VEGETATION II:
Determination of the Hydrophytic Vegetation Parameter

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WSP

Wetland Vegetation
Lecture #2

1. **Introduction to 1987 technical criteria for identification of wetland vegetation**

2. **Variations in the Arid West & Western Mountains/ Coast Supplements**

3. **Sampling vegetation (briefly!)**

4. **Completing vegetation portions of data forms**

5. **Difficult wetland situations**

Safety First: Poison Oak
(*Toxicodendron diversiloba)*

Wetlands Definition

*Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, **a prevalence of vegetation typically adapted for life in saturated soils conditions**. Wetlands generally include swamps, marshes, bogs, and similar areas.*

Part II Technical Guidelines – On line 1987 *Corps Manual,* p. 9 ¶26(a)

Hydrophytic Vegetation (1)

Hydrophytic vegetation is defined herein as –

"*the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.*"

Part II Technical Guidelines – On line 1987 *Corps Manual,* p. 12, ¶29

HYDROPHYTE

Any macrophyte that grows in water or on a substrate that is at least periodically deficient in oxygen as a result of excess water content

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But remember!

Not all plants found in California wetlands are classic "hydrophytes"

"Tolerance"

"All purpose" genotype (H.G. Baker)

Many genotypes

Hydrophytic Vegetation (2)

Additional Comments –
1) One or more plant communities may be present
2) Plant community concept followed
3) Emphasis on assemblage of plants (not just one or two species)
4) Density of vegetation must also be considered

Part II Technical Guidelines – On line 1987 *Corps Manual*

Wetlands Definition

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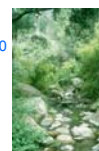
Part II Technical Guidelines – On line 1987 *Corps Manual*, p. 9 ¶26(a)

Prevalence

". . . . Is an imprecise term not generally used in the plant ecological literature"

"As used in the wetlands definition, prevalence refers to the plant community or communities that occur in an area at some point in time."

Part II Technical Guidelines – On line 1987 *Corps Manual*, p. 13 ¶30

Prevalence can be determined using different approaches, including…

• Dominance (basal area or canopy coverage)
• Density (number of individuals/unit area)
• Frequency (# times Species "X" occurs/number of sample points x 100)
• Importance Value (sum of relative frequency, density, and dominance, or any combination thereof)
• Biomass (dry weight of species above ground, below ground, or both)
• Net Primary Productivity (rate at which carbohydrate is accumulated in the tissue of plants [a primary producer] in an ecosystem)

HQ USACE, 6 Mar 92 "User Note"

The '50/20' rule is the recommended method for selecting dominant species from a plant community when quantitative data are available.

(more on this later on)

Dominant Vegetation in Four Strata

Selection of three of the most dominant species in each of four strata:

1) tree
2) shrub/sapling
3) herb
4) woody vines

Indicators of Hydrophytic Vegetation (1)

1) >50% of the dominant species are OBL, FACW, or FAC on the lists of plant species that occur in wetlands.

2) A FAC-Neutral option is also available
   *(more on this later, too)*

3) Other indicators

Indicators of Hydrophytic Vegetation (2)

Other Indicators . . .

1. Visual observation of plant species growing under prolonged inundation or saturation

2. Morphological adaptations

3. Technical literature (taxonomic references, botanical journals, technical reports), *etc.*

4. Physiological adaptations

5. Reproductive adaptations

National List of Plant Species that Occur in Wetlands (1988, 1996)
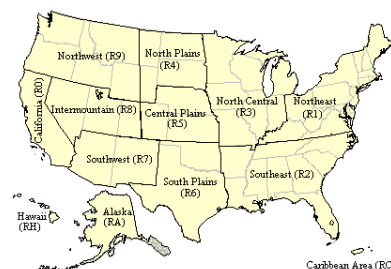
National List of Plant Species that Occur in Wetlands (1988, 1996)

1988   **1996**

Which List to Use?

