Interim Regional Supplement to the Corps Wetland Delineation Manual

ARID WEST REGION

- Presentation highlights some concepts, procedures, changes, q's and a's
- Not intended as Wetland Delineation Training or advanced instruction for identification of hydric soil, hydrophytic vegetation or wetland hydrology
- During year long Interim Period request wetland determinations are evaluated by both:

  -Corps 87 Manual with current guidance

  -Corps 87 Manual with Regional Supplement
- Differences in wetland determinations delineations should be identified and evaluated

WHY REGIONAL SUPPLEMENT

- National Academy of Sciences (1995) made recommendations to increase the regional sensitivity of wetland delineation methods
- 20-year-old Manual no longer reflects the state-of-the-science
- Regional Supplements to the Corps Wetland Delineation Manual are intended to improve the accuracy and efficiency of wetland delineation procedures

REGIONAL SUPPLEMENT GOALS

- Bring the Corps Manual up to date with current knowledge and practice
- Not change wetland boundaries but increase clarity and certainty in wetland determination and boundary delineation
- Used to identify areas meeting the Corps/EPA definition of wetlands
- Not used for identification for Waters of US or to establish regulatory jurisdiction

REGIONAL SUPPLEMENT CONTAINS

- Description of the region
- Regionalized indicators of hydrophytic vegetation, hydric soil, and wetland hydrology
- Guidance for dealing with disturbed or problem wetland situations in the region

REGIONAL SUPPLEMENT - NATIONAL MANUAL

- Regional Supplement is designed for use with current National 1987 Wetland Delineation Manual
- Where differences between the two documents occur, the Regional Supplement takes precedence over the National Manual
- Corps Districts retain final authority over use and interpretation of National Manual and Regional Supplements

REGIONAL SUPPLEMENT – NATIONAL MANUAL

Table 1
Sections of the Corps Manual replaced by this Regional Supplement for applications in the Arid West.

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(g)

FUTURE SUPPLEMENT/MANUAL CHANGES

- Amendments may be issued periodically in response to new scientific information
- Corps HQ's may provide updates and supplemental information between published versions
- Delineators should use most current version of supplement and manual
- An interagency National Advisory Team for Wetland Delineation has been established to review new data and make recommendations to Corps HQ's for changes
- Problems with use or results of the Regional Supplement should be brought to the attention of the local District

ARID WEST REGION

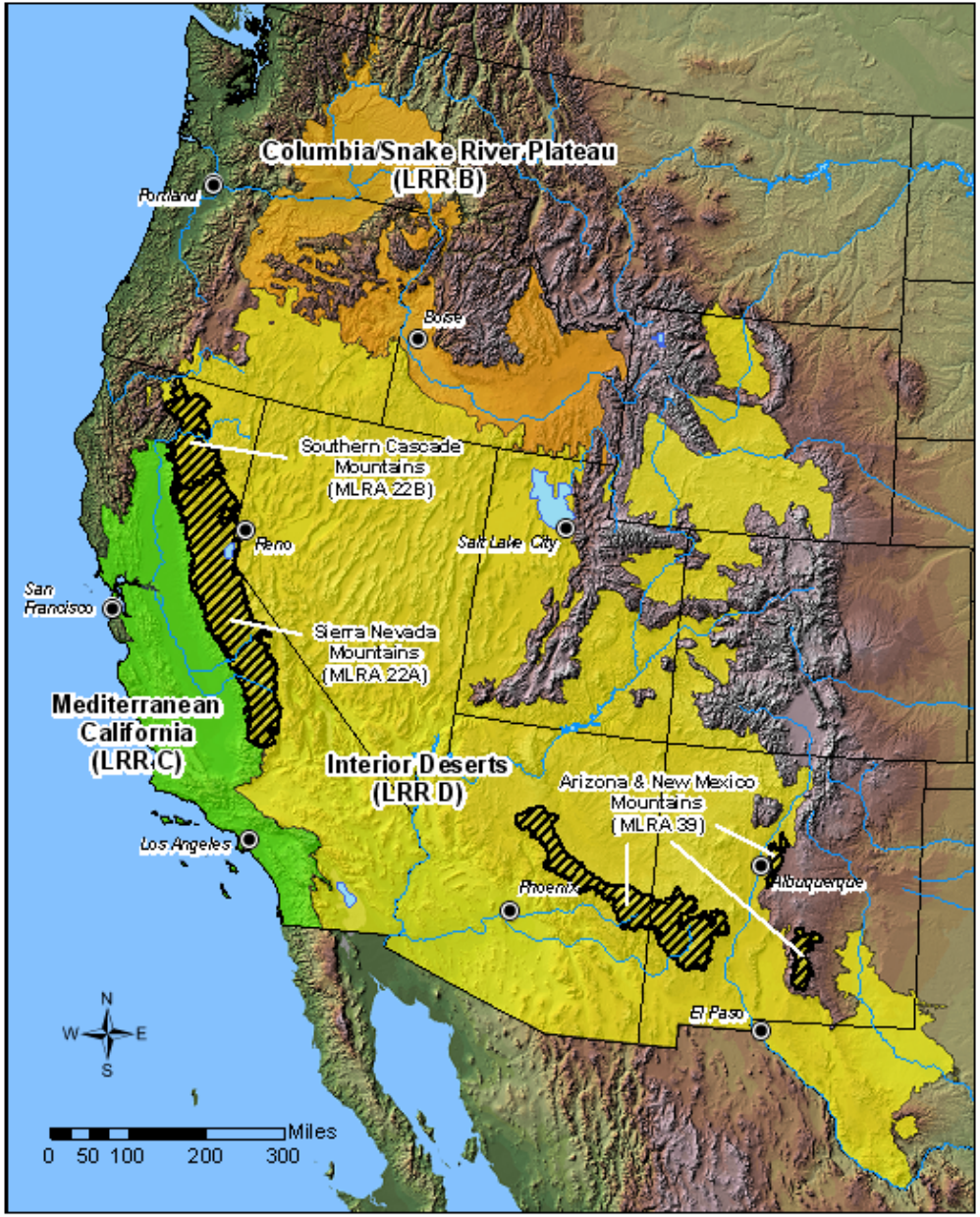
- Arid west encompasses wide variety of landforms and ecosystems
- Common characteristic is predominantly dry climate with a long summer dry season
- Annual evapotranspiration exceeds precipitation across most of the region
- Arid West Region generally conforms to NRCS LRR's B, C and D

ARID WEST REGION - SUBREGIONS

- Within the Arid Western Region there are three recognized sub-regions that are sufficiently different in climate, landforms, biogeography, and/or wetland characteristics to warrant separate consideration of wetland indicators and delineation guidance.
- Sub-regions include the Interior Deserts (LRR D), Columbia/Snake River Plateau (LRR B) and Mediterranean California (LRR C).
- Most indicators in the Regional Supplement are applicable across all sub-regions in the Arid West.

ARID WEST REGION / SUBREGIONS

Figure 1. Approximate boundaries of the Arid West Region and subregions (LRR B, C, and D). This regional supplement is applicable throughout the highlighted areas, including coastal areas, with the following exceptions: (1) the cross-hatched portions of LRR D comprising the Sierra Nevada Mountains (MLRA 22A), the Southern Cascade Mountains (MLRA 22B), and the Arizona and New Mexico Mountains (MLRA 39) and (2) other embedded mountain ranges not indicated on the map that support predominantly coniferous forests with interspersed meadows, shrublands, and riparian woodlands above and including the ponderosa pine zone. See text and Table 2 for details.



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ARID WEST–WESTERN MOUNTAINS BOUNDARY

- Arid West is surrounded by and interspersed with portions of Western Mountains, Valleys and Coast
- Areas within LRR B, C and D that are excluded from Arid West include:

  + Sierra Nevada Mountains – MLRA 22A

  + Southern Cascade Mountains – MLRA 22B

  + Arizona and New Mexico Mountains – MLRA 39

  + other mountain ranges scattered throughout the west that support mainly coniferous forests on the lower slopes, alpine tundra at the highest elevations, and open coniferous woodlands, shrublands, meadows and hardwood riparian woodlands in the valleys, down to the lower elevation limit of the Ponderosa Pine Zone or its local equivalent

USE PROPER REGIONAL SUPPLEMENT

- Decision on which regional supplement to use at a particular site should be based on landscape and site conditions rather than solely on map location
- Map is generalized and does not include small areas of Western Mountains or areas with Arid West conditions outside LRR's B, C and D
- If in doubt contact local District to resolve uncertainty before doing the work

COMPARISON OF ARID WEST-WESTERN MOUNTAIN GENERAL CONDITIONS

Table 2
Comparison of site characteristics for application of the Arid West Regional Supplement or the Western Mountains, Valleys and Coast Regional Supplement

Site 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). 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 (*P. monophylla* or *P. edulis*), junipers (*Juniperus*), cottonwoods (*Populus*), willows (*Salix*), or hardwoods (e.g., *Quercus, Platanus*). Landscape mostly dominated by grasses and shrubs (e.g., sagebrush (*Artemisia*), rabbitbrush (*Chrysothamnus*), bitterbrush (*Purshia*), and creosote bush (*Larrea*)). Halophytes (e.g., *Allenrolfea, Salicornia, Distichlis*) present in saline areas.	Forests at comparable elevations in the local area dominated by conifers (e.g., spruce (*Picea*), fir (*Abies*), hemlock (*Tsuga*), Douglas-fir (*Pseudotsuga*), coast redwood (*Sequoia*), or pine (*Pinus*) except pinyon) or aspen (*Populus tremuloides*). West of the Cascades, Oregon ash (*Fraxinus latifolia*) and bigleaf maple (*Acer macrophyllum*) often dominate. Open areas generally dominated by grasses, sedges, shrubs (e.g., willows or alders (*Alnus*)), or alpine tundra.
Soils	Mostly dry, poorly developed, low in organic matter content, and high in carbonates. Soils sometimes highly alkaline. Surface salt crusts and efflorescences common in low areas.	Generally better developed, higher in organic matter content, and low in carbonates. Surface salt features are less common except in geothermal areas.
Hydrology	Drainage basins often lacking outlets. Temporary ponds (often saline), salt lakes, and ephemeral streams predominate. Water tables often perched. Major streams and rivers flow through but have headwaters outside the Arid West.	Streams and rivers often perennial. Open drainages with many natural, freshwater lakes. Water tables often continuous with deeper groundwater. Region serves as the headwaters of the major streams and rivers of the western United States.

