – based on percentage of visible fibers
 - Second – based on visual examination of the color of the water expelled and nature of plant residue

ORGANIC ACCUMULATION

- For indicators A1 (Histosols), A2 (Histic Epipedon), and A3 (Black Histic), depths are measured from the top of the **organic soil materials (the O horizons)**
 - **Fibric materials (peat):**
 - Does not include litter that has not undergone observable decomposition
 - Does include slightly decomposed litter
 - Looking at unrubbed and rubbed fibers
 - fibers are either 2 cm or less in their smallest dimensions or decomposed enough so they can be crushed or shredded with the fingers

HYDRIC SOIL INDICATORS

- Indicators are divided into groups:
 - All Soils – indicators in **A** series refer to soils with any USDA soil texture
 - Sandy Soils – indicators in **S** series refer to soils layers with USDA soil texture of loamy fine sand and coarser
 - Loamy and Clayey Soils – indicators in **F** series refer to soils layers with USDA texture of loamy very fine sand and finer
 - Problem and Test Indicators – for use on Problem Soil situations when hydrophytic vegetation and wetland hydrology are present but soil lacks an indicator

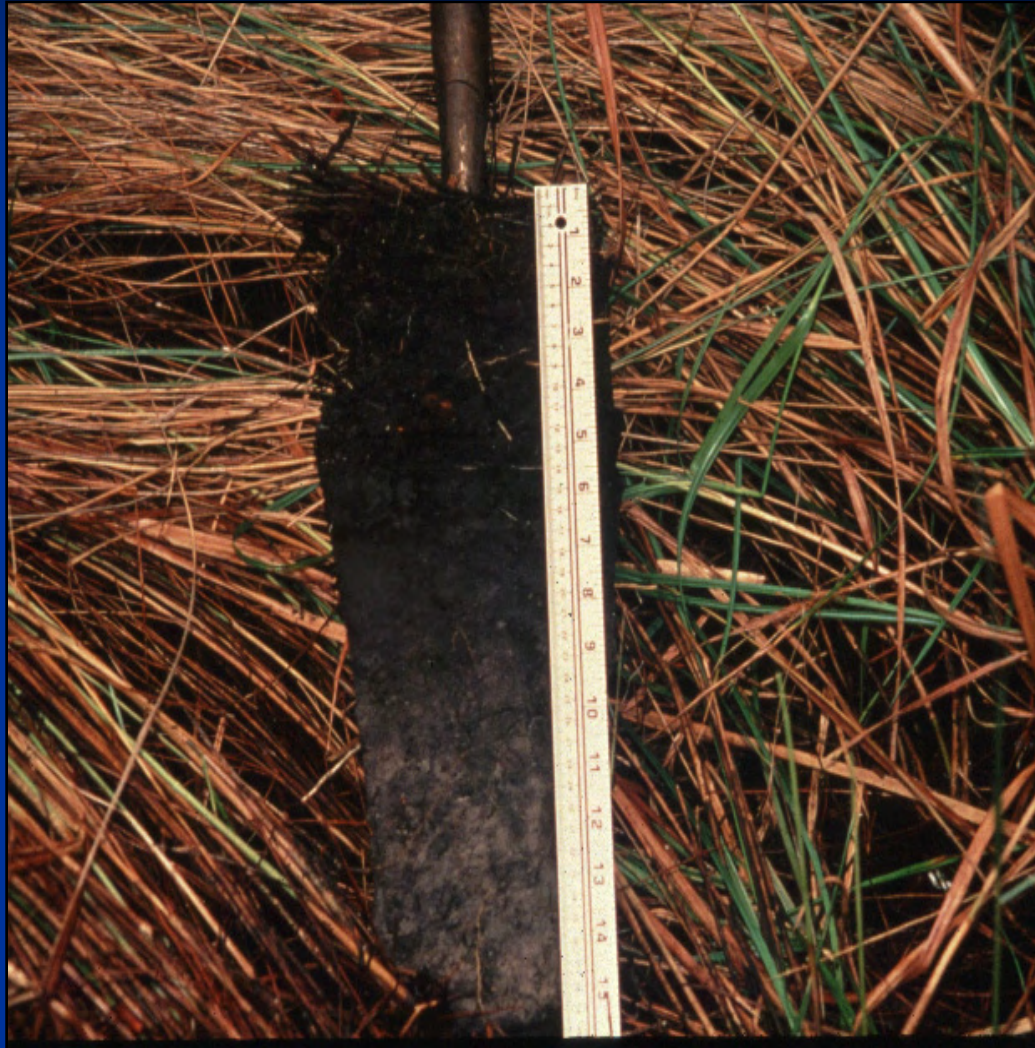
HYDRIC SOIL INDICATORS

- Field Indicators are structured as follows:
 - Alpha-numeric listing
 - Short name
 - Applicable land resource regions (LRRs)
 - Description of the field indicator
 - User notes

HYDRIC SOIL INDICATORS

- For all indicators unless otherwise indicated, all mineral layers above any of the indicators must have a dominant chroma of 2 or less, or the layer(s) with dominant chroma of more than 2 must be less than 6 inches thick to meet the hydric soil indicator.
 - Pg 43 All soils
 - pg 49 Sandy soils (e.g. Indicator S6)
 - pg 54 Loamy and clayey soils (e.g. Indicator F8)

S1 – SANDY MUCKY MINERAL (pg 50)



S1: Sandy Mucky Mineral (pg 50)

- Technical Description: a layer of **mucky modified sandy soil material** 2 in. or more thick starting within 6 in. of the soil surface.
- Applicable Subregions: throughout the WMVCR