"USER NOTES": CE-supplied plant lists are obsolete and have been superseded by the May 1988 version of the "National List of Plant Species that Occur in Wetlands" published by the U.S. Fish and Wildlife Service and available on the World Wide Web. Subsequent changes to the May 1988 national plant list, or regional versions of the national list, *should not be used until they receive official review and approval* (emphasis added).

HQ USACE, 27 Aug 91 and 17 Jan 96

Part III Characteristics and Indicators of Wetland Vegetation Soils, and Hydrology
– On line 1987 *Corps Manual*, p. 17

* Confirmed with Dan Martel and Mark D'Avignon that the Corps still uses the 1988 plant list. A revised plant list (1996) is expected in Spring 2009 (personal communication to PLF, 2008)

LAP801 Suggest adding this slide.
Laptop80, 10/31/2008

Slide 1

Further. . . .

"The 1996 National List is a draft revision of the National List of Plant Species That Occur in Wetlands: 1988 National Summary. The 1996 National List is provided to encourage public review and comments on the draft regional wetland indicator assignments" (emphasis added).
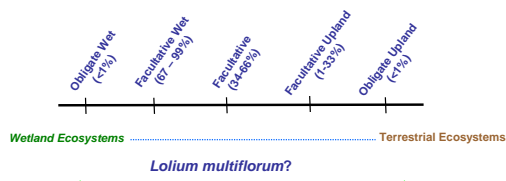
http://www.fws/gov/nwi/Plants/plants.htm

Slide 2

Reed, P.B., Jr. 1988. *National List of Plant Species That Occur in Wetlands: California (Region 0).*

Slide 3

Plant Indicator Status

Indicator Category	Symbol	Occurrence in Wetlands
Obligate Wetland Plants	OBL	>99%
Facultative Wetland Plants	FACW	66-99%
Facultative Plants	FAC	34-66%
Facultative Upland Plants	FACU	1-33%
Obligate Upland Plants	UPL	<1%
No Indicator Status	NI	Unreviewed
No Agreement	NA	Multiple opinions

Slide 4

Definition of Wetland Indicator Status

Obligate Wet (<1%) — Facultative Wet (67 – 99%) — Facultative (34-66%) — Facultative Upland (1-33%) — Obligate Upland (<1%)

Wetland Ecosystems .... Terrestrial Ecosystems

Lolium multiflorum?

Slide 5

Wetland Indicator Status

Example: *Scirpus microcarpus* = OBL

Slide 6

Obligate Wetland (OBL) Plant Examples
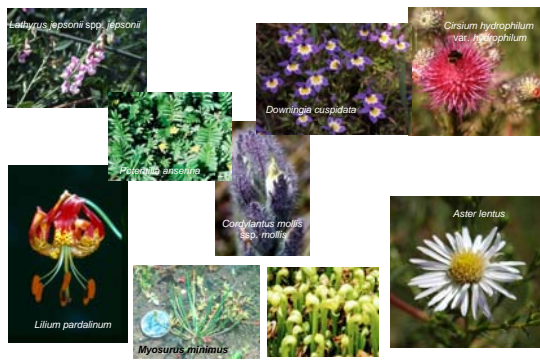
Lathyrus jepsonii ssp. jepsonii
Cirsium hydrophilum var. hydrophilum
Downingia cuspidata
Potentilla anserina
Cordylanthus mollis ssp. mollis
Aster lentus
Lilium pardalinum
Myosurus minimus

Facultative Wetland (FACW) Plant Examples

Salix lasiolepis
Calochortus palmeri
Dodecantheon hendersonii
Camassia quamash
Lepidium latifolium
Calochortus striatus
Iris longipetala