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HYDROPHYTIC VEGETATION

ARID WEST REGIONAL SUPPLEMENT VEGETATION – DEFINITION

- Hydrophytic vegetation is defined as the community of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to exert a controlling influence on the plant species present

VEGETATION– ARID WEST COMMON PROBLEMS

- Disturbance or altered conditions may change the hydrophytic composition and/or status of a vegetation community
- Halophytes and Phreatophytes
- Shifts in presence and species composition of vegetation especially annuals caused by seasonal weather patterns or climatic extremes
- See Problematic Hydrophytic Vegetation when indicators of hyrdophytic vegetation may be misleading due to disturbance, alteration, problems or abnormal conditions

VEGETATION– ARID WEST COMMON PROBLEMS

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- Common for shifts in presence and species composition of vegetation especially annuals caused by seasonal weather patterns or climatic extremes
- See Problematic Hydrophytic Vegetation when indicators of hyrdophytic vegetation may be misleading due to disturbance, alteration, problems or abnormal conditions

VEGETATION- ARID WEST SPECIES INDICATORS

- Species wetland indicator status found in Reed (1988)
- Only five basic levels of wetland indicator status (Olb, FacW, Fac, FacU and Upl) are used in determinations. No plus (+) or minus (-) modifiers are used

VEGETATION- ARID WEST PLANT LISTS

Figure 2-1. Plant list regional boundaries (red lines) currently used by the U.S. Fish and Wildlife Service, National Wetlands Inventory, in the Arid West.

Figure 2-1. Plant list regional boundaries (red lines) currently used by the U.S. Fish and Wildlife Service, National Wetlands Inventory, in the Arid West.

VEGETATION- ARID WEST SAMPLING

- All sampling techniques must be usable in format of DT or PI
- Percent cover is the preferred measure of abundance
- Arid west strata include tree, sapling/shrub, herbaceous and woody vine
- Change from Corps Manual: 1) Short woody shrubs placed in sapling/shrub 2) Herb stratum includes only non-woody species; 3) A stratum is not counted unless there is at least 5% total plant cover; and 4) If less than 5% total plant cover for a stratum include in next lower stratum

VEGETATION - ARID WEST INDICATORS 1

- Dominance Test – is the basic hydrophytic vegetation indicator and should be applied in all wetland determinations. A hydrophytic plant community exists when >50% of dominant species from across all strata are Fac or wetter.
- Prevalence Index – used when plant community fails dominance test but has hydric soil and wetland hydrology. PI includes all species within community not just dominants. A PI number of 3 or less is a hydrophytic plant community.

VEGETATION – ARID WEST INDICATORS 2

- Morphologic Indicators – used when plant community has failed the Dominance Test and PI but has hydric soil and wetland hydrology. The indicator status of a plant with morphologic adaptations to wetland conditions is reconsidered and the Dominance Test and PI are recalculated.
- If no indicator is present than the hydrophytic vegetation is absent UNLESS hydric soils and wetland hydrology are present and the site meets the requirements for a problematic wetland situation

VEGETATION- ARID WEST DOMINANCE TEST

- > 50% of the dominant plant species across all strata are rated as Obl, FacW and Fac
- Use 50/20 rule to identify dominant species from each stratum
- Dominant species in all strata are treated equally regardless of absolute cover value
- Species that are dominant in two strata are counted twice

VEGETATION- ARID WEST

PREVALENCE INDEX

- Prevalence Index value of 3.0 or less is a hydrophytic plant community
- PI is a weighted average of indicator status for all species in a sample plot where indicator status is converted to a numeric code (Obl = 1, FacW = 2, Fac = 3, FacU = 4, and Upl = 5)
- Cover estimates for species are summed across strata
- Use of PI requires species identification of at least 80% of the total vegetative cover and requires that identified species have an assigned indicator status (Reed 1988)
- Used on sites where indicators of hydric soils and wetland hydrology are present but the vegetation initially fails the Dominance Test

VEGETATION – ARID WEST MORPHOLOGICAL ADAPTATIONS

- Dominance Test or Prevalence Index can be recalculated if the indicator status of a species is reconsidered because of plant morphologic adaptation for life in wetlands
- Common morphologic adaptations in the arid west include but are not limited to adventitious roots and shallow root systems
- Wetland morphologic adaptations occurring on FacU species indicate those individuals are functioning as hydrophytes in that setting
- Consider morphologic adaptations on sites with hydric soils and wetland hydrology but no hydrophytic plant community

VEGETATION–MANUAL/ARID WEST SUPPLEMENT

HYDROPHYTIC PLANT COMMUNITY

87 MANUAL	ARID WEST 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. Indicators of hydric soil and wetland hydrology must be present
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 with presence of hydric soil and wetland hydrology
Technical Literature	Not an Indicator. See Difficult Situations
Physiological Adaptations	Not Used
Reproductive Adaptations	Not Used

VEGETATION SECTION – DATA SHEET 87 MANUAL

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1.			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). _____

Remarks:

VEGETATION SECTION – ARID WEST

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

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)

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 = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** _____ **No** _____

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
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2.			
Total Cover:			

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

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)

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 = _____

Hydrophytic Vegetation Indicators:

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___ Prevalence Index is ≤3.0[1]

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___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** _____ **No** _____

Remarks:

HYDRIC SOIL

HYDRIC SOIL - INTRODUCTION 1

- Hydric soils are defined as soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part
- Hydric soils generally exhibit characteristic morphologies resulting from biogeochemical processes such as organic matter accumulation and the reduction, translocation, and accumulation of iron and other elements

HYDRIC SOIL - INTRODUCTION 2

- Arid West is adopting regional indicators found in NTCHS Field Indicators for Hydric Soils
- Indicators are not intended to replace or relieve requirements contained in the definition of hydric soil
- The absence of a listed indicator does not preclude the soil from being considered hydric

HYDRIC SOIL- DOCUMENT SITE CONDITIONS

- Before hydric soil determination can be made site conditions should be understood
- Arid west data form requests information on site conditions including:

  hydrology – observed and antecedent conditions

  slope- surface drainage

  slope shape- concave, convex, flat, convergent

  landform- terrace, floodplain

  soil material- presence of aquatard, texture

  vegetation- condition, site comparative species composition and abundance

HYDRIC SOIL – FIELD INDICATORS 1

- 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 fine sandy loam 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 – FIELD INDICATORS 2

- 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. Nodules and concretions are not considered to be redox concentrations unless other wise noted
- Both sandy layers and loamy or clayey layers may be present in the same soil profile

ARID WEST REGIONAL HYDRIC SOIL INDICATORS

A1 Histosol	S1 Sandy Mucky Mineral	F1- Loamy Mucky Mineral	+ * A9 1 cm Muck
A2 Histic Epipedon	S4 Sandy Gleyed Matrix	F2 Loamy Gleyed Matrix	+ *** A10 2 cm Muck
A3 Black Histic	S5 Sandy Redox	F3 Depleted Matrix	+ F18 Reduced Vertic
A4 Hydrogen Sulfide		F6 Redox Dark Surface	+ TF2 Red Parent Material
* A5 Stratified Layer		F7 Depleted Dark Surface	
** A9 1 cm Muck		F8 Redox Depressions	
A11 Depleted Below Dark Surface		F9 Vernal Pools	
A12 Thick Dark Surface			
* applicable to LRR C	** applicable to LRR D	*** applicable to LRR B	+ Problem Soil Indicator

HYDRIC SOIL - MANUAL / ARID WEST CHANGES NON-SANDY SOIL 1

87 MANUAL	ARID WEST SUPPLEMENT
Organic Soil (Histosol)	A1 Histosol A3 Black Histic
Histic Epipedon	A2 Histic Epipedon A3 Black Histic
Sulfidic Material	A4 Hydrogen Sulfide
Aquic or Peraquic Moisture Regime	None

HYDRIC SOIL – MANUAL / ARID WEST CHANGES NON-SANDY SOIL 2

87 MANUAL	ARID WEST SUPPLEMENT
Reducing Soil Conditions	General Procedure Used with Problem Hydric Soil F-18 Reduced Vertic
Soil Color (1) gleyed soils (2) soil with bright mottles and /or matrix with low chroma	(1) F2 Loamy Gleyed Matrix (2) F3 Depleted Matrix (2) F9 Vernal Pools
Soil appearing on Hydric Soil List	None
Iron and Manganese Concentrations	None

HYDRIC SOIL – MANUAL / ARID WEST CHANGES SANDY SOIL 1

87 Manual	ARID WEST SUPPLEMENT
Organic Soil (Histosol)	A1 Histosol A3 Black Histic
Histic Epipedon	A2 Histic Epipedon A3 Black Histic
Sulfidic Material	A4 Hydrogen Sulfide
Aquic or Peraquic Moisture Regime	None
Reducing Soil Conditions	Used with Problem Hydric Soil

HYDRIC SOIL – MANUAL / ARID WEST CHANGES SANDY SOIL 2

87 Manual	ARID WEST SUPPLEMENT
Iron and Manganese Concentrations	None
High Organic Matter Content in the Surface Horizon	A9 1cm Muck A10 2 cm Muck S1 Sandy Mucky Mineral
Streaking of Subsurface Horizons by Organic Matter	S6 Stripped Matrix
Organic Pans	None
Soils Appearing on Hydric Soil List	None

HYDRIC SOIL – 87MANUAL / ARID WEST CHANGES PROBLEM SOIL

87 Manual	Arid West Supplement
Sandy Soil	A5 Stratified Layers S4 Sandy Gleyed Matrix
Soils with Thick A Horizons	A11 Depleted Below Dark Surface A12 Thick Dark Surface F6 Redox Dark Surface F7 Depleted Dark Surface F18 Reduced Vertic
Soil with Red Parent Material	F8 Redox Depressions F9 Vernal Pools TF2 Red Parent Material
Soil with Low-Chroma Parent Material	S4 Sandy Gleyed Matrix

SOIL SECTION – DATA SHEET 87

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Field Observations

Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

SOIL SECTION – ARID WEST

SOIL Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

HYDRIC SOIL – A1-HISTOSOL

- histosol except folists
- all arid west sub-regions
- 16 inches or more of the upper 32 inches as organic soil material, 12% to 18% or more carbon by weight depending on clay content

A1 – Histosol

Figure 3-1. Indicator A1 (Histosols). In this example, muck (sapric soil material) is greater than 3 ft (0.9 m) thick.