- User notes:
 - **Mucky** is a USDA texture modifier for mineral soils
 - Field procedure for identifying **mucky mineral soil material** is in the Concepts section of Chapter 3
- Remember general requirement: For all indicators unless otherwise indicated, all mineral layers above any of the indicators must have a dominant chroma of 2 or less, or the layer(s) with dominant chroma of more than 2 must be less than 6 inches thick to meet the hydric soil indicator.

S5 – SANDY REDOX (pg 52)



Figure 3-10. Redox features in this soil begin at about 2 in.

S5: Sandy Redox (pg 52)

- Technical Description: a layer starting within 6 inches of the soil surface that is at least 4 inches thick and has a matrix with 60% or more chroma 2 or less with 2% or more distinct or prominent redox concentrations as soft masses or pore linings.
- Applicable Subregions: throughout WMVCR
- User Notes:
 - Redox contrast table in Appendix A (pg 131)
 - Redox concentrations include iron and manganese masses and pore linings (Vepraskas 1992)
 - **Few vs. Fine vs. Faint**
- Remember general requirement

F6 – REDOX DARK SURFACE (pg 58)



Figure 3-15. Redox features can be small and difficult to see within a dark soil layer.

F6: Redox Dark Surface (pg 58)

- Technical Description: a layer at least 4 in. thick, is entirely within the upper 12” of the mineral soil, and has a:
 - matrix value of 3 or less and chroma 1 or less and 2% or more distinct or prominent redox concentrations as soft masses or pore linings, **or**
 - matrix value 3 or less and chroma 2 or less and 5% or more distinct or prominent redox concentrations as soft masses or pore linings
- Applicable Subregions: throughout the WMVCR
- User notes: Redox concentrations in high organic content soils with dark surfaces are often difficult to observe. May require a hand lens, drying of sample. Examine interior of peds.
- Remember general requirement

A11 – DEPLETED BELOW DARK SURFACE (pg 46)



Figure 3-6. Depleted matrix starts immediately below the black surface layer (approximately 10 in. (25 cm)).