Facultative (FAC) Plant Examples

Helianthus bolanderi
Calochortus nudus
Cypripedium fasculatum
Lonicera involucrata
Rhododendron occidentale
Solanum americanum
Tamarix ramosissima
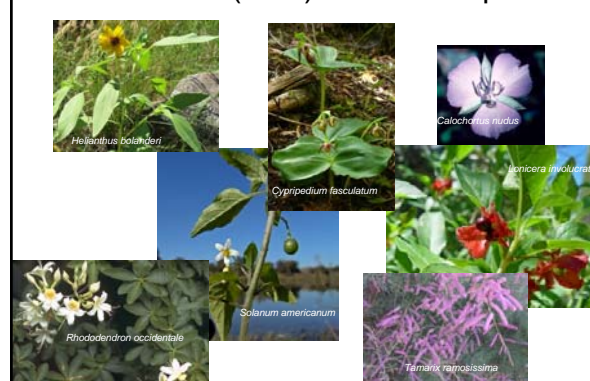
Facultative Upland (FACU) Plant Examples

Dactylis glomerata
Lactuca canadensis
Oxalis corniculata
Mimulus parishii
Ricinus communis
Cystopteris fragilis
Anthemis cotula

Obligate Upland (UPL) Plant Examples

Raffinesquea neomexicana
Calochortus argillosus
Dichelostemma congesta
Viola pedunculata
Langloisia setossima
Hibiscus lasiocarpus
Astragalus nuttallii var. virgatus
Phacelia campanularia

"NI" & "NA"
Plant Examples

NI – not reviewed
by Review Panel

Saxifraga caespitosa

NA – No concensus
by Review Panel

Maianthemum dilatatum

1988 List - (+) (-) and (*)
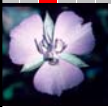
(+) = species tends to be on the wetter side of the category
E.g., *Sporobolus airoides*   FAC+

(-) = species tends to be on the drier side of the category
E.g., *Cirsium arvense*   FAC-

(*) = species category designation is tentative
E.g., *Trifolium beckwithii*   FAC*

NOTE! (+) and (-) not used in the Arid West Supplement
or in the Mountains, Valleys & Coast

FAC-Neutral Option (1)
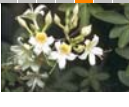
If FAC species occur as dominants w/ other dominants (either wetter or drier),

then FAC species can be considered "neutral"

Therefore, the vegetation parameter is determined using those remaining dominants species wetter than FAC, as compared to the number drier than FAC.

When a tie (or all dominants are FAC) occurs, then nondominants must be considered.

Part III Characteristics and Indicators of Wetland Vegetation Soils, and Hydrology
– On line 1987 *Corps Manual*, p. 17, ¶35 (a)

FAC-Neutral Option (2)

1) Used where evidence of wetlands hydrology or hydric soils is weak. (Presence of a plant community that satisfies the FAC neutral option may be used as a secondary indicator of wetland hydrology.)

2) Use is at the discretion of the District.

3) **However,** FAC-Neutral Option **cannot be used to exclude areas** as wetlands that meet the basic vegetation rule and that meet wetland hydrology and hydric soil requirements

Part III Characteristics and Indicators of Wetland Vegetation Soils, and Hydrology
– On line 1987 *Corps Manual*, p. 17, ¶35 (a)

Overview – Comparison between 1987 COE Wetlands Delineation Manual & Supplements for Vegetation

1987 Manual
• +/- modifiers on indicator status
• Methods to determine dominant species is not specifically recommended
• Dominance Test: Greater than 50% of dominant species are FAC or wetter
• Morphological Adaptations
• Atypical Situations and Problem Area Procedures

Supplements
• Elimination of +/- modifiers
• Recommended use of 50/20 Rule to determine dominant species in each stratum
• Dominance Test: Greater than 50% of dominant species are FAC or wetter
• Prevalence Index PI is 3.0 or less
• Morphological Adaptations
• Wetland Non-Vascular Plants (WMVC only)
• Difficult Wetland Situations Procedures

Supplements
New Methods for Hydrophytic Vegetation

• Indicator 1: Dominance test
  – If not met but you have wetland hydrology and hydric soils, continue