HYDRIC SOIL – A2-HISTIC EPIPEDON

- a histic epipedon (generally, an organic surface layer underlain by mineral soil material with C 2 or less
- all arid west sub-regions
- generally, a surface horizon that is 8 inch or more thick and composed of organic soil material. Aquic conditions or artificial drainage are required but aquic conditions can be assumed if indicators of hydrophytic vegetation and wetland hydrology are present.

A2 HISTIC EPIPEDON

Figure 3-2. Organic surface layer less than 16 in. (40.6 cm) thick.

HYDRIC SOIL – A3-BLACK HISTIC

- a layer of peat, mucky peat, or muck 8 inches or more thick starting within 6 inches of the soil surface; has a hue of 10YR or yellower, value 3 or less, and chroma 1 or less; and is underlain by mineral soil material with C 2 or less
- all arid west sub-regions
- does not require proof of aquic conditions or artificial drainage

A3 – BLACK HISTIC

Figure 3-3. Black organic surface layer greater than 11 in. (28 cm) thick.

HYDRIC SOIL – A4-HYDROGEN SULFIDE

- hydrogen sulfide (rotten egg) odor with 12 inches of the soil surface
- all arid west sub-regions
- hydrogen sulfide odors occur in soils that have reduced sulfur. This indicator is typically found in permanently inundated or saturated soils

HYDRIC SOIL – A5-STRATIFIED LAYERS

- several stratified layers starting within 6 inches of the soil surface. One or more of these layers has V 3 or less with C 1 or less and/or it is muck, mucky peat, peat or mucky modified mineral texture. The remaining layers have C 2 or less.
- applicable to LLR C
- Individual strata are typically less than 1 inch thick. Alluvial soils may have stratified layers buried below the required depths or not meet the V and/or C requirements and are not considered hydric. Stratified layers may occur in any texture of soil material.

A5 – STRATIFIED LAYER

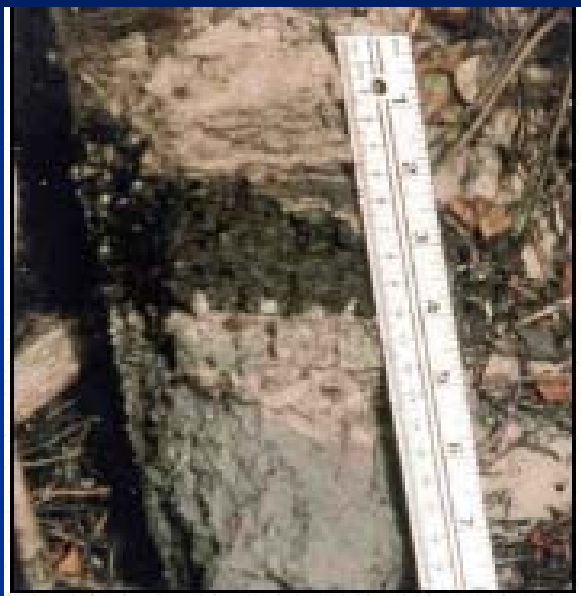


Figure 3-4. Stratified layers in loamy material.

Figure 3-5. Stratified layers in sandy material. Scale in inches.

HYDRIC SOIL – A9-1 cm Muck

- a layer of muck 0.5 inches or more thick with V 3 or less and C 1 or less starting within 6 inches of the soil surface
- applicable in LRR D; test indicator in LRR C
- typically muck layer is at the surface but it can be within 6 inches. Muck is sapric soil material with at least 12% to 18% carbon. Sapric soil material has undergone sufficient decomposition to limit recognition of plant parts (< 15% after rubbing).

HYDRIC SOIL – A11-DEPLETED BELOW DARK SURFACE

- a layer with a depleted or gleyed matrix that has 60 % or more C 2 or less starting within 12 inches of the soil surface that has a minimum thickness of either 6 inches or 2in if the two inches consists of fragmental soil material.
- Loamy/clayey layers above the depleted or gleyed matrix must have a V 3 or less and C 2 or less. Sandy layers above the depleted or gleyed matrix must have V 3 or less, C 1 or less, and at least 70 % of the visible soil particles must be covered, coated, or similarly masked with organic material.
- all arid west sub-regions
- frequently occurs in Mollisols, umbric and dark ochric epipedons. Depleted matrix requires 2% redox concentrations for matrix with V4 C1, V4 C2 and V5 C2.

A11 – DEPLETED BELOW DARK SURFACE

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

HYDRIC SOIL – A12-THICK DARK SURFACE

- a layer at least 6 inches thick with a depleted or gleyed matrix that has 60% or more C 2 or less starting below 12 inches of the surface. The layers above the depleted or gleyed matrix must have a V 2.5 or less and C 1 or less to a depth of at least 12 inches and V 3 or less and C 1 or less in any remaining layers above the depleted or gleyed matrix. Any sandy material above the depleted or gleyed matrix must have at least 70% of the visible soil particles covered, coated, or similarly masked with organic material.
- all arid west sub-regions
- the soil has a depleted or gleyed matrix below a black or very dark gray surface layer 12 inches or more thick. Typically found in overthickened soils in concave landscape positions. Depleted matrix requires 2% redox concentrations for matrix with V4 C1, V4 C2 and V5 C2.

A12 – THICK DARK SURFACE

Figure 3-7. Deep observations may be necessary to identify the depleted or gleyed matrix below the dark surface layer.

HYDRIC SOIL – S1-Sandy Mucky Mineral

- a mucky modified sandy mineral layer 2 inches or more thick starting with 6 inches of the soil surface.
- all arid west sub-regions
- for sandy soil, mucky modifier requires at least 5% but not more than 12 % carbon when there is 0% clay.

S1 – SANDY MUCKY MINERAL

Figure 3-8. The mucky modified sandy layer is approximately 3 in. (7.5 cm) thick. Scale in inches on the right side of ruler.

HYDRIC SOIL – S4-SANDY GLEYED MATRIX

- a gleyed matrix that occupies 60% or more of a layer starting within 6 inches of the soil surface
- all arid west sub-regions
- no minimum thickness of gleying is required.
- Gleyed matrix has one of the following combinations of hue, value and chroma and the soil is not glauconitic:
- 10Y, 5GY, 10GY, 10G, 5BG,10BG, 5B, 10B, or 5PB with V4 or more and C1 ; or

  5G with V4 or more and C1or C2; or

  N with V4 or more

S4 – SANDY GLEYED MATRIX

Figure 3-9. In this example, the gleyed matrix begins at the soil surface.

HYDRIC SOIL – S5-Sandy Redox

- 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 C2 or less with 2% or more distinct or prominent redox concentrations as soft masses or pore linings.
- all arid west sub-regions
- A key describing Contrast is in the Glossary (Appendix A) of Arid West Supplement

S5 – SANDY REDOX

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

HYDRIC SOIL – S6-STRIPPED MATRIX

- a layer starting within 6 inches of the soil surface in which iron/manganese oxides and/or organic matter have been stripped from the matrix exposing the primary base colors of the soil material. The stripped areas and translocated oxides and/or organic matter form a faint, diffuse splotchy pattern of two or more colors. The stripped zones are 10% or more of the volume; they are rounded and approximately 0.5 to 1 inch in diameter.
- all arid west sub-regions
- No specific color requirements for this indicator. The mobilization and translocation of the oxides and/or organic matter is the important process and should result in splotchy coated and uncoated areas.

S6 – STRIPPED MATRIX

Figure 3-11. The layer stripped of organic matter begins beneath the dark surface layer (approximately 2 in. (5 cm)).

HYDRIC SOIL – F1-LOAMY MUCKY MINERAL

- a layer of mucky modified loamy or clayey soil material 4 inches or more thick starting within 6 inches of the soil surface
- all arid west sub-regions
- requires between 8% and 18% carbon depending on clay content. May be difficult to distinguish in the field

HYDRIC SOIL – F2-LOAMY GLEYED MATRIX

- a gleyed matrix that occupies 60% or more of a layer starting within 12 inches of the soil surface
- all arid west sub-regions
- gleyed matrix only needs to be present within 12 inches of the surface. Soils with gleyed matrices are saturated for significant periods; therefore no minimum thickness of gleyed layer is required

F2 – LOAMY GLEYED MATRIX

Figure 3-12. This gleyed matrix begins at the soil surface.

HYDRIC SOIL – F3-DEPLETED MATRIX

- a layer that has a depleted matrix with 60% or more C 2 or less and that has a minimum thickness of either 2 inches entirely within the upper 6 inches of the soil or 6 inches and starts within 10 inches of the soil surface
- all arid west sub-regions
- this is a common indicator. Redox concentrations including iron/manganese sort masses or pore linings, or both, are required in soils with matrix V/C of 4/1, 4/2 and 5/2. Redox concentrations are not required for soils with matrix V5 C1 or V6 C1 or 2. Low chroma matrix must be caused by wetness and not a relict or parent material feature.