A11: Depleted Below Dark Surface (pg 46)

- Technical Description: a layer with a **depleted** or **gleyed matrix** that has 60 % or more chroma 2 or less, starting within 12 in. of the soil surface, and having a minimum thickness of either:
 - 6 in. **or** 2in. if the 2 in. consists of **fragmental soil material** (pg 134)
 - Loamy/clayey layers above the depleted or gleyed matrix must have a value 3 or less and chroma 2 or less
 - Sandy material above the depleted or gleyed matrix must have value 3 or less and chroma 1 or less, and at least 70 % of the visible soil particles must be covered, coated, or similarly masked with organic material.
- Remember general requirement

A11: Depleted Below Dark Surface (pg 46)

- Applicable Subregions: throughout WMVCR
- User Notes:
 - Frequently occurs in Mollisols, also applies to dark-colored surface layers, such as umbric and dark ochric epipedons
 - For soils with dark surface layers greater than 12” thick, use indicator A12

HYDRIC SOIL – NO INDICATORS

- See guidance for observing and documenting the site and soil in **Chapter 3** (pg 38 - 41) to determine if the soil is non-hydric or might be a problem soil
- See **Problematic Hydric Soils** in Chapter 5 (pg 110 - 116)
- Does the soil meet the **“definition”** of a hydric soil?
- Document in the remarks section

PROBLEMATIC HYDRIC SOILS (pg 110)

Examples of problematic hydric soils in the WMVCR include but are not limited to:

- 1) Moderately to Very Strongly Alkaline Soils – at pH 7.9 or higher Fe or Mn features do not readily form
- 2) Volcanic Ash - Silica is low in Fe, Mn or S content
- 3) Vegetated Sand & Gravel Bars in Floodplains - recent deposition; low Fe, Mn; low organic-matter
- 4) Dark Parent Materials – Soils formed from materials such as dark shales (not dark due to high organic-matter).
- 5) Recently Developed Wetlands - Indicators not developed
- 6) Seasonally Ponded Soils – depressional wetlands and perched water tables

PROBLEMATIC HYDRIC SOIL

Recommended procedure (pg 112 - 116) for soils meeting the **definition** of hydric soil but not exhibiting an indicator and where indicators of hydrophytic vegetation and wetland hydrology are present:

- Use caution when vegetation and hydrology are also problematic
- Number 3: Document soil profile and landscape setting including concave surfaces, floodplains, level or nearly level area, toe of slope, convergent slopes, fringe, shallow aquitard or restrictive soil layers, or other

PROBLEMATIC HYDRIC SOIL

- Number 4: Use one or more of the listed approaches (pg 113 - 116) to determine if the soil is hydric
 - a. Determine if meets one of the two problematic hydric soil indicators (pg 62 - 63)
 - b. Determine if one or more problematic situations is present (pg 110 – 112)
 - c. Exhibits reducing conditions upon exposure to air
 - Requires a layer 4 inches thick within the top 12 inches with value 4 or more and chroma 2 or less changing by one or more pages in hue and/or increases one or more in chroma when exposed to air for 30 minutes

PROBLEMATIC HYDRIC SOIL

- d. Has a positive reaction to alpha-alpha dipyridyl, in saturated soils. The lack of a positive reaction does not preclude the presence of hydric soil
 - Requires a layer 4 inches thick within the top 12 inches where 60% of the layer would react in a positive reaction (turns pink or red) within 30 seconds
- e. Direct observations or monitoring data to determine if soil is ponded, flooded and/or has a water table within 12 inches of the surface for at least 14 consecutive days during the growing season in most years

Note: Hydric Soil Criteria #3 and #4

QUESTIONS ?

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Wetland Hydrology Indicators

- Evidence of a continuing wetland hydrologic regime
- Indicators may be transitory - lack of an indicator is not evidence for lack of wetland hydrology (i.e., difficult situations, Chapter 5)
- Direct hydrologic monitoring is rarely necessary; presence of an indicator confirms wetland hydrology

(Pages 64 – 97)



“Growing Season”

Start and end dates indicated by:

- Above-ground growth and development of 2 or more species of non-evergreen vascular plants; or
- Soil temperature at 12 inches ≥ 5 °C

If start/end dates unknown and on-site data collection not practical, use WETS air temperature data.