• Indicator 2: Prevalence Index
  – If not met but you have wetland hydrology and hydric soils, continue

• Indicator 3: Morphological Adaptations
  – If not met but you have wetland hydrology and hydric soils, continue

• Indicator 4: Wetland Non-Vascular Plants (WMVC only)
  – If not met but you have wetland hydrology and hydric soils, proceed to Difficult Wetland Situations procedures

New *(Sequential)* Methods for Hydrophytic Vegetation in Arid West & WMVC Supplements (1)

• Indicator 1: Dominance test
  – If not met, but you have wetland hydrology and hydric soils, continue . . . . *(more in a moment)*
• Indicator 2: Prevalence Index
  – If not met, but you have wetland hydrology and hydric soils, continue . . . . *(more in a moment)*
• Indicator 3: Morphological Adaptations
  – If not, met, but you have wetland hydrology and hydric soils, continue . . . . *(more in a moment)*
• Indicator 4: Wetland Non-Vascular Plants (WMVC only)
  – If not met, but you have wetland hydrology and hydric soils, proceed to Difficult Wetland Situations procedure . . . . *(more in a moment)*

(From US ACOE, Seattle District 10/29/08)

Dominance Test
Requirements for HydrophyticVegetation in Arid West & WMVC Supplements (1)

• Before using **Indicator 1 Dominance Test,** you must determine the dominant species in each stratum
  – Strong recommendation of use of the 50/20 Rule
  – Must determine dominant species for *each stratum*
    • Tree = woody plant ≥ 3" DBH regardless of height
    • Sapling/shrub = woody plant < 3" DBH, regardless of height
    • Herb
    • Woody vines

• Describe plot size utilized

• If species is NI, use the indicator status in adjacent region. If not listed in adjacent region, then delete it from the calculation process even if it is the dominant species (unless it is acting as a hydrophyte)

(two examples to come)

(From US ACOE, Seattle District 10/29/08)

Prevalence Index
Requirements for Hydrophytic Vegetation
in Arid West & WMVC Supplements (2)

Indicator 2: Prevalence Index

At least 80% of species across strata must be identified
and have assigned wetland indicator status

PI of a hydrophytic vegetation community is 3.0 or less

(*two examples to come*)

(From US ACOE, Seattle District 10/29/08)

Morphological Adaptations Requirements for Hydrophytic
Vegetation in Arid West & WMVC Supplements (3)

Indicator 3: Morphological Adaptations

Confirm morphological adaptation present in potential wetland area
and not common in potential non-wetland

For each FACU species, identify morphological adaptations present
in more than 50% of the FACU plants; record percentage, then

If >50% of individuals in each species has the adaptation, reassign
wetland indicator status as FAC (if present), then

Go back to see if Hydrophytic Vegetation Indicator 1 or 2 has been
met.

(From US ACOE, Seattle District 10/29/08)

Wetland Specialist Bryophytes
Requirements for WMVC Supplement **Only!** (4)

- Indicator 4: Wetland Specialist Bryophytes
  (*WMVC region only*)
  - Estimate percent cover of wetland specialist
    bryophytes and total cover of bryophytes

  - If more than 50% of the bryophyte cover consists of
    wetland specialist bryophytes, then the vegetation is
    hydrophytic
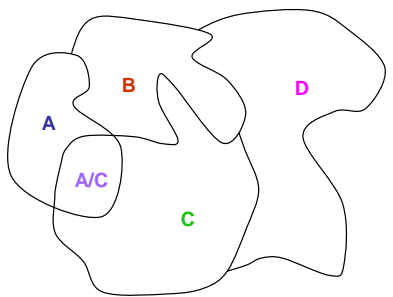
Vegetation Sampling

Things to Think About When You First Get to a Site…..