F3 – DEPLETED MATRIX

Figure 3-13. Indicator F3, Depleted Matrix. Redox concentrations are present within a low-chroma matrix.

Figure 3-14. Redox concentrations at 2 in. (5 cm).

HYDRIC SOIL – F6-REDOX DARK SURFACE

- entirely within the upper 12 inches of the soil surface, a layer at least 4 inches thick that has: 1) a matrix V 3 or less and C 1 or less and 2% or more distinct or prominent redox concentrations as soft masses or pore linings; or 2) matrix V 3 or less and C 2 or less and 5% or more distinct or prominent redox concentrations as soft masses or pore linings
- all arid west sub-regions
- this is a common indicator. Redox concentrations in high organic content soils with dark surfaces are often difficult to observe.

F6 – REDOX DARK SURFACE

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

HYDRIC SOIL – F7-DEPLETED DARK SURFACE

- entirely within the upper 12 inches of the mineral soil, redox depletions with V 5 or more and C 2 or less in a layer that is at least 4 inches thick and has: 1) a matrix V 3 or less and C 1 or less and 10% or more redox depletions; or 2) matrix V 3 or less and C 2 or less and 20% redox depletions
- all arid west sub-regions
- redox depletions are usually associated with redox concentrations as soft masses or pore linings within or surrounding the depletions. E and calcic horizons are not depletions but may be mixed into the surface layers.

F7 – DEPLETED DARK SURFACE

Figure 3-16. Redox depletions (lighter colored areas) scattered within the darker matrix.

HYDRIC SOIL – F8-REDOX DEPRESSIONS

- in closed depressions subject to ponding, 5% or more distinct or prominent redox concentrations occurring as soft masses or pore linings in a layer that is 2 inches or more thick and is entirely within the upper 6 inches
- all arid west sub-regions
- indicator occurs on depressional landforms (e.g. vernal pools, playa lakes) but not microdepressions on convex landscapes. Closed depressions often occur within flats or floodplain landscapes. There are no color requirements for the soil matrix.

F8 – REDOX DEPRESSIONS

Figure 3-17. In this example, the layer of redox concentrations begins at the soil surface and is slightly more than 2 in. (5 cm) thick.

HYDRIC SOIL – F9-VERNAL POOLS

- in closed depressions that are subject to ponding, presence of a depleted matrix with 60% or more C 2 or less in a layer 2 inches or more thick entirely within the upper 6 inches in the soil
- all arid west sub-regions
- typically this indicator occurs at the soil surface and is found in landscape positions that collect water and have restrictive layers that do not allow water to move downward through the soil. Redox concentrations are required for V 4 C 1 and 2 or V 5 C 2.

F9 – VERNAL POOLS

Figure 3-18. Inundation in a vernal pool.

HYDRIC SOIL INDICATORS FOR PROBLEM SOILS

A9-1cm MUCK

- a layer of muck 0.5 inches or more thick with a V 3 or less and C 1 or less starting within 6 inches of the soil surface
- for use with problem soils in LRR C
- sapric material is usually a black surface layer that feels greasy and has no grit when rubbed. 12% to 18% carbon with sufficient decomposition to limit recognition of plant remains

HYDRIC SOIL INDICATORS FOR PROBLEM SOILS
A10-2cm MUCK

- a layer of muck 0.75 inches or more thick with V 3 or less and C 1 or less starting within 6 inches of the soil surface
- for use with problem soils in LRR B
- sapric material is usually a black surface layer that feels greasy and has not grit when rubbed. 12% to 18% carbon with sufficient decomposition to limit recognition of plant remains

HYDRIC SOIL INDICATORS FOR PROBLEM SOILS

F18-REDUCED VERTIC

- in vertisols and vertic intergrades, a positive reaction to alpha, alpha-dipyridyl that:

  a) the dominant (60% or more) condition of a layer at least 4 inches thick within the upper 12 inches or at least 2 inches thick within the upper 6 inches of the mineral or muck soil surface;

  b) occurs for at least 7 consecutive days and 28 cumulative days, and

  c) occurs during a normal or drier season and month
- for use with problem soils in all arid west sub-regions
- These soils usually have a thick dark surface horizon but indicators A11, A12 and F6 are often lacking

HYDRIC SOIL INDICATORS FOR PROBLEM SOILS

TF2-RED PARENT MATERIAL

- in parent material with a hue of 7.5YR or redder. A layer at least 4 inches thick with a matrix V and C of 4 or less and 2% or more redox depletions and/or redox concentrations occurring as soft masses or pore linings. The layer is entirely within 12 inches of the soil surface. The minimum thickness requirement is 2 inches if the layer is the mineral surface layer.
- for use in problem soils in all arid west sub-regions
- redox features that are most noticeable in red material include redox depletions and soft manganese masses that are black or dark reddish black

HYDRIC SOIL - USE OF EXISTING SOIL DATA

- Soil Surveys – in arid west vary in mapping scale and ground truthing. Inclusions in mapped units are common. Soil Survey data is not site specific and does not preclude the need for on-site evaluation
- Hydric Soil List – hydric soil list should be used to indicate that hydric soils will likely be found in an area but contain errors and inclusions of non-hydric inclusions. Local Hydric Soil Lists are preferred because they are more current and reflect local variation in soil properties.

HYDRIC SOIL CONTRAST DETERMINATION

Table A1
Tabular key for contrast determinations using Munsell notation

Hues are the same (Δ h = 0)			*Hues differ by 2 (Δ h = 2)*		
Δ Value	Δ Chroma	Contrast	Δ Value	Δ Chroma	Contrast
0	≤1	Faint	0	0	Faint
0	2	Distinct	0	1	Distinct
0	3	Distinct	0	≥2	Prominent
0	≥4	Prominent	1	≤1	Distinct
1	≤1	Faint	1	≥2	Prominent
1	2	Distinct	≥2	—	Prominent
1	3	Distinct			
1	≥4	Prominent			
≤2	≤1	Faint			
≤2	2	Distinct			
≤2	3	Distinct			
≤2	≥4	Prominent			
3	≤1	Distinct			
3	2	Distinct			
3	3	Distinct			
3	≥4	Prominent			
≥4	—	Prominent			

Hues differ by 1 (Δ h = 1)			*Hues differ by 3 or more (Δ h ≥ 3)*		
Δ Value	Δ Chroma	Contrast	Δ Value	Δ Chroma	Contrast
0	≤1	Faint	Color contrast is prominent, except for low chroma and value.		Prominent
0	2	Distinct			
0	≥3	Prominent			
1	≤1	Faint			
1	2	Distinct			
1	≥3	Prominent			
2	≤1	Distinct			
2	2	Distinct			
2	≥3	Prominent			
≥3	—	Prominent			

Note: If both colors have values of ≤3 and chromas of ≤2, the color contrast is *Faint* (regardless of the difference in hue).

Adapted from USDA Natural Resources Conservation Service (2002)

Table A1
Tabular key for contrast determinations using Munsell notation

Hues are the same (Δ h = 0)			*Hues differ by 2 (Δ h = 2)*		
Δ Value	**Δ Chroma**	**Contrast**	**Δ Value**	**Δ Chroma**	**Contrast**
0	≤1	Faint	0	0	Faint
0	2	Distinct	0	1	Distinct
0	3	Distinct	0	≥2	Prominent
0	≥4	Prominent	1	≤1	Distinct
1	≤1	Faint	1	≥2	Prominent
1	2	Distinct	≥2	---	Prominent
1	3	Distinct			
1	≥4	Prominent			
≤2	≤1	Faint			
≤2	2	Distinct			
≤2	3	Distinct			
≤2	≥4	Prominent			
3	≤1	Distinct			
3	2	Distinct			
3	3	Distinct			
3	≥4	Prominent			
≥4	---	Prominent			

Hues differ by 1 (Δ h = 1)			*Hues differ by 3 or more (Δ h ≥ 3)*		
Δ Value	**Δ Chroma**	**Contrast**	**Δ Value**	**Δ Chroma**	**Contrast**
0	≤1	Faint	Color contrast is prominent, except for low chroma and value.		Prominent
0	2	Distinct			
0	≥3	Prominent			
1	≤1	Faint			
1	2	Distinct			
1	≥3	Prominent			
2	≤1	Distinct			
2	2	Distinct			
2	≥3	Prominent			
≥3	---	Prominent			

Note: If both colors have values of ≤3 and chromas of ≤2, the color contrast is *Faint* (regardless of the difference in hue).

Adapted from USDA Natural Resources Conservation Service (2002)

GLEYED MATRIX

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.

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.