Wetland Hydrology Indicators

- Group A: Direct Observation
- Group B: Evidence of Recent Inundation
- Group C: Evidence of Soil Saturation
- Group D: Landscape Conditions or Other Features

Note: Other evidence of wetland hydrology may be used with appropriate documentation.



Wetland Hydrology Indicators

- Each indicator includes a general description and cautions & user notes
- Much more information than 1987 manual provided
- Read these thoroughly as they contain important information for use & interpretation



Indicator	Use in 1987 Manual	Category	
		Primary	Secondary
Group A – Observation of Surface Water or Saturated Soils			
A1 – Surface water	P	X	
A2 – High water table	P	X	
A3 – Saturation	P	X	
Group B – Evidence of Recent Inundation			
B1 – Water marks	P	X	
B2 – Sediment deposits	P	X	
B3 – Drift deposits	P	X	
B4 – Algal mat or crust		X	
B5 – Iron deposits		X	
B6 – Surface soil cracks		X	
B7 – Inundation visible on aerial imagery		X	
B8 – Sparsely vegetated concave surface		X	
B11 – Salt crust		X	
B13 – Aquatic invertebrates		X	
B9 – Water-stained leaves	S	X	X (MLRA 1, 2, 4A, and 4B)
B10 – Drainage patterns	P		X

Indicator	Category	
	Primary	Secondary
Group C – Evidence of Current or Recent Soil Saturation		
C1 – Hydrogen sulfide odor	X	
C3 – Oxidized rhizospheres along living roots S	X	
C4 – Presence of reduced iron	X	
C6 – Recent iron reduction in tilled soils	X	
C2 – Dry-season water table		X
C9 – Saturation visible on aerial imagery		X
Group D – Evidence from Other Site Conditions or Data		
D1 – Stunted or stressed plants	X (LRR A)	
D2 – Geomorphic position		X
D3 – Shallow aquitard		X
D5 – FAC-neutral test S		X
D6 – Raised ant mounds		X (LRR A)
D7 – Frost-heave hummocks		X

Indicator A3: Saturation (Primary)

- Observation of saturated soil conditions within 12 inches of the soil surface
- Glistening on the surfaces and broken interior faces of soil samples
- Must be associated with existing water table located immediately below the saturated zone (except when restrictive layer present).
- **Note:** Ped interiors must be saturated



Indicator C6: Recent Iron Reduction in Tilled Soils (Primary)