1) Sampling universe
2) Moisture gradient (wet to dry)
3) Sampling design – what, where, and how
4) Objective of vegetation sampling

Step # 1: Stratify Study Area into Relatively
Homogeneous Hydrologic, Habitat, or Plant
Community Types

B   D

A

A/C

C

Vegetation Sampling Presented in Supplements & 1987

Corps Manual Appropriate for Most Calls
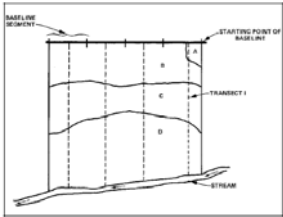
Areas ≤ 5 Acres
1. Identify plant community(-ies); sketch
2. Difficult wetland situation?
3. Select representative sample points
4. Sample/record vegetation, soils, & hydrologic data

Areas > 5 Acres
1. Establish baseline
2. Determine number and position of sampling transects
3. Difficult wetland situation?
4. Complete data form for each sampling point

Hypothetical Project Area
(Azevedo Field [tomorrow!])

1. From wetland observation point, look for (subtle) changes in plant communities
2. Establish sampling point & sample
3. Continue on transect until upland indicators become apparent
4. Repeat sampling back/forth until boundary is found

Part IV Methods
– On line 1987 *Corps Manual*, p. 56

Plot Sampling

Plot Size

5-ft radius for herbs and shrubs/saplings

30-ft radius for trees and woody vines.
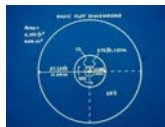
1987 Corps Manual

Plot Size
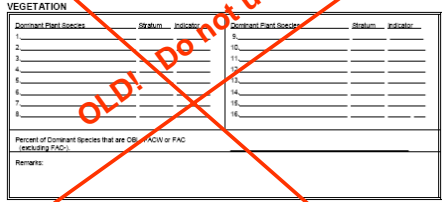
1/100 acre (11.78-ft radius) for herbs and shrubs/saplings

1/10 37.23-ft radius for trees and woody vines.

Section IX, Useful Tools

ROUTINE WETLAND DETERMINATION DATA FORM
1987 COE Wetlands Delineation Manual
Vegetation Section

OLD! Do not use!

WETLAND DETERMINATION FORM
Arid West Region – Vegetation Section

NOTE! Vegetation section of the datasheet is **identical** (*well, almost*) for Western Mountains, Valleys and Coast Region and for Arid West Region

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WETLAND DETERMINATION FORM
Western Mountains, Valleys, and Coast Region --
Vegetation Section

NOTE! Vegetation section of the datasheet is **identical** (*well,* almost) for Western Mountains, Valleys and Coast Region and for Arid West Region

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Indicator #1: Selection of Dominant Species by the 50/20 Rule

Dominant species chosen independently from each stratum

Uses absolute cover measurements

Includes every species (individually or collectively) that is ≥ 50% of that stratum

Additionally, includes any other species that, by itself, accounts for ≥ 20% of that stratum

Part II Technical Guidelines – On line 1987 *Corps Manual*

Absolute vs Relative Cover

Absolute Cover (AC) = proportion of the ground occupied by the perpendicular projection on to it of the aerial parts of individuals of species under consideration, usually expressed in %

Relative Cover (RC) = percentage of total plant cover; relative cover is always 100%

Species	AC(%)	RC(%)
A	0.2	0.4
B	33.2	63.6
C	4.7	9.0
D	6.2	11.9
E	7.9	15.1
Total	52.2	100.0

E.g., Solve for **B** relative cover (RC)
$33.2/52.2 = B/100$
$33.2 \times 100 = 52.2 \times B$
$332 = 52.2B$
$332/52.2 = 52.2B/52.2$
$6.36 = B$
For %, multiply **B** by 100
Therefore, **B = 63.6% RC**

50/20 Protocol

1) Estimate absolute cover
2) Rank from most to least abundant
3) Calculate total cover of all species per stratum
4) In decreasing order of cover, select species until the total coverage exceeds 50% for each stratum
5) Select any other species that individually accounts for at least 20%