DEPLETED MATRIX

- the volume of soil from a horizon or sub-horizon from which iron has been removed or transformed by processes of reduction and translocation to create colors of low chroma and high value

DEPLETED MATRIX

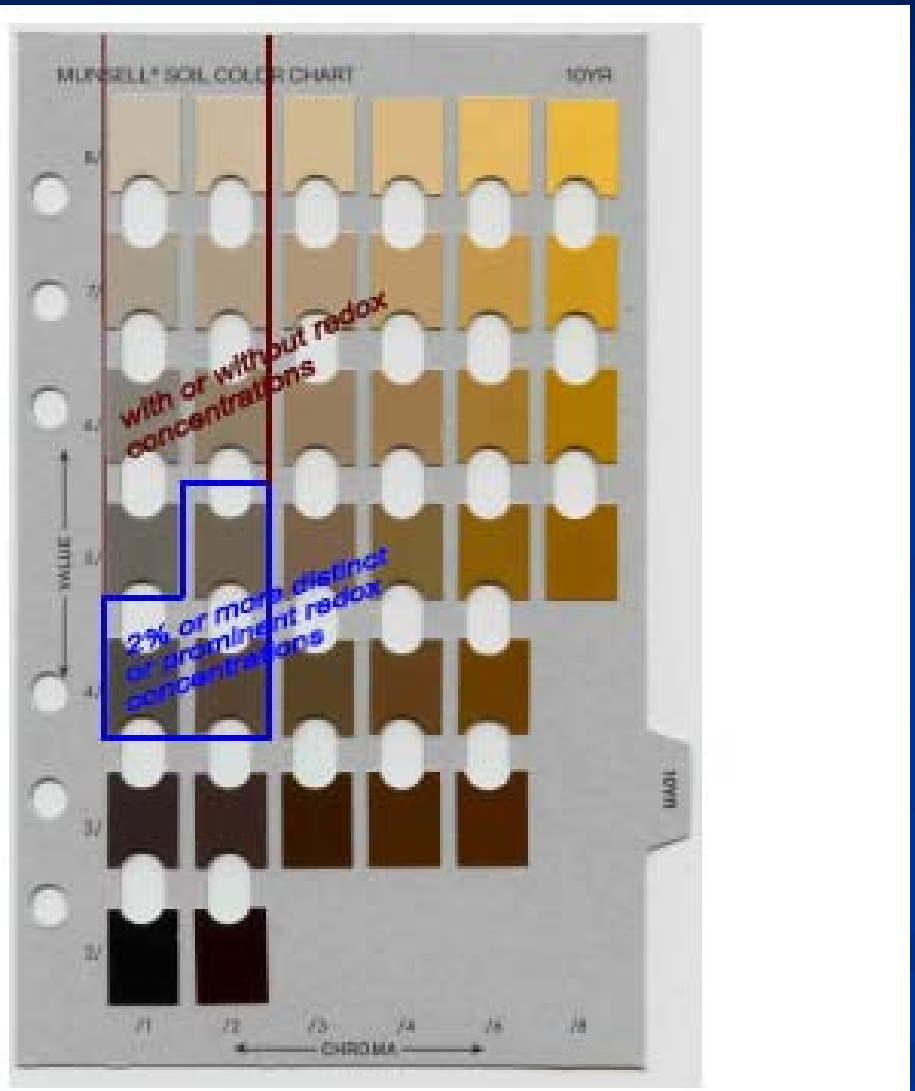


Figure A1. Illustration of value and chroma that require 2 percent or more distinct or prominent redox concentrations and those that do not, for hue 10YR, to meet the definition of a depleted matrix. *Due to inaccurate color reproduction, do not use this page to determine soil colors in the field.* Background image from the Munsell Soil Color Charts reprinted courtesy of Munsell Color Services Lab, a part of X-Rite, Inc.

Figure A1. Illustration of values and chromas that require 2 percent or more distinct or prominent redox concentrations and those that do not, for hue 10YR, to meet the definition of a depleted matrix. *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.

WETLAND HYDROLOGY

ARID WEST HYDROLOGY – INTRODUCTION

- Hydrology indicators imply a continuing wetland hydrologic regime for sites with hydrophytic vegetation and hydric soil
- Wetland hydrology indicators are meant to confirm recent episodes of inundation and/or saturation but not necessarily timing, duration or frequency
- A hydrology indicator is sufficient to confirm the presence of wetland hydrology, no measurement of duration is required
- Wetlands in the arid west may be dry for much of the year making hydrology indicators difficult to directly observe
- Lack of an indicator is not evidence for the absence of wetland hydrology
- Consider antecedent weather conditions to evaluate observed site conditions

ARID WEST HYDROLOGY – DIFFICULT SITES

- When hydrology indicators are absent from an area with hydrophytic vegetation and hydric soil further information may be required to make a wetland determination

  + schedule one or more site visits during the wet portion of the growing season

  + review aerial photography, gage data, NRCS Hydrology Tools
- On highly disturbed or problematic sites, direct hydrologic monitoring may be needed to determine whether wetland hydrology is present (ERDC TN WRAP 05 02)

ARID WEST HYDROLOGY – GROWING SEASON

- Corps recommends period when air temperature is above 28 degree day (WETS Table) as the standard procedure to determine the growing season dates at a particular site
- In the arid west, site specific alternative measures for determining growing season may be used
  + above ground growth and development of vascular plants
  + soil temperature

ARID WEST HYDROLOGY – GROWING SEASON

- The growing season has begun on a site in a given year when two or more different non-evergreen vascular plant species growing in a wetland or surrounding areas exhibit one or more of the following indicators of biologic activity:

  1) emergence of herbaceous plants from the ground; 2) appearance of new growth from vegetative crowns 3) coleoptile/cotyledon emergence from seed; 4) bud burst on woody plants; 5) emergence or elongation of leaves of woody plants; 6) emergence or opening of flowers
- The growing season has begun on a site when the soil temperature is 41 degrees F or higher at a depth of 12 inches in the soil

ARID WEST HYDROLOGY – INDICATORS

- Wetland hydrology indicators are intended as one time observations of site conditions that are sufficient evidence of wetland hydrology in areas where hydric soils and hydrophytic vegetation are present
- Wetland hydrology indicators have been placed into 4 groups

  + Group A based on direct observation of surface or ground water

  + Group B based on indirect evidence of recent ponding or flooding

  + Group C based on indirect evidence of recently saturated soil

  + Group D based on vegetation or soil features that indicate contemporary rather than historical wet conditions

ARID WEST HYDROLOGY - INDICATORS

- Indicators are rated as primary and secondary based on their regional reliability
- One primary or two secondary indicators are sufficient to conclude wetland hydrology is present
- List of hydrology indicators is not exclusive. Site specific hydrology indicators need documentation

LIST OF WETLAND HYDROLOGY INDICATORS FOR ARID WEST

Table 8. List of wetland hydrology indicators for the Arid West		
Indicator	**Category**	
	Primary	**Secondary**
Group A – Observation of Surface Water or Saturated Soils		
A1 – Surface water	X	
A2 – High water table	X	
A3 – Saturation	X	
Group B – Evidence of Recent Inundation		
B6 – Surface soil cracks	X	
B7 – Inundation visible on aerial imagery	X	
B9 – Water-stained leaves	X	
B11 – Salt crust	X	
B12 – Biotic crust	X	
B13 – Aquatic invertebrates	X	
B1 – Water marks	X	X (riverine)
B2 – Sediment deposits	X	X (riverine)
B3 – Drift deposits	X	X (riverine)
B10 – Drainage patterns		X
Group C – Evidence of Recent Soil Saturation		
C1 – Hydrogen sulfide odor	X	
C3 – Oxidized rhizospheres along living roots	X	
C4 – Presence of reduced iron	X	
C6 – Recent iron reduction in plowed soils	X	
C2 – Dry-season water table		X
C7 – Thin muck surface		X
C8 – Crayfish burrows		X
C9 – Saturation visible on aerial imagery		X
Group D – Evidence from Other Site Conditions or Data		
D3 – Shallow aquitard		X
D5 – FAC-neutral test		X

Table 8. List of wetland hydrology indicators for the Arid West		
Indicator	**Category**	
	Primary	**Secondary**
Group A – Observation of Surface Water or Saturated Soils		
A1 – Surface water	X	
A2 – High water table	X	
A3 – Saturation	X	
Group B – Evidence of Recent Inundation		
B6 – Surface soil cracks	X	
B7 – Inundation visible on aerial imagery	X	
B9 – Water-stained leaves	X	
B11 – Salt crust	X	
B12 – Biotic crust	X	
B13 – Aquatic invertebrates	X	
B1 – Water marks	X	X (riverine)
B2 – Sediment deposits	X	X (riverine)
B3 – Drift deposits	X	X (riverine)
B10 – Drainage patterns		X
Group C – Evidence of Recent Soil Saturation		
C1 – Hydrogen sulfide odor	X	
C3 – Oxidized rhizospheres along living roots	X	
C4 – Presence of reduced iron	X	
C6 – Recent iron reduction in plowed soils	X	
C2 – Dry-season water table		X
C7 – Thin muck surface		X
C8 – Crayfish burrows		X
C9 – Saturation visible on aerial imagery		X
Group D – Evidence from Other Site Conditions or Data		
D3 – Shallow aquitard		X
D5 – FAC-neutral test		X

HYDROLOGY – 87 MANUAL / ARID WEST SUPPLEMENT

WETLAND HYDROLOGY INDICATORS 1

87 MANUAL	ARID WEST SUPPLEMENT
INUNDATED (P)	A1 SURFACE WATER (P)
SATURATED in the UPPER 12 INCHES (P)	A2 High WATER TABLE (P) A3 SATURATION (P)
WATER MARK (P)	B1 WATER MARK (P) (S-riverine)
DRIFT LINES (P)	B3 DRIFT DEPOSIT (P) (S-riverine)
SEDIMENT DEPOSITS (P)	B2 SEDIMENT DEPOSIT (P) (S-riverine)
DRAINAGE PATTERNS in WETLANDS (P)	B10 DRAINAGE PATTERN (S)

WETLAND HYDROLOGY INDICATORS 2

87 MANUAL	ARID WEST SUPPLEMENT
OXIDIZED ROOT CHANNELS in the UPPER 12 INCHES (S)	C3 OXIZIDED RHIZOSPHERES ALONG LIVING ROOTS (P)
WATER-STAINED LEAVES (S)	B9 WATER-STAINED LEAVES (P)
LOCAL SOIL SURVEY DATA (S)	NOT USED
FAC-NEUTRAL TEST (S)	D5 FAC-NEUTRAL TEST (S)

WETLAND HYDROLOGY INDICATORS 3

87 MANUAL	ARID WEST SUPPLEMENT
NONE	B6 SURFACE SOIL CRACKS (P)
RECORDED DATA	B7 INUNDATION VISIBLE ON AERIAL IMAGERY (P)
NONE	B11 SALT CRUSTS (P)
NONE	B12 BIOTIC CRUSTS (P)
NONE	B13 AQUATIC INVERTEBRATES (P)
NONE	C1 HYDROGEN SULFIDE ODOR (P)
NONE	C4 PRESENCE OF REDUCED IRON (P)
NONE	C6 RECENT IRON REDUCTION IN PLOWED SOIL (P)

WETLAND HYDROLOGY INDICATORS 4

87 MANUAL	ARID WEST SUPPLEMENT
NONE	C2 DRY-SEASON WATER TABLE (S)
NONE	C7 THIN MUCK SURFACE (S)
NONE	C8 CRAYFISH BURROWS (S)
RECORDED DATA	C9 SATURATION VISIBLE ON AERIAL IMAGE (S)
NONE	D3 SHALLOW AQUITARD (S)

HYDROLOGY SECTION – DATA SHEET 87 MANUAL

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

HYDROLOGY SECTION – ARID WEST SUPPLEMENT

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

HYDROLOGY – A1 SURFACE WATER

- direct, visual observation of surface water (flooding or ponding) during a site visit
- primary
- ponded or flooded sites must be evaluated for recent abnormal weather conditions and status of growing season. Surface water may be absent from seasonal wetlands during the dry season or from wetlands with sub-surface saturation

A1 – SURFACE WATER

Figure 4-1. Wetland with surface water present.