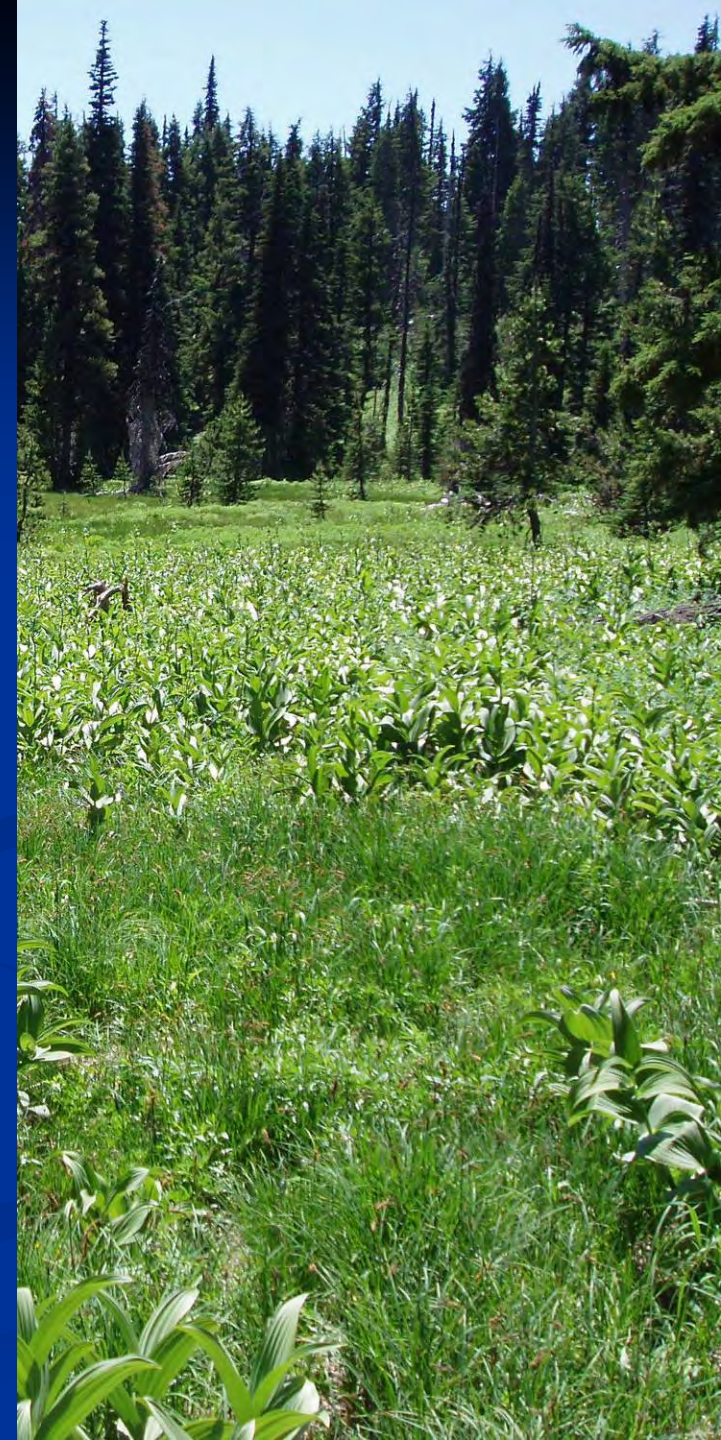
- Redox pore linings in the tilled surface layer of soils cultivated within the last 2 years
- Within the tilled zone or within 12 inches of soil surface, whichever is shallower
- **Note:** Use professional judgment to determine if redox features other than pore linings are “continuous and unbroken”

(Pages 89 - 90)



Indicator C2: Dry Season Water Table (Secondary)

- Visual observation of the water table between 12 and 24 inches below the surface during the normal dry season or during a drier than normal year.
- **Note:** A dry season water table below 24 inches does not necessarily indicate a lack of wetland hydrology.
- **Note:** Complements indicator A2



Indicator D3: Shallow Aquitard (Secondary)

- Aquitard within 24 inches of the soil surface.
- Examples include:
 - Duripans
 - Plow pans
 - Clay layers
 - Lacustrine deposits
 - Coarse textural shifts
- **Note:** Redoximorphic features are often evident in the layers above the aquitard; may or may not be evident below.



Indicator D3: FAC-Neutral Test (Secondary)

- Plant community passes the FAC neutral test.
- Remove FAC species from consideration and determine if more than 50% of remaining dominant species are FACW or OBL.
- If equal number, include non-dominant species
- **Note:** Only applicable to wetland hydrology determinations.



Wetland Hydrology

Difficult Situations

- Winter wet / summer dry climate, with periodic multi-year droughts
- Special care required where wetland vegetation and soils are present but hydrology indicators appear absent
- Supplement augments 1987 Manual:
 - Atypical situations
 - Problem areas
 - Except Item 3(h): long-term monitoring