Indicator #1- 50/20 Example:
Selection of Dominant Species by the 50/20 Rule

$11(.5) = 5.5\%$
$11(.2) = 2.2\%$

$17(.5) = 8.5\%$
$17(.2) = 3.4\%$

$20(.5) = 10\%$
$20(.2) = 4\%$

Table 4, *Arid West Supplement (p. 23); see also Table 2-3, Mountains, Valleys & Coast*

Carmel River Flood Plain

WETLAND DETERMINATION FORM - Arid West Region or Western Mountains, Valleys, and Coast Region – Vegetation Section

Trees & Sapling/Shrub Strata (35%): 50% = 17.5%; 20% = 7%
Herb Stratum (87%): 50% = 43.5%; 20% = 17.4%

Indicator #2: Prevalence Index (1)

Weighted average wetland indicator status for all species in the sampling plot

Each indicator status category assigned a number
(OBL = 1, FACW = 2, FAC = 3, FACU = 4, UPL = %)

Weighted by abundance (i.e., per cent cover)

Indicator #2: Protocol for Prevalence Index (PI)

1) Identify all species & estimate absolute cover in each stratum

2) Categorize all species across strata into wetland indicator status categories (if not only the wetland list, assume to be UPL)

3) Calculate PI using formula:

$$PI = A_{OBL} + 2A_{FACW} + 3A_{FAC} + 4A_{FACU} + 5A_{UPL} / A_{OBL} + A_{FACW} + A_{FAC} + A_{FACU} + A_{UPL}$$

(A = summed percent cover of each indicator status)

5) PI will range from 1 – 5; ≤3.0 PI is sufficient to satisfy the hydrophytic vegetation parameter

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Indicator #2: Prevalence Index (3)

Table 5, *Arid West Supplement (p. 25)*; see also Table 2-4, *Mountains, Valleys & Coast*

Carmel River Flood Plain

Indicator #2- PI Example:
Selection of Dominant Species by the PI Rule

PI < 3, therefore hydrophytic vegetation parameter is met.

Indicator #3: Plant Morphological Adaptations

- Buttressed tree trunks
- Multiple tree trunks
- Pheumatophores
- Adventitious roots
- Shallow roots
- Hypertrophied lenticels
- Aerenchyma
- Polymorphic leaves
- Floating leaves

Indicator #4: Wetland Non-Vascular Plants

Rationale: Based upon presence and abundance of selected group of specialist bryophytes specific to forested wetlands in coastal Oregon & Washington.

>50% cover of specialist bryophytes in bryophyte layer

Not appropriate for Region Ø

Difficult Wetland Situations

- Problem area wetlands are defined as:

  "naturally occurring wetland types that periodically lack indicators of hydrophytic vegetation, hydric soil, or wetland hydrology due to normal seasonal or annual variability."

Problematic Hydrophytic Vegetation

- Many factors affect plant community composition, consequently indicator vegetation may not present during certain times.
  – *i.e.,* climate, ephemeral water sources, saline soils, grazing, and other human activities

  Therefore….Wetland delineation decisions should be based on the plant community *normally present during the wet portion of the growing season*.
  ✓ Field observations
  ✓ Information gathered from scientific literature or other sources.

Three General Approaches to Problematic Hydrophytic Vegetation
*For both **Arid West** and **WMVCR***

1. Direct hydrological observations
   Visit site during portion of growing season when surface water is most likely to be present or water tables are normally high

2. Reference sites
   Landscape setting, topology, soils, and vegetation are nearly the same as nearby wetland reference sites

3. Technical literature
   Published or unpublished literature supporting decision to treat species or plant communities as hydrophytic

Specific Problematic Vegetation Situations- Examples

a. Temporal shifts in vegetation
b. Sparse and patchy vegetation
c. Riparian areas
d. Areas affected by grazing
e. Managed plant communities
f. Aggressive invasives
g. Areas affected by natural disturbances
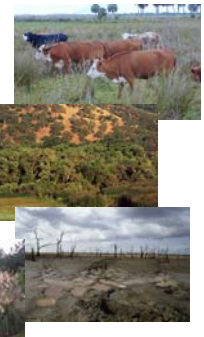
General Procedure for Addressing Problematic Hydrophytic Vegetation (1)

Step #1: Verify at least one indicator of hydric soil and one primary or two secondary indicators are present.

  X Indicators of either hydric soil or wetland hydrology absent- likely non-wetland (unless disturbed or problematic)

  ✓ Indicators are present- proceed to step 2 (*specific problematic vegetation situations*) or step 3 (*general approaches to problematic hydrophytic vegetation*)

Work as a team!! (with soil scientist and hydrologist)

General Procedure for Addressing Problematic Hydrophytic Vegetation (2)

Step #2: Verify the area is in a landscape position likely to collect or concentrate water (*e.g.,* depression, seep, floodplain, toe slope, fringe, *etc.*)

Step #3: Determine which is best approach for specific problem vegetation situations (*e.g.,* patchy/sparse, riparian areas, *etc.*) described in *Supplements*

Step #4: Complete basic 3- or 4- or 5- step procedure, depending upon type of problematic vegetation situation

Procedure for Temporal Shifts in Vegetation - Seasonal

Step #1. If possible, return to site under normal wet conditions and re-examine for indicators of hydrophytic vegetation

Step # 2. Examine site for identifiable plants remains (dead or alive) present during normal wet conditions

Step # 3. Use off-site data sources to determine whether plant community(ies) normally present is hydrophytic (*e.g.,* aerial photography, soil surveys, *etc.*)

Step # 4. Use reference site

Temporal Shifts in Vegetation - Drought

Drought in Arid West > 1yr

WMVCR > 2 yr

Step #1. Investigate climate records to determine drought conditions. Determine whether vegetation under normal climatic conditions is hydrophytic.

Step # 2. If vegetation on drought-affected area is +/- same as reference, then consider vegetation to be hydrophytic

Sparse and Patchy Vegetation

Can be complicated/confusing

Vegetated areas: >5% area cover of plants at peak growing season

Unvegetation areas: <5%

However! Some unvegetated areas may exhibit OHW indicators (other waters)

And some may be unvegetated by have hydric soils and wetland hydrology

Procedures for Playa (Arid West)

Step #1. Develop site map of vegetated & unvegetated

Step #2. Use standard methods for vegetated (e.g., 50/20)

Step #3. In unvegetated, look for OHW indicators. If present, these areas are potential non-wetland waters of the U.S.

Step #4. Identify unvegetated areas w/o OHW indicators, but have indicators of hydric soils and wetland hydrology. These are part of the mosaic of vegetated wetlands & other waters

Step #5. Final delineation has (a) wetlands; (b) other waters: (c) interspersed areas w/o vegetation but that have other parameters present.

One more example…..
"Managed Plant Communities"

These include areas where vegetation cleared, disked or plowed, non-native planted, pastures, etc.

Step #1: Examine vegetation on near by unmanaged reference site. Assume plant community would exist at managed site under investigation

Step #2: Recently plowed or cleared – wait at least one growing season w/ normal rainfall to evaluate

Step #3: If recent management, can use data sources (*e.g.,* NWI maps, interviews) to make determination

Step #4: If unmanaged vegetation conditions cannot be determined, make determination based upon indicators of hydric soils and wetland hydrology

True also for Areas affected by Floods & Fires, Areas Grazed

One *last* example…..
Riparian Plant Communities in Arid West

Riparian areas highly variable in Arid West, w/ wetland and non-wetland species

Riparian areas also may support remnant vegetation from a wetter period (*e.g.,* black cottonwoods) – hydrophytic overstory w/ non-hydrophytic understory

Depending on soils (entisol?) and hydrology, emphasis should be placed on vegetation more indicative of current conditions.

Cuyamaca River