HYDROLOGY – A2 HIGH WATER TABLE

- direct visual observation of a water table within 12 inches of the soil surface. This indicator includes perched water tables and discharge water tables (e,g, seeps) where water may enter the hole from surface soil layers
- primary
- allow soil water time to stabilize in the hole. If outside of growing season determine if water table would persist for sufficient duration during the growing season. Consider recent and long-term precipitation amounts. Soil pit should not penetrate restrictive soil horizons.

A2 – HIGH WATER TABLE

Figure 4-2. High water table observed in a soil pit.

HYDROLOGY – A3 SATURATION

- visual observation of saturated soil conditions within 12 inches from the soil surface as indicated by water glistening on the surfaces and broken interior faces of soil samples removed from the soil pit. This indicator must be associated with an existing water table located immediately below the saturated zone.
- primary
- recent rainfall events and proximity of water table to the soil surface must be considered in applying this indicator. Water observed in soil cracks or on ped faces do not meet this indicator unless ped interiors are also saturated

A3 – SATURATION

Figure 4-3. Water glistens on the surface of a saturated soil sample.

HYDROLOGY – B6 SURFACE SOIL CRACKS

- Surface soil cracks consist of shallow cracks that form when fine grained mineral or organic sediments dry and shrink, creating a network of cracks or small polygons
- Primary
- Soil cracks are common in fine sediments in seasonally ponded depressions but can also occur in temporary ponds or puddles in non-wetlands. Does not include soil cracks in Vertisols or biotic crusts

B6 – SURFACE SOIL CRACKS

Figure 4-4. Surface soil cracks in a seasonally ponded wetland.

HYDROLOGY – B7 INUNDATION VISABLE ON AERIAL IMAGERY

- One or more recent aerial photographs or satellite images show the site to be inundated
- Primary
- Consider antecedent weather conditions to evaluate imagery. Consider status of growing season. Surface water may be absent during dry season, drought conditions early in the ppt season, in some wetland types or not every year. If 5 years of photos are available NRCS method for evaluating photos is recommended (1997, section 650.1903).

HYDROLOGY – B9 WATER-STAINED LEAVES

- Water stained leaves are fallen leaves that have turned grayish or blackish in color due to inundation for long periods.
- Primary
- Not common id arid west but known to occur in depressional wetlands and along streams with woody vegetation. Water stained leaves should contrast in color with fallen leaves in nearby non-wetland areas.

HYDROLOGY –B11 SALT CRUST

- Salt crusts are hard or brittle deposits of salts formed on the ground surface due to the evaporation of saline surface water.
- Primary
- Salt crusts typically form in ponded depressions, seeps and lake fringes. Salt crusts do not include fluffy salt deposits or efflorescences resulting from capillary rise and evaporation of saline groundwater that may be derived from a deep water table.

B11 – SALT CRUST

Figure 4-5. A hard salt crust in a dry temporary pool (25-cent coin for scale).

HYDROLOGY – B12 BIOTIC CRUSTS

- This indicator includes ponding-remnant biotic crusts, benthic microflora, and the dries remains of free floating algae left on or near the soil surface after dewatering.
- Primary
- Biotic crusts are soil aggregates held together by microorganisms (blue-green algae, green algae, diatoms, lichens and fungi) and the substances they produce. Ponding-remnent crusts often form polygons with upturned edges. Dried algal mats are common features of seasonally flooded wetlands.

B12 – BIOTIC CRUST

Figure 4-6. Ponding-remnant biotic crusts on the surfaces of mud-crack polygons. Biotic crusts often have up-turned edges with the surface layer darker than the underlying material.

HYDROLOGY- B13 AQUATIC INVERTEBRATES

- Presence of numerous live individuals, diapausing insect eggs or crustacean cysts, or dead remains of aquatic invertebrates, such as clams, snails, insects, ostracods, shrimp, and other crustaceans on the soil surface.
- Primary
- Shells, exoskeletons, clam valves etc should be numerous and not imported or relic.

B13 – AQUATIC INVERTEBRATES

Figure 4-14. Carapaces of tadpole shrimp (*Triops* sp.) and clam shrimp (*Leptestheria compleximanus*) in dried sediments of an ephemeral pool. Photo by Brian Lang (New Mexico Dept. of Game & Fish).

HYDROLOGY – B1 WATER MARKS

- Water marks are discolorations or stains on the bark of woody vegetation, rocks, bridge pillars, buildings, fences, or other fixed objects as a result of inundation.
- Primary (Secondary in Riverine situations)
- When several water marks are present, the highest reflects the maximum extent of recent inundation and can be used to indicate the water-level elevation. Consider water marks left by extreme, infrequent or brief flooding events. Water marks often reflect higher than normal flows and should be considered a secondary indicator in riverine situations within the region.

B1 – WATER MARKS

Figure 4-15. Water marks on a boulder.

HYDROLOGY – B2 SEDIMENT DEPOSITS

- Sediment deposits are thin layers or coatings of fine-grained mineral material (e.g. silt, clay) or organic matter (e.g. pollen), sometimes mixed with other detritus, remaining on tree bark, plant stems or leaves, rocks and other objects after surface water recedes.
- Primary (Secondary in Riverine situations)
- Generally occurs in ponded situations where water stood long enough to allow suspended sediment to settle. Sediment deposits indicate the minimum level of inundation and can be extrapolated across lower elevations. Sediment deposits may be left by extreme events or infrequent high flows. Sediment deposits may reflect higher than normal flows and should be considered secondary indicators in riverine situations within the region.

B2 – SEDIMENT DEPOSITS

Figure 4-16. Sediment deposits (tan coloration) on tree bases in a seasonally flooded area.

HYDROLOGY – B3 DRIFT DEPOSITS

- Drift deposits consist of rafted debris that has been deposited on the ground surface or entangled in vegetation or other fixed objects. Drift material may be deposited at or near the high water line in ponded or flooded areas, piled against the upstream side of trees, rocks, and other fixed objects, or widely distributed within the dewatered area.
- Primary (Secondary in Riverine situations)
- Commonly found along streams, tidal marshes, lake shores and ponded areas. The elevation of the drift line can be extrapolated across the lower elevation areas. Drift lines can be caused by extreme, infrequent or brief flooding events and may exist for years in arid regions. Drift deposits may be the result of higher than normal flows and should be considered secondary indicators in riverine situations within the region.

B3 – DRIFT DEPOSITS

Figure 4-17. Drift deposit on the upstream side of a sapling in a floodplain wetland.

HYDROLOGY – B10 DRAINAGE PATTERNS

- This indicator includes flow patterns visible on the soil surface or eroded into the soil, low vegetation bent over in the direction of flow, absence of leaf litter or small woody debris due to flowing water, and similar evidence that water flowed across the ground surface.
- Secondary
- Generally seen where water flows over the surface and is not confined within a channel. Consider areas affected by recent extreme or unusual flooding events.

B10 – DRAINAGE PATTERNS

Figure 4-18. Vegetation bent over in the direction of water flow across a stream terrace.

HYDROLOGY – C1 HYDROGEN SULFIDE ODOR

- A hydrogen sulfide odor (rotten egg) within 12 inches of the soil surface.
- Primary
- Odor produced in response to prolonged soil saturation and to be detectable the soil must be have been saturated long enough to be very reduced. Hydrogen sulfide serves as both an indicator of hydric soil and wetland hydrology.

HYDROLOGY – C3 OXIDIZED RHIZOSPHERES ALONG LIVING ROOTS

- This indicator consists of iron oxide coatings or plaques on the surface of living roots and/or iron oxide coatings or linings on soil pores immediately surrounding living roots within 12 inches of the soil surface and occupying at least 2% of the volume of the soil layer.
- Primary
- Oxidized rhizospheres are evidence of saturation and reduction during the plant lifetime. Oxidized iron must be associated with living roots to indicate contemporary wet conditions. Distinguish between organic material associated with root and oxidized iron.

C3 – OXIDIZED RHIZOSPHERES ALONG LIVING ROOTS

Figure 4-19. Iron oxide plaque (orange coating) on a living root. Iron also coats the channel or pore from which the root was removed.

HYDROLOGY – C4 PRESENCE OF REDUCED IRON

- Presence of reduced (ferrous) iron in the upper 12 inches of the soil profile, as indicated by a ferrous iron test or by the presence of a soil that changes color upon exposure to air.
- Primary
- The presence of ferrous iron can be verified with alpha, alpha-dipyrridyl dye (NRCS Hydric Soils Technical Note 8) or observing a soil that changes color upon exposure to air. Saturated soil low in weatherable iron may not exhibit a positive reaction to the dye or exposure to air.

C4 – PRESENCE OF REDUCED IRON

Figure 4-20. When alpha, alpha-dipyridyl dye is applied to a soil containing reduced iron, a positive reaction is indicated by a pink or red coloration to the treated area.