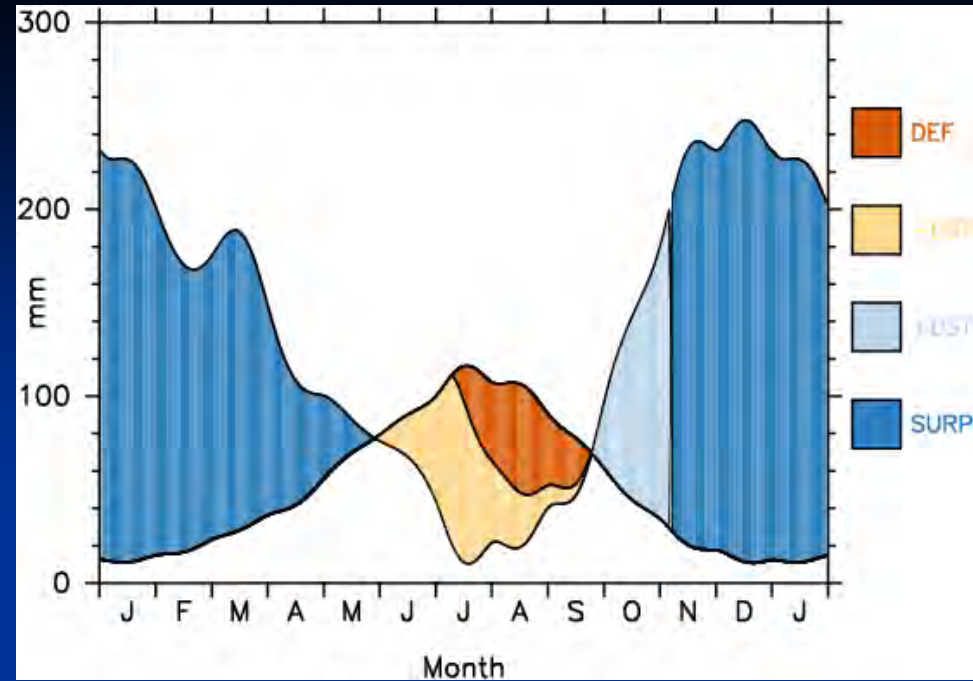
Difficult Situations

1. Verify vegetation and soils indicators
2. Verify landscape position
3. Use appropriate approach
 - Dry season or below normal precip.
→ presume indicator is present or revisit site
 - Reference sites, with hydrology monitoring or observations
 - NRCS Hydrology Tools
 - Multiple years of aerial photography
 - Long-term hydrologic monitoring

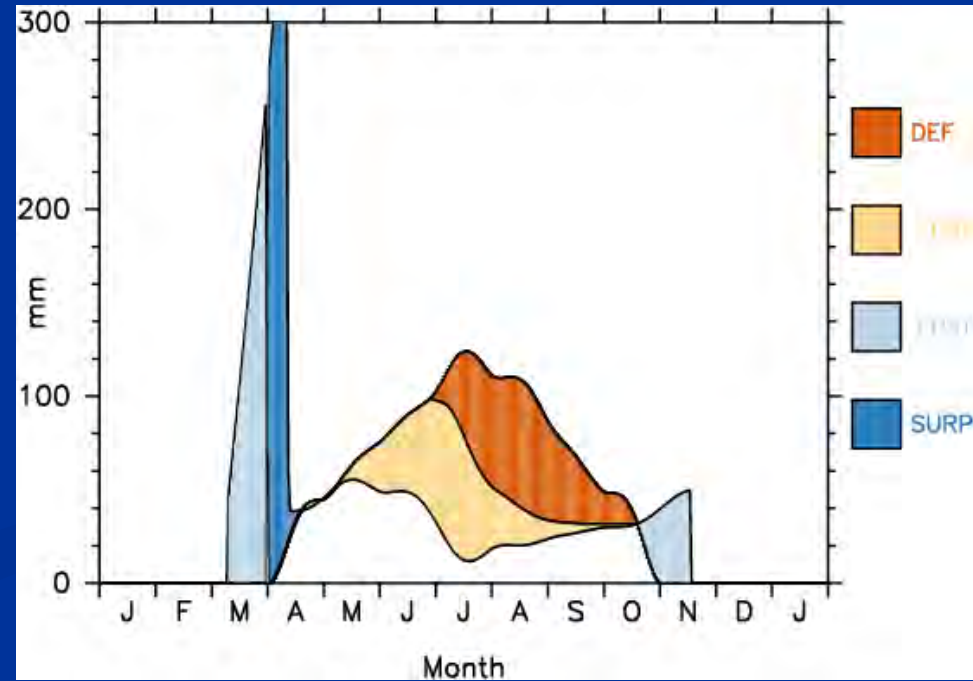


Dry Season: WIMP

Sublimity, OR

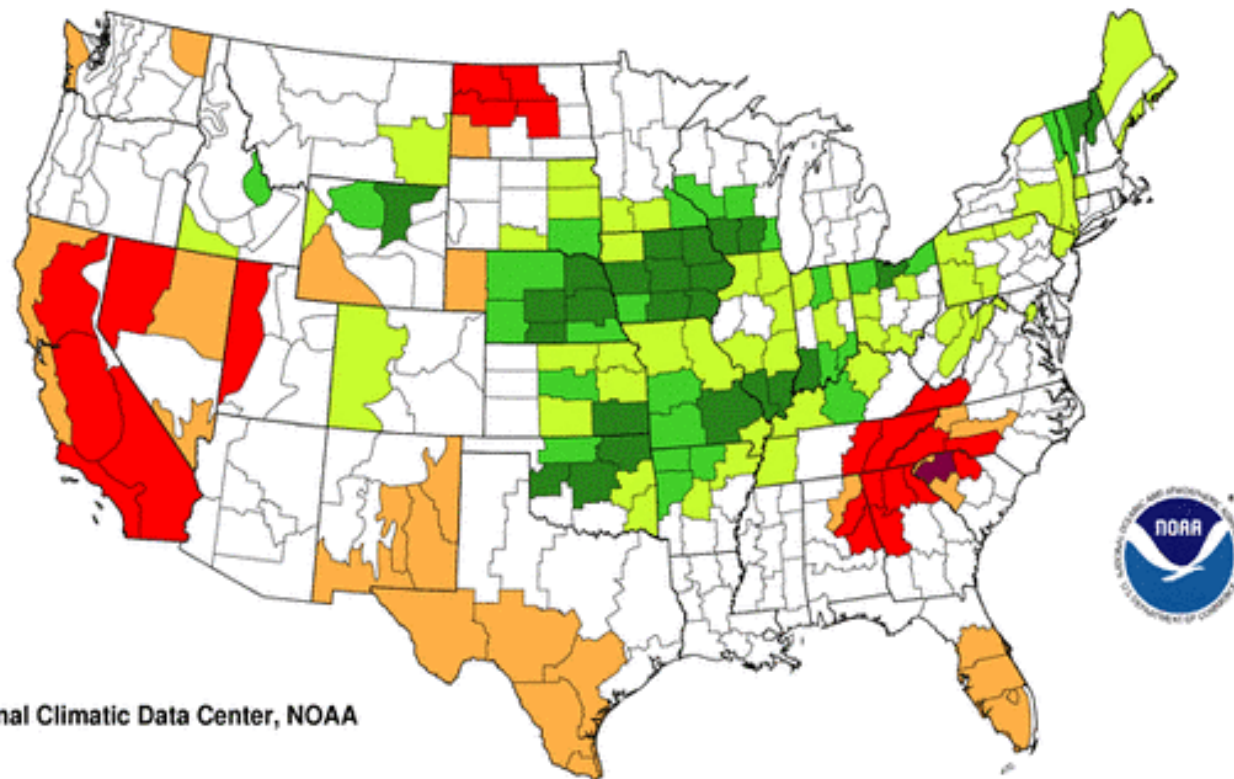


Joseph, OR



Palmer Drought Index Long-Term (Meteorological) Conditions

May 2008



National Climatic Data Center, NOAA