HYDROLOGY – C6 RECENT IRON REDUCTION IN PLOWED SOIL

- Presence of 2% or more redox concentrations as pore linings in the plowed surface layer of soils cultivated within the last two years.
- Primary
- Cultivation breaks up or destroys redox features in the plow zone. The presence of intact redox features indicates that the soil was saturated and reduced since the last episode of cultivation. Use caution with relic features that may be broken up but not destroyed by plowing. The indicator is most reliable in areas that are cultivated regularly, so that soil aggregates and older redox features are more likely to be broken up.

C6 – RECENT IRON REDUCTION IN PLOWED SOIL

Figure 4-21. Redox concentrations in a recently cultivated soil.

HYDROLOGY – C 2 DRY SEASON WATER TABLE

- 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.
- Secondary
- A water table between 12 and 24 inches during the dry season, or during an abnormally dry year, indicates a normal wet-season water table within 12 inches. Wetlands with seasonally perched water tables do not have dry season water tables.
- A dry season water table below 24 inches does not necessarily indicate a lack of wetland hydrology.

HYDROLOGY – C7 THIN MUCK SURFACE

- This indicator consists of a layer of muck 1 inch or less thick on the soil surface.
- Secondary
- In a dry climate, muck accumulates only where soils are saturated to the surface for long periods each year. Thin muck surfaces disappear quickly or become incorporated into mineral horizons when wetland hydrology is removed. The presence of a thin muck layer on the soil surface indicates an active wetland hydrology regime.

HYDROLOGY – C8 CRAYFISH BURROWS

- Presence of crayfish burrows, as indicated by openings in soft ground up to 2 inches in diameter, often surrounded by chimney-like mounds of excavated mud.
- Secondary
- Crayfish burrows are usually found near streams, ditches, and ponds in areas that are seasonally inundated or have seasonal high water tables

C8 – CRAYFISH BURROWS

Figure 4-22. Crayfish burrow.

HYDROLOGY – C9 SATURATION VISABLE ON AERIAL IMAGERY

- One or more recent aerial photographs or satellite images show soil saturation. Saturated soil signatures must correspond to field verified hydric soils, depressions or drainage patterns, differential crop management, or other evidence of a seasonal high water table.
- Secondary
- Indicator useful when plant cover is sparse and ground surface is visible on image. Saturated areas generally reflect a darker signature than adjacent non-saturated areas. Consider antecedent weather conditions and dates of growing season for the date of the image to identify extreme or abnormal conditions. Indicator requires onsite verification that saturated signatures correspond to hydric soil or other evidence of a seasonal high water table.

C9 – SATURATION VISABLE ON AERIAL IMAGERY

Figure 4-23. Aerial photograph of an agricultural field with saturated soils indicated by darker colors.

HYDROLOGY – D3 SHALLOW AQUITARD

- This indicator occurs in and around the margins of depressions, such as temporary pools, and consists of the presence of an aquitard within the soil profile that is potentially capable of perching water within 12 inches of the surface. Indicators of hydrophytic vegetation and hydric soils must also be present.
- Secondary
- An aquitard is a relatively impermeable soil layer or bedrock that slows or stops the downward infiltration of water and can produce a perched water table, generally in flat or depressional landforms. Potential aquitards include fragipans, cemented layers, dense glacial till, lacustrine deposits, and clay layers. Often redoximorphic features are evident in the layers above the aquitard.

HYDROLOGY – D5 FAC- NEUTRAL TEST

- The plant community passes the Fac-neutral test.
- Secondary
- The Fac-neutral test is performed by compiling a list of dominant plant species across all strata in the community, and dropping from the list ant species with a Fac indicator status. The Fac-neutral test is met if >50% of the remaining dominant species are rated FacW and/or Obl. If there are an equal number of dominants that are Obl and FacW versus FacU and Upl, nondominant species should be considered. This indicator is only applicable to wetland hydrology determinations.

DIFFICULT WETLAND SITUATIONS IN THE ARID WEST

DIFFICULT SITUATION – INTRODUCTION 1

- Difficult situations in the Arid West include Problem Areas and Atypical 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 or may permanently lack certain indicators due to the nature of the soil or plant species
- Atypical Situations are defined as wetlands in which vegetation, soil, or hydrology indicators are absent due to recent human activities or natural events

DIFFICULT SITUATION – INTRODUCTION 2

- The list of difficult wetland situations presented in this chapter IS NOT intended to be exhaustive and other difficult situations may exist in the region
- Wetland determinations on difficult sites must be based on THE BEST INFORMATION AVAILABLE to the field inspector, interpreted in light of his or her personal experience and knowledge of the ecology of wetlands in the region

PROBLEMATIC HYDROPHYTIC VEGETATION

- Problematic hydrophytic vegetation procedures should only be used where indicators of hydric soil and wetland hydrology are present but no indicators of hydrologic vegetation are evident, unless one or both of these factors is also disturbed or problematic

PROBLEMATIC HYDROPHYTIC VEGETATION
SPECIFIC PROBLEMATIC VEGETATION

- a) Temporal Shifts in Vegetation- Hydrophytic vegetation decisions should be based on the plant community that would be normally present during the wet portion of the growing season in a normal rainfall year.

  1] Seasonal Shifts in Plant Community:

  2] Long-Term Drought Conditions

PROBLEMATIC HYDROPHYTIC VEGETATION SPECIFIC PROBLEMATIC VEGETATION

- b) Sparse and Patchy Vegetation. For delineation purposes, an area should be considered vegetated if it has at least 5% areal cover of plants during the peak of the growing season. Unvegetated areas have less than 5% cover and may be "waters". Patchy vegetation is a mosaic of both vegetated and unvegetated areas. Site specific analysis must be used to identify wetland, water and upland components of mosaics.

PROBLEMATIC HYDROPHYTIC VEGETATION SPECIFIC PROBLEMATIC VEGETATION

- c) Riparian Areas. Riparian corridors can be lined with hydrophytic vegetation, upland vegetation, unvegetated areas or a mosaic of these types. Soils are frequently Entisols and lack indicators of hydric soil even when hydrophytic vegetation and wetland hydrology are present. In Riparian areas with phreatophytes, the groundwater may be too deep to support wetlands and generally have a non-hydrophytic understory.

PROBLEMATIC HYDROPHYTIC VEGETATION
SPECIFIC PROBLEMATIC VEGETATION

- d) Areas Affected by Grazing. Short or long term grazing can cause soil compaction and selective avoidance or destruction of plant species resulting in unreliable vegetative determinations.
- e) Managed Plant Communities. Managed plant communities include cleared woody vegetation, discing, plowing, mowing, planting, irrigation, use of herbicide etc. If the natural vegetation has been altered through management to such an extent that a hydrophytic vegetation determination may be unreliable, it is a problem site.

PROBLEMATIC HYDROPHYTIC VEGETATION

SPECIFIC PROBLEMATIC VEGETATION

- f) Areas Affected by Fires, Floods, and Other Natural Disturbances. The vegetation on a site has been removed or made unidentifiable by a recent fire, flood, or other disturbance.
- g) Vigor and Stress Responses to Wetland Conditions. Plants can develop stress-related features (i.e. stunting in agricultural crops, browning or yellowing of native or planted vegetation) when subjected to long periods of saturation in the root zone. Check comparative conditions between plants in wet and non-wet areas. Consider factors other than wetland effects

PROBLEMATIC HYDRIC SOIL SOILS WITH FAINT OR NO INDICATORS

- Examples of problematic hydric soils in the arid west include but are not limited to:

  1) Moderately to Very Strongly Alkaline Soils - pH 7.9 or higher

  2) Volcanic Ash - Low Fe, Mn or S content

  3) Vegetated Sand / Gravel Bars in Floodplains-Low Fe, Mn, C, recent deposition

  4) Recently Developed Wetlands - Indicators not developed

  5) Seasonally ponded soils or shallow perched water tables

PROBLEMATIC HYDRIC SOIL - SOIL WITH RELICT OR INDUCED HYDRIC SOIL INDICATORS

- Relict redoximorphic features may persist in areas that no longer have wetland hydrology and may be difficult to distinguish from contemporary features
- When indicators of hydrophytic vegetation and wetland hydrology are present, then hydric soil indicators can be assumed to be contemporary
- Artificial wetland hydrology can induce the formation of hydric soil indicators (i.e. upland irrigated agricultural fields). Some irrigated fields may have wetland hydrology in the early portion of the growing season

PROBLEMATIC HYDRIC SOIL – INDICATORS

- 1 cm Muck (LRR C)
- 2 cm Muck (LRR B)
- Reduced Vertic
- Red Parent Material

PROBLEMATIC WETLAND HYDROLOGY SITUATIONS AND PROCEDURES

- List includes problem hydrology situations when indicators of hydrophytic vegetation and hydric soils are present but wetland hydrology indicators are lacking due to normal variations in rainfall, runoff, human activities or other reasons:

  A] Site visit during the dry season

  B] Periods with below normal rainfall

  C] Drought years

  D] Years with unusually low winter snowpack

  E] Reference sites

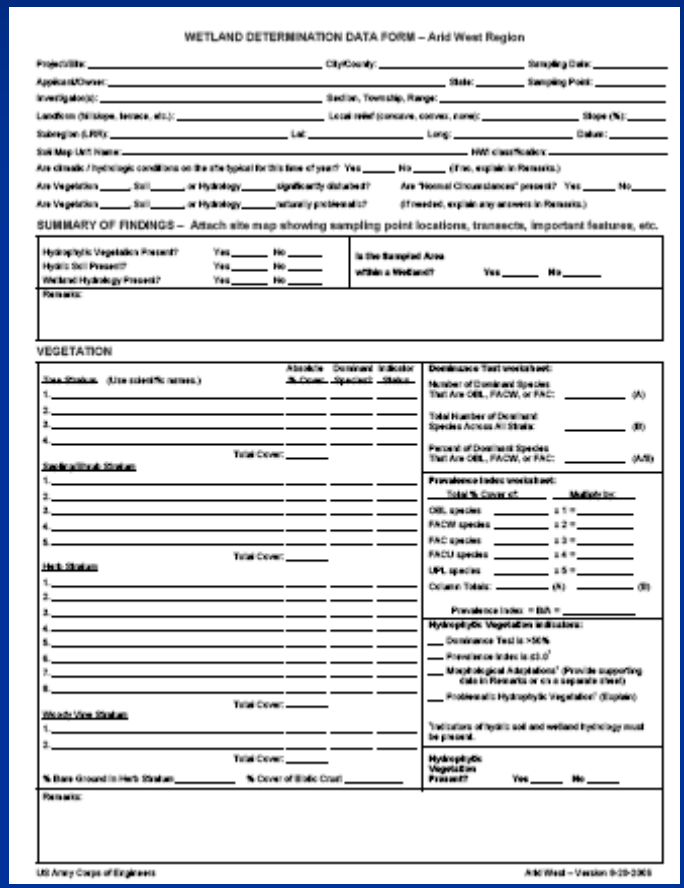
  F] Hydrology tools

PROBLEMATIC WETLAND HYDROLOGY SITUATIONS AND PROCEDURES

G] Long-term hydrologic monitoring – on difficult sites that lack hydrology indicators, direct monitoring of surface AND GROUNDWATER may be necessary. Technical Standard for Water-Table Monitoring of Potential Wetland Sites (2005) describes minimum standards to monitor hydrology. Standard calls for at least 14 consecutive days of a combination of ponding, flooding, or a water table at or above 12 inches of the soil surface during the growing season in a normal year. 87 Manual Hydrologic Zones based on % of inundated/saturated in the growing season is no longer used in the Arid West

DATA SHEET

WETLAND DETERMINATION DATA FORM ARID WEST REGION



WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: _____ City/County: _____ Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: _____

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____
Hydric Soil Present? Yes _____ No _____
Wetland Hydrology Present? Yes _____ No _____

Is the Sampled Area within a Wetland? Yes _____ No _____

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	Total Cover:		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
	Total Cover:		
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	Total Cover:		
Woody Vine Stratum			
1.			
2.			
	Total Cover:		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Remarks:

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)

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 = _____

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes _____ No _____

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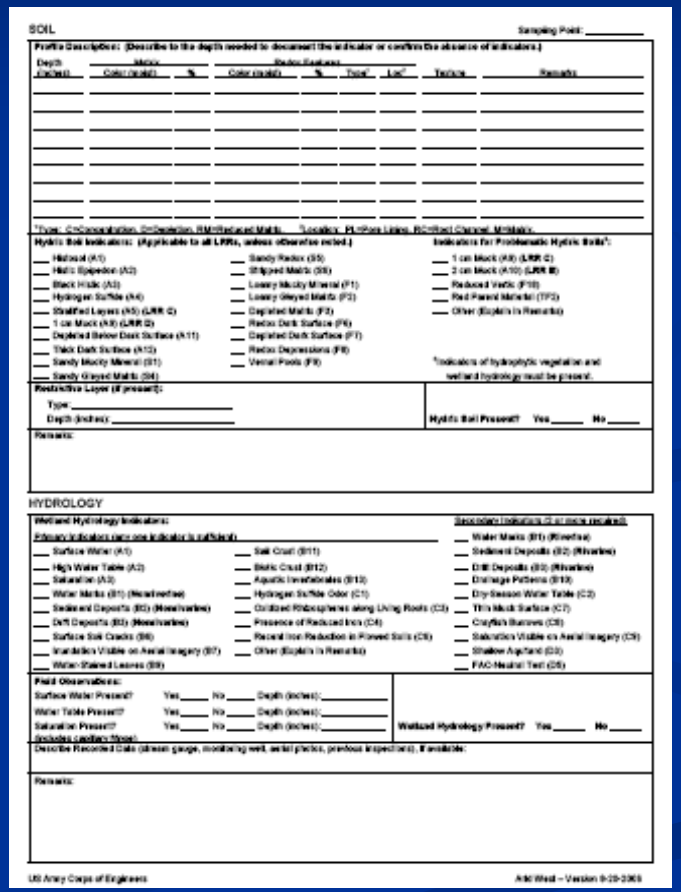

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (LRR C)
___ 1 cm Muck (A9) (LRR D)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (LRR C)
___ 2 cm Muck (A10) (LRR B)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (Nonriverine)
___ Sediment Deposits (B2) (Nonriverine)
___ Drift Deposits (B3) (Nonriverine)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (Riverine)
___ Sediment Deposits (B2) (Riverine)
___ Drift Deposits (B3) (Riverine)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____
Water Table Present? Yes _____ No _____ Depth (inches): _____
Saturation Present? Yes _____ No _____ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: _____ City/County: _____ Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: _____

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

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)

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 = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

DATA FORM – SITE INFORMATION

Project/Site: _____ City/County: _____ Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: _____

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

DATA FORM – SUMMARY OF FINDINGS

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No _____	**Is the Sampled Area**		
Hydric Soil Present?	Yes _____	No _____	**within a Wetland?**	**Yes _____**	**No _____**
Wetland Hydrology Present?	Yes _____	No _____			

Remarks:

DATA FORM – VEGETATION

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

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)

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 = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** _____ **No** _____

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

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)

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 = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** _____ **No** _____

Remarks:

DATA FORM – SOIL

SOIL Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (If present):

Type: _____

Depth (Inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

DATA FORM – HYDROLOGY

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

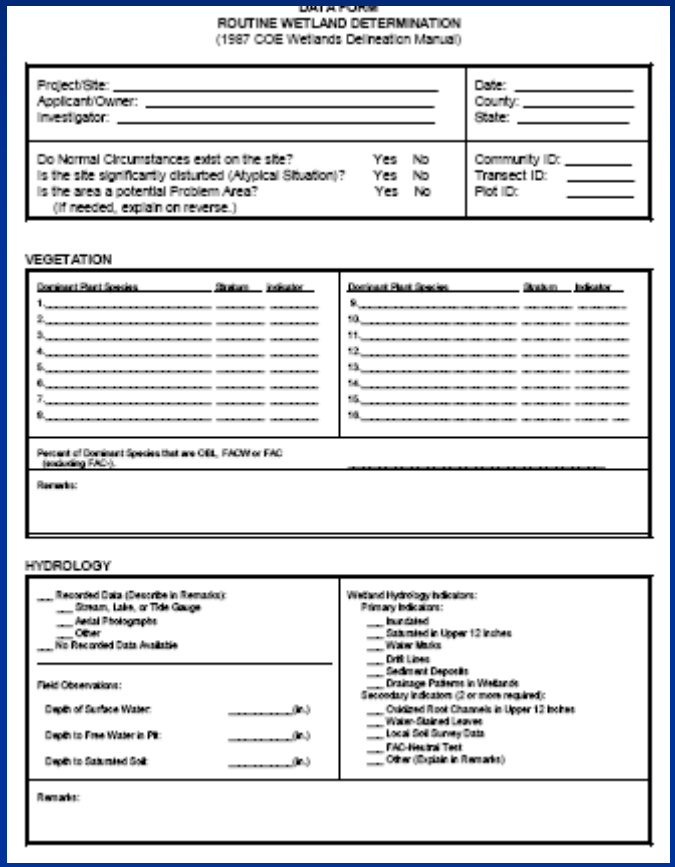
Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

DATA SHEET 87 MANAUL



DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: _____ Date: _____
Applicant/Owner: _____ County: _____
Investigator: _____ State: _____

Do Normal Circumstances exist on the site? Yes No
Is the site significantly disturbed (Atypical Situation)? Yes No
Is the area a potential Problem Area? Yes No
(If needed, explain on reverse.)

Community ID: _____
Transect ID: _____
Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1.			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): _____

Remarks:

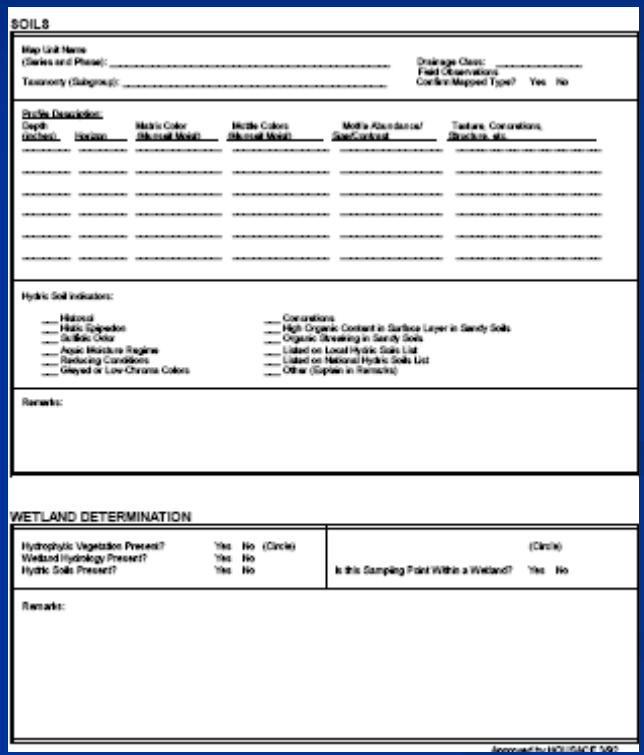
HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations:
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks:



SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____
Field Observations
Confirm Mapped Type? Yes No
Taxonomy (Subgroup): _____

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Greyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes No (Circle)
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes No

Remarks:

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: _____ Applicant/Owner: _____ Investigator: _____	Date: _____ County: _____ State: _____
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: _____ Transect ID: _____ Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1.			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). _____

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Field Observations

Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	No	(Circle)	
Wetland Hydrology Present?	Yes	No		
Hydric Soils Present?	Yes	No		
				(Circle)
Is this Sampling Point Within a Wetland?				Yes No

Remarks: