Wetland Delineation

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Why Delineate Wetlands?

- To define the limits of federal jurisdiction, in accordance with current law, regulations, and policy:
  - is a wetland present?
  - if so, where is the boundary?
- To determine the affected environment as a basis for impact assessment, alternatives analysis, and compensatory mitigation

Wetland Definition*

- Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Basis for the three-parameter approach to wetland identification

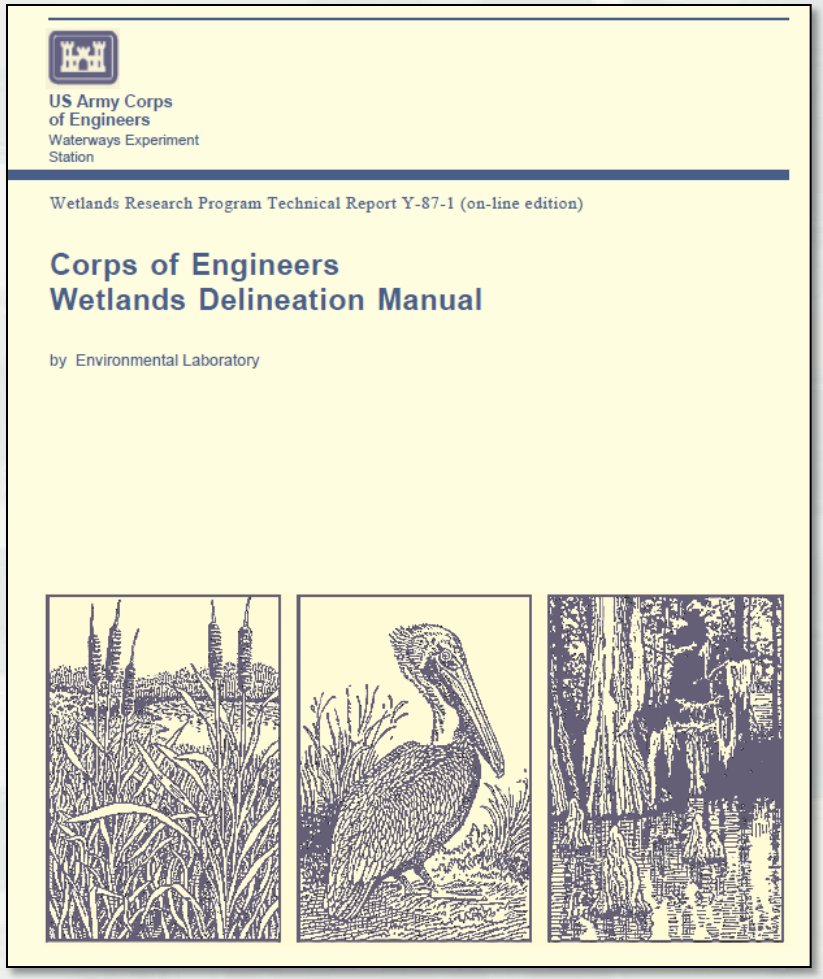
*Corps / EPA definition - for Clean Water Act, Section 404 purposes [33CFR 328.3(b)]

What Are Indicators…
…and Why Do We Use Them?

Indicators are direct or indirect evidence that a parameter is met (present) based on the presence of a set of defined criteria…

For example, since (reliable, long-term) hydrologic data are often unavailable for project sites, most wetland hydrology decisions are based on indicators.

1987 Wetlands Delineation Manual

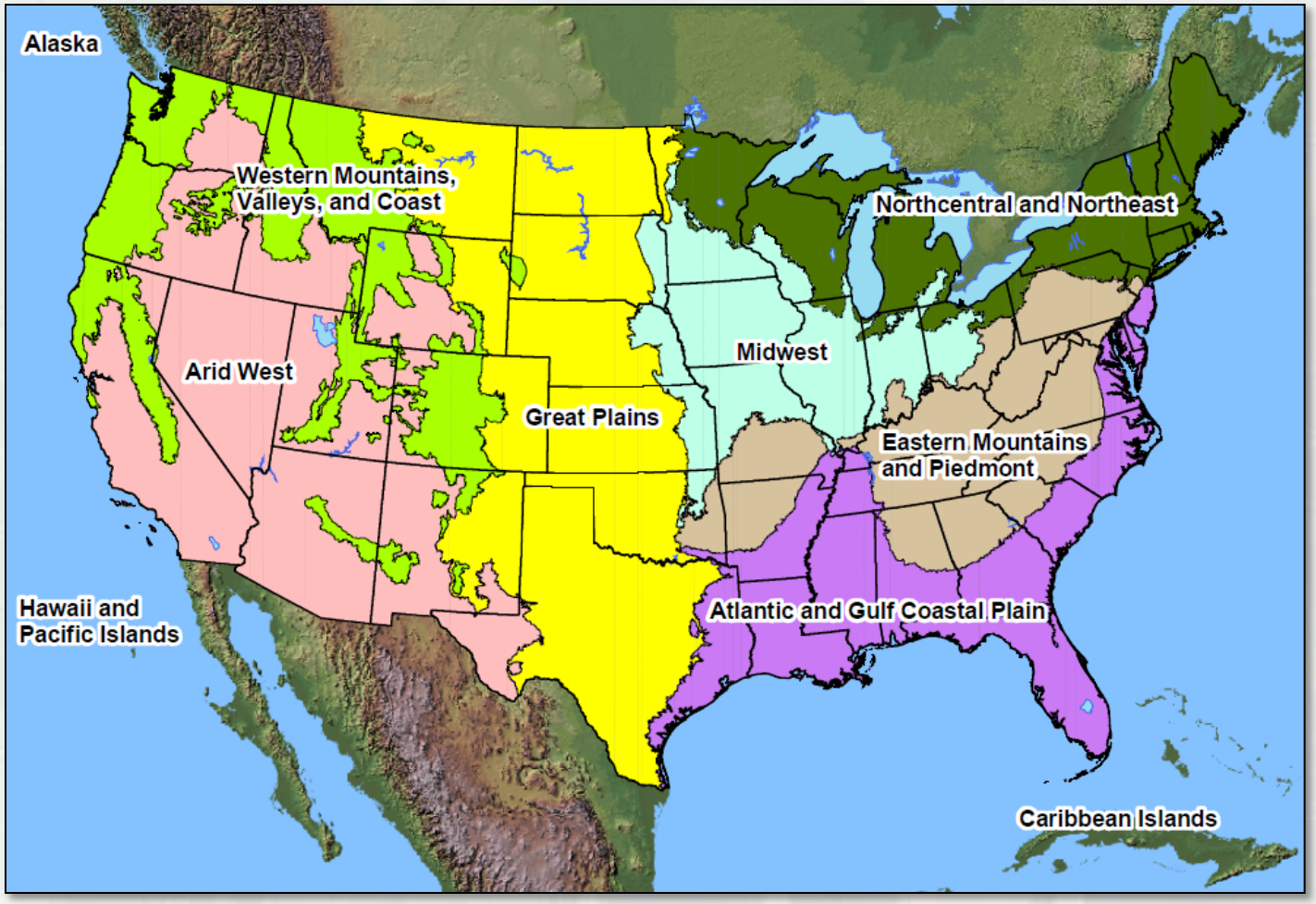


- The Corps Manual provides guidance and procedures from a national perspective

- Where differences occur, the Regional Supplement takes precedence over the Corps Manual

http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf

Regionalization of the 1987 Manual



http://www.usace.army.mil/cecw/pages/reg_supp.aspx

SAD - 2 Regional Supplements

ERDC/EL TR-10-20

Environmental Laboratory

US Army Corps of Engineers®
Engineer Research and Development Center

Wetlands Regulatory Assistance Program

Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)

U.S. Army Corps of Engineers

November 2010

Approved for public release; distribution is unlimited.

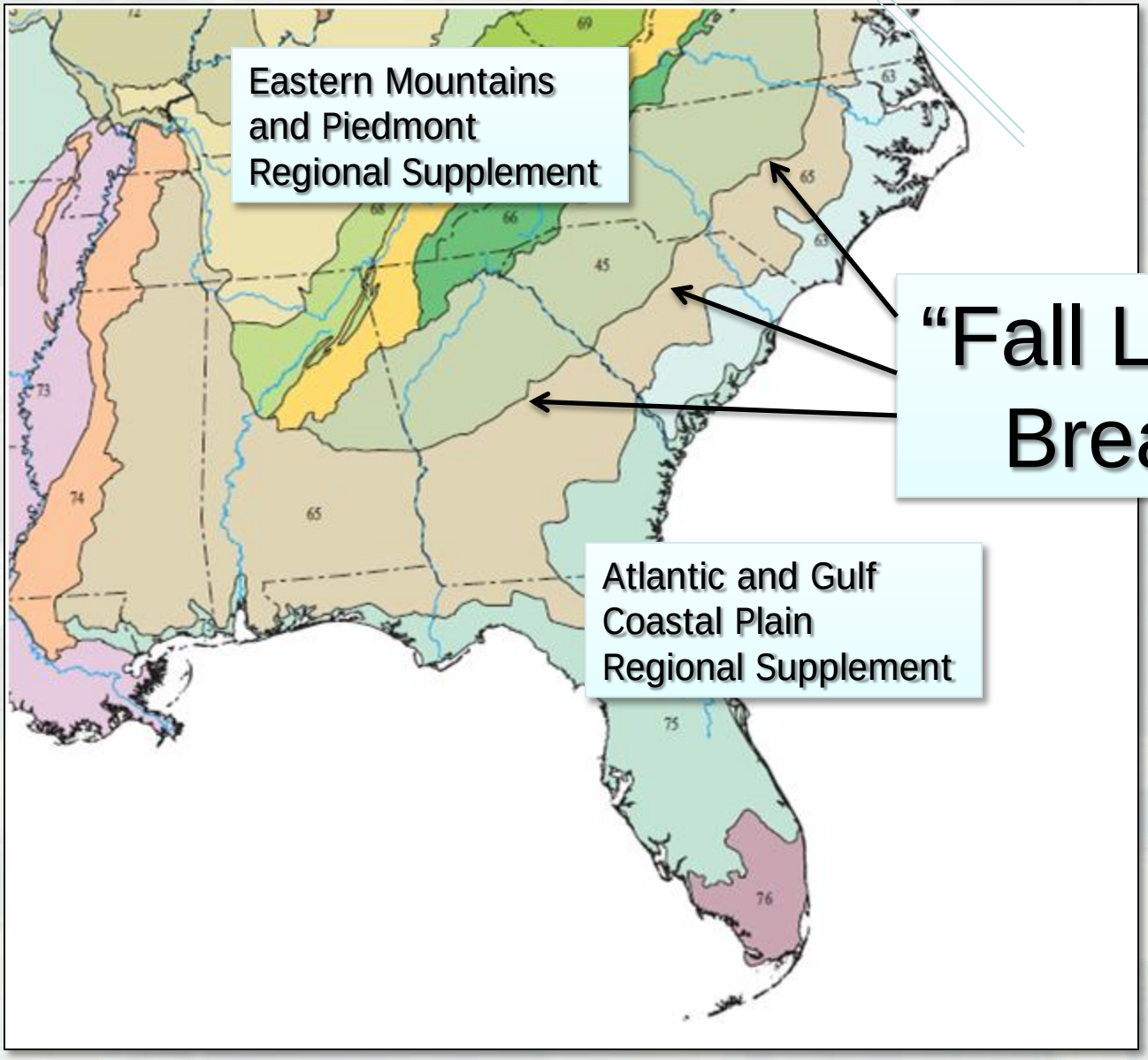
Draft for Peer Review
and Field Testing 6-25-2009

Wetlands Regulatory Assistance Program

DRAFT Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region

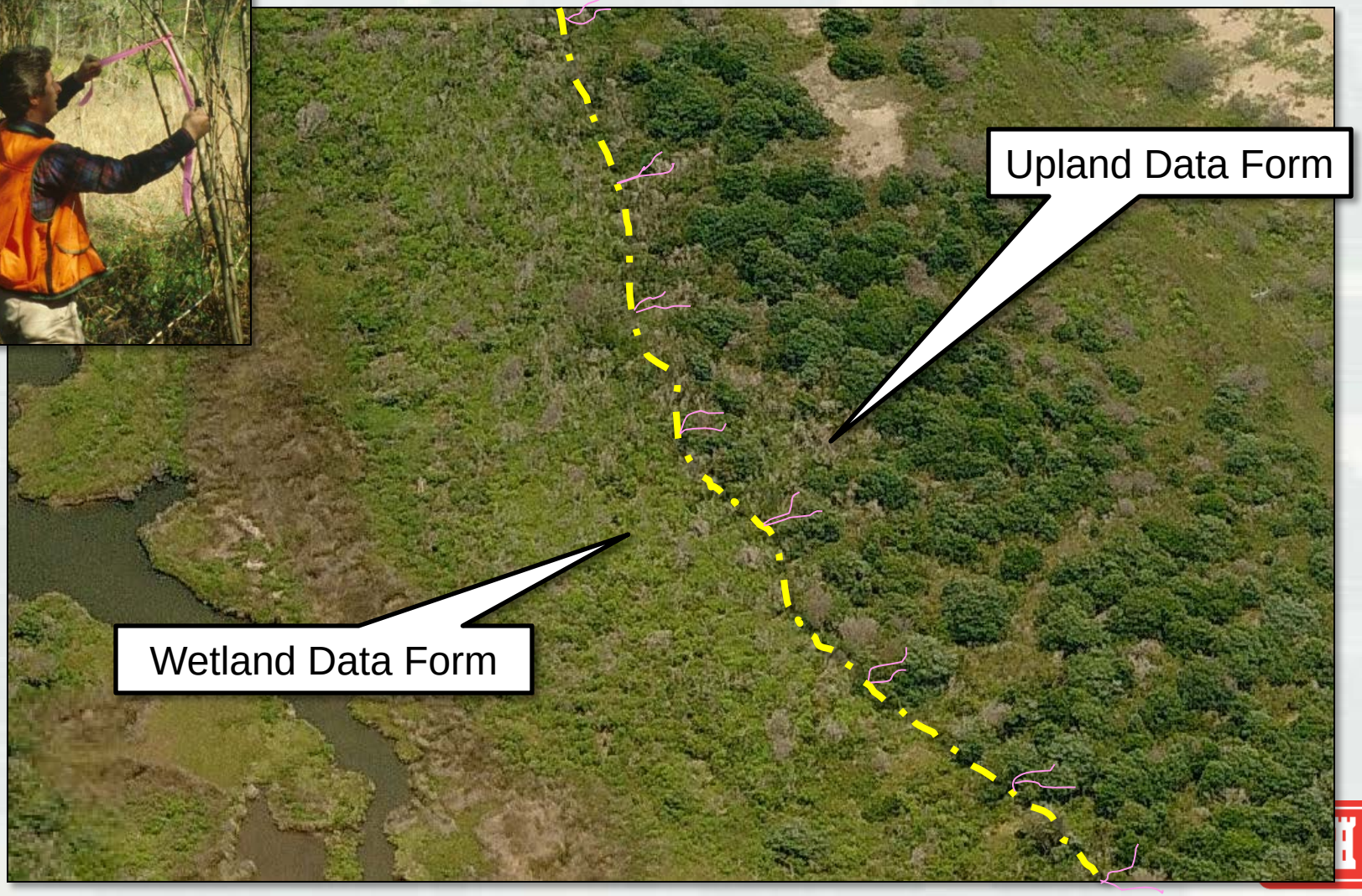
U.S. Army Corps of Engineers

http://www.usace.army.mil/CECW/Pages/reg_supp.aspx



"Fall Line" is the Break Point

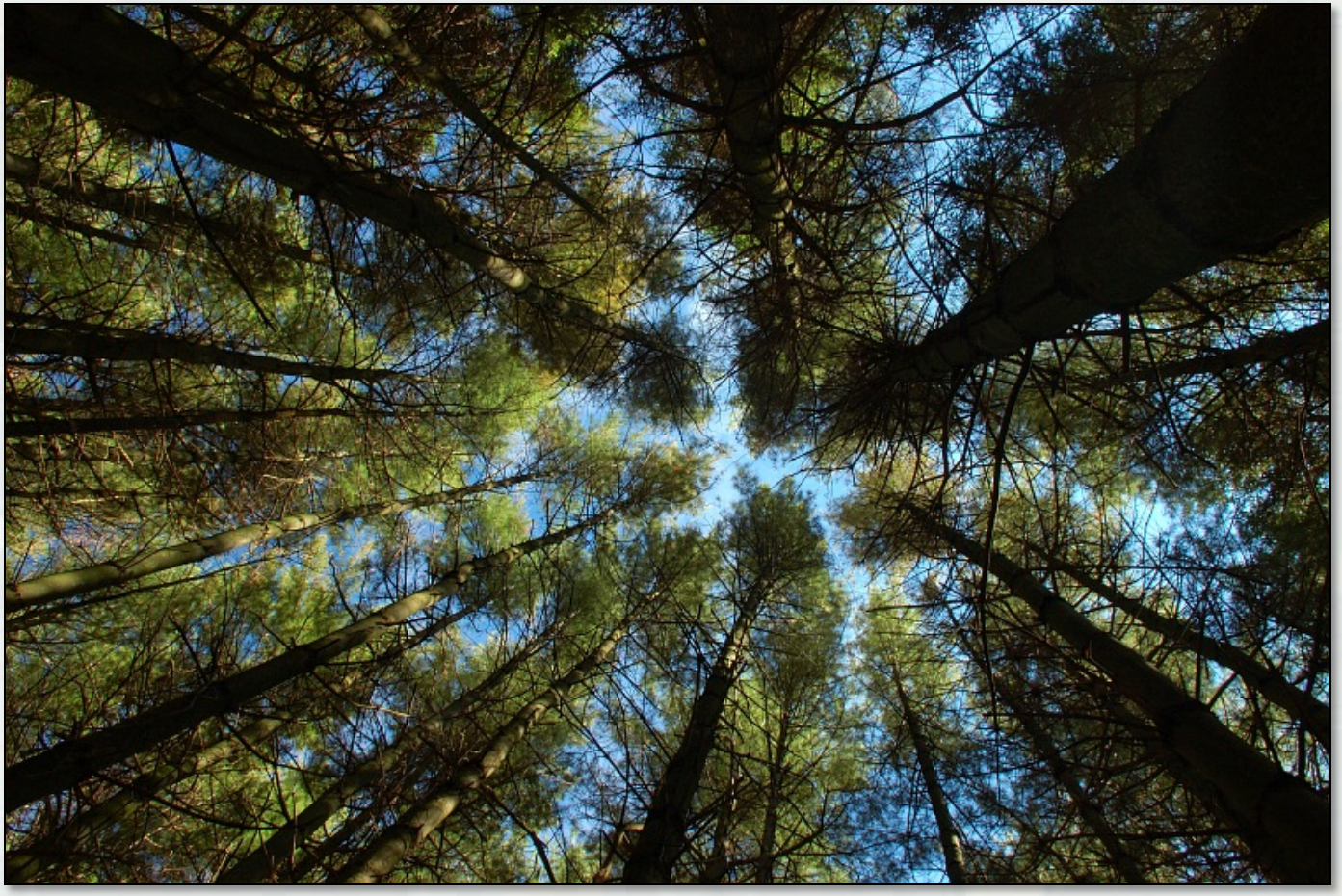
Hang the Flags / Complete the forms



Parts of a typical delineation report

- Narrative
- Wetland map
- Wetland Determination Data Forms
- Additional supporting documentation including basis for jurisdictional determination (USGS Quad, Soil map, LiDAR map, rainfall data, photos, etc.)

Hydrophytic Vegetation Indicators



Hydrophytic Vegetation

The Corps Manual defines hydrophytic vegetation as the community of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to influence plant occurrence.

Hydrophytic vegetation is present when the plant community is **dominated** by species that require or can tolerate prolonged inundation or soil saturation during the growing season

National Wetland Plant List (NWPL)

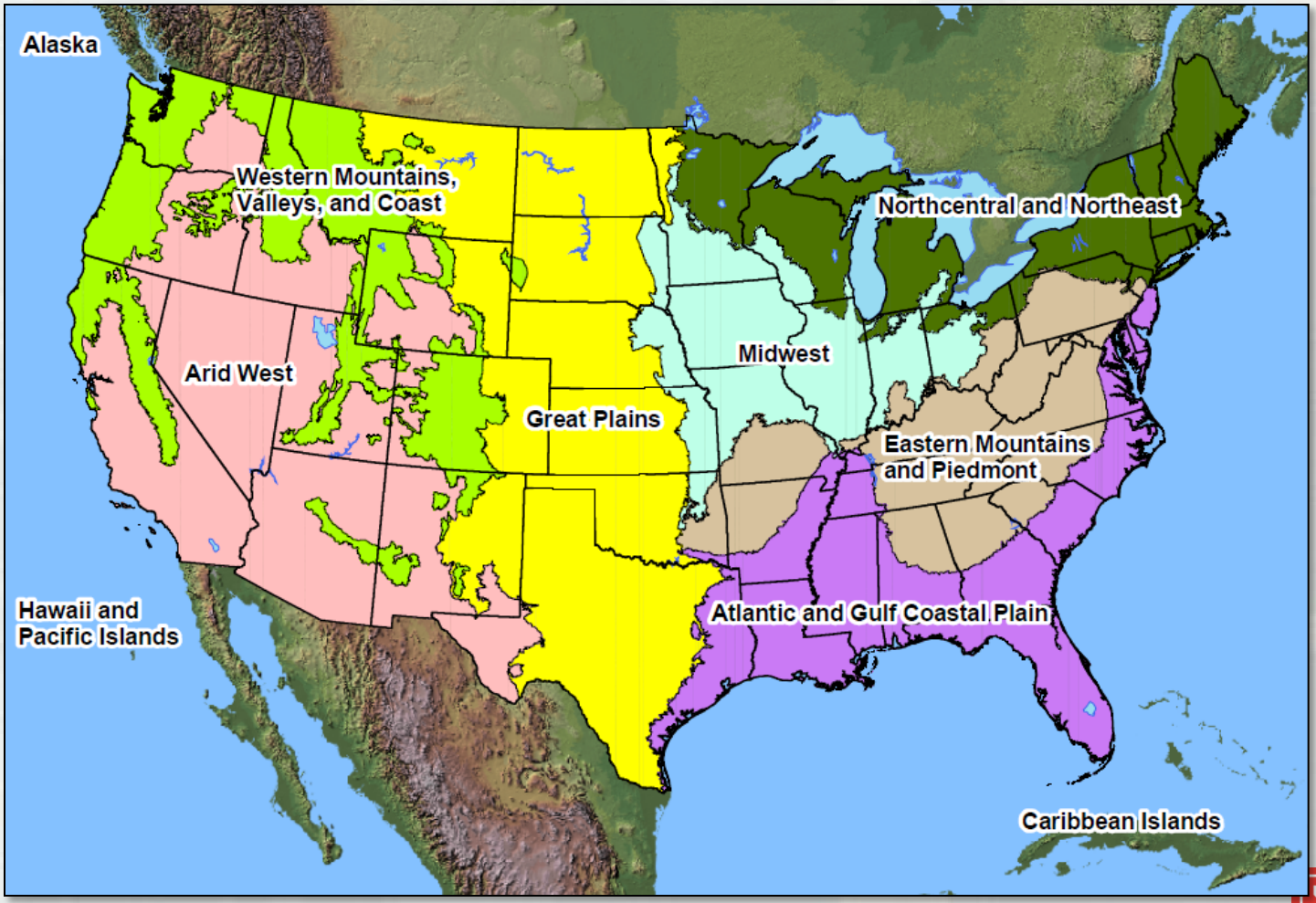
To determine whether a plant is considered hydrophytic, consult the National Wetland Plant List (NWPL)

- The NWPL is a list of plants with assigned wetland indicator statuses which is used as part of the wetland delineation process, in the restoration of wetlands, and as a resource of botanical information about wetland plants.
- The NWPL can be found at:

  http://rsgisias.crrel.usace.army.mil/NWPL/

- The NWPL is divided into 10 regions

Proposed NWPL Regions



Wetland Indicator Status

OBL (Obligate): almost always is a hydrophyte, rarely in uplands (occur in wetlands > 99% of the time)

FACW (Facultative Wetland): usually a hydrophyte, but occasionally found in uplands (occur in wetlands 67%-99% of the time

FAC (Facultative): commonly occurs as either a hydrophyte or a non-hydrophyte (occur in wetlands 33%-66% of the time)

FACU (Facultative Upland): occasionally is a hydrophyte, but usually occurs in uplands (occur in wetlands 1%-33% of the time)

UPL (Upland): rarely a hydrophyte, almost always in uplands (occur in wetlands <1% of the time)

Sampling Methods

- Vegetation sampling done as part of a routine wetland delineation is designed to characterize the site quickly without need for detailed scientific study or statistical methods
- For wetland delineation purposes, an area is considered to be vegetated if it has 5% or more total plant cover during the peak of growing season
- Sample plots to determine if hydrophytic vegetation is present should be located in areas that are representative of that community

Sampling Methods

- Sampling for a single or multi-layered community can be accomplished using a 30-ft (9.1m) radius plot for all strata

- Plot sizes and shapes should be adjusted so as not to overlap into an adjacent community having different vegetation, soil, or hydrologic conditions

VEGETATION – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Sapling Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

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:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below).

BUILDING STRONG®

How do you know if the hydrophytic vegetation parameter is met?

Hydrophytic vegetation is present when the plant community is **dominated** by species that require or can tolerate prolonged inundation or soil saturation during the growing season

Morphological Adaptations

Morphological Adaptations are the structural adaptations that enhance the survival of an organism.

Many plant species have morphological adaptations for occurrence in wetlands. These structural modifications most often provide the plant with increased buoyancy or support.

Not all species occurring in areas having anaerobic soil conditions exhibit morphological adaptations for such conditions.

Buttressed Trunks

Tree species may develop enlarged trunks in response to frequent inundation. This adaptation is a strong indicator of hydrophytic vegetation in non-tropical forested areas.

Pneumatophores

These modified roots may serve as respiratory organs in species subjected to frequent inundation or soil saturation. Cypress knees are a classic example, but other species may also develop pneumatophores

Adventitious Roots

Sometimes referred to as “water roots,” they occur on plant stems in positions where roots normally are not found. These usually develop during periods of sufficiently prolonged soil saturation to destroy most of the root system.

Shallow Root Systems

When soils are inundated or saturated for long periods of time during the growing season, anaerobic conditions develop in the zone of root growth. Most species with deep root systems cannot survive in such conditions. Most species capable of growth during periods when soils are oxygenated only near the surface have shallow root systems.

Hypertrophied Lenticels

Some plant species produce enlarged lenticels (pores for gas exchange) in response to prolonged inundation or soil saturation and are thought to increase oxygen uptake.

Hydric Soils Indicators

Bottom Line: We Look For
low chroma colors and redoxymorphic features

Definition of a Hydric Soil

…a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Development of Hydric Soils

Prolonged inundation or saturation

Leads to

Combined with soil microbial activity, causes depletion of oxygen

Promotes

Accumulation of organic matter & certain biogeochemical processes

Geochemical processes: reduction, translocation, oxidation, or accumulation of reducible elements in soil

Hydric Soils Indicators

The **field** indicators are morphological properties known to be associated with soils that meet the definition of a hydric soil.

Presence of one or more field indicators suggests that the processes associated with hydric soil formation have taken place on the site being observed.

The field indicators are essential for hydric soil identification because once formed, they persist in the soil during both wet and dry seasonal periods.

Hydric Soils Indicators

NOTE: Any change to the *Field Indicators of Hydric Soils in the United States* represents a change to the Regional Supplement's subset of indicators.

- Bottom line: Use the most recent guidebook

http://soils.usda.gov/

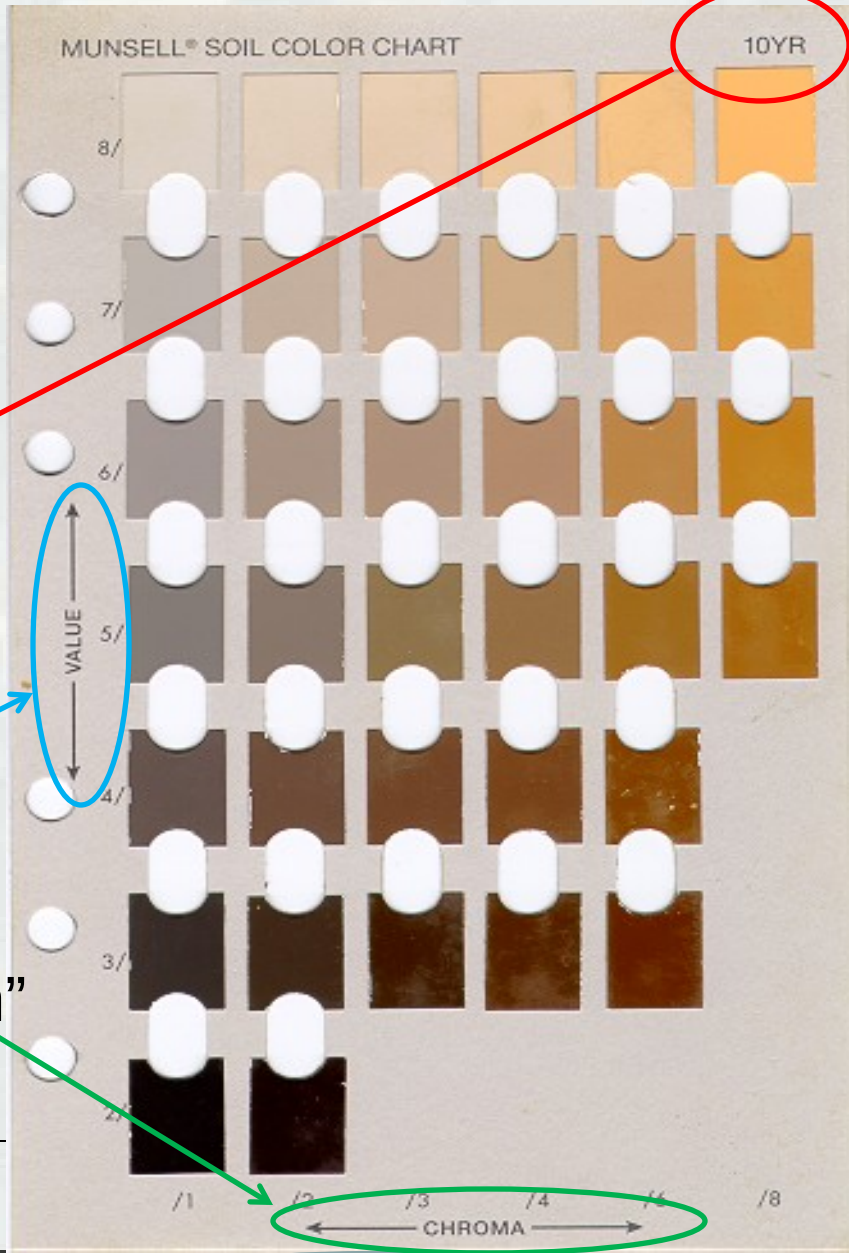
Soil Textures and Colors are Key

Soil colors have 3 “dimensions”:

Hue – indicates a color’s relation to red, yellow, green, blue and purple

Value – indicates the “lightness” of a color

Chroma – indicates the “strength” of a color

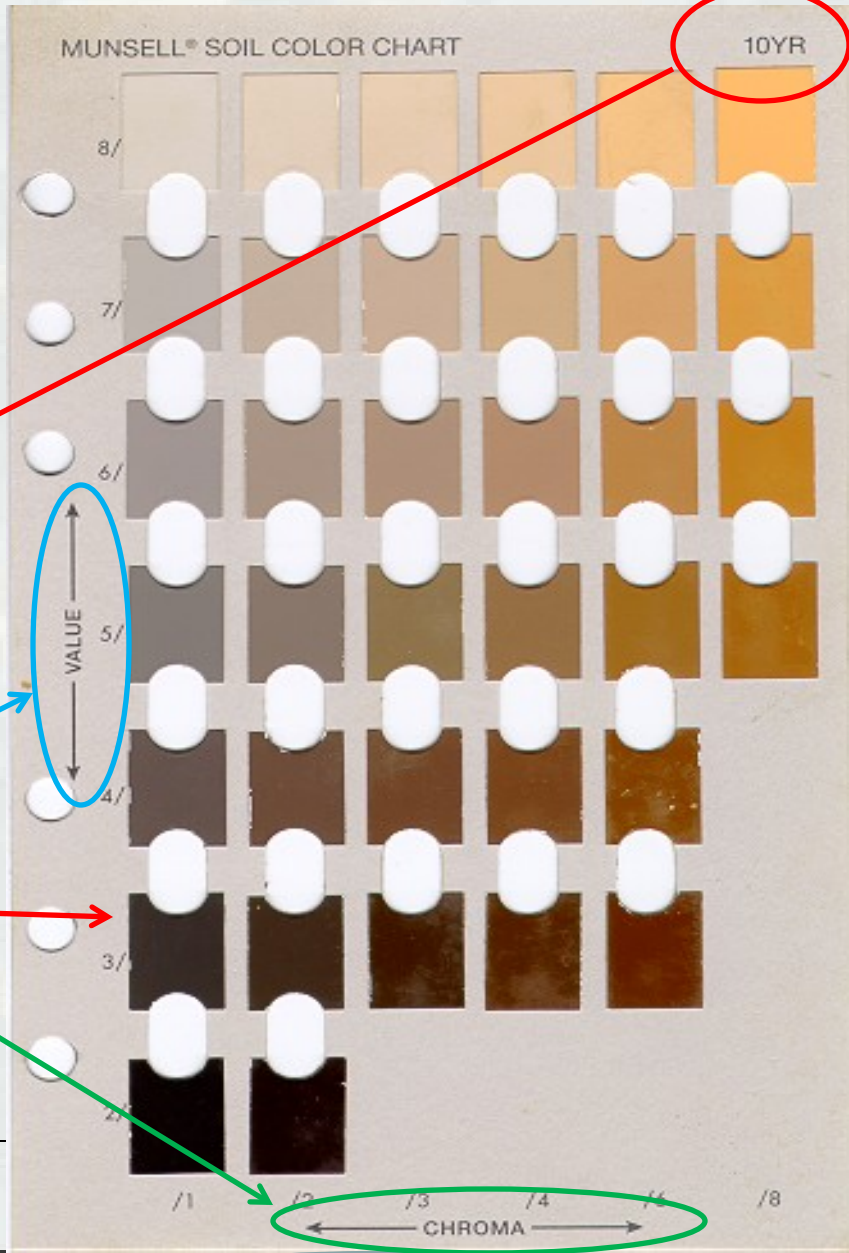


Soil Textures and Colors are Key

Soil colors have 3 “dimensions”:

This color chip is described as:

10YR 3/1



Hue

Value

Chroma

Soil Profiles are Layered

SOIL

Sampling Point: _____

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

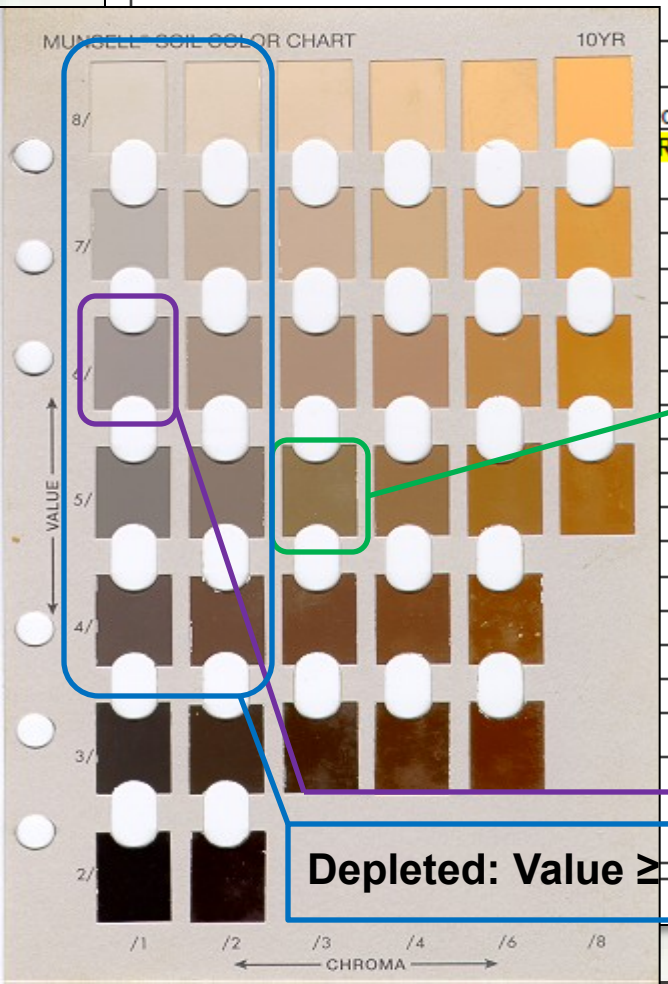
Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 5/3	100					Loam	Layer 1
2-20	10YR 6/1	70	5YR 4/6	30	C	M	Clay	Layer 2

duced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Rs, unless otherwise noted.) Indica

- Polyvalue Below Surface (S8) (LRR S, T, U)
- Thin Dark Surface (S9) (LRR S, T, U)
- Loamy Mucky Mineral (F1) (LRR O)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Marl (F10) (LRR U)
- Depleted Ochric (F11) (MLRA 151)
- Iron-Manganese Masses (F12) (LRR O, P, T)
- Umbric Surface (F13) (LRR P, T, U)
- Delta Ochric (F17) (MLRA 151)
- Reduced Vertic (F18) (MLRA 150A, 150B)
- Piedmont Floodplain Soils (F19) (MLRA 149A)
- Anomalous Bright Loamy Soils (F20) (MLRA 149A, 1

Hydric



Layer 1

Layer 2

Depleted: Value ≥ 4, Chroma ≤ 2

What Hydric Soils Indicators Are Present Here?

Indicator F3: Depleted Matrix

A layer with a depleted matrix that has 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

1) 2 in. if the 2 in. is entirely within the upper 6 in. of the soil, or

2) 6 in. starting within 10 in. of the soil surface

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)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 5/3	100					Loam	Layer 1
2-20	10YR 6/1	70	5YR 4/6	30	C	M	Clay	Layer 2

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, 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)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 1**

Indica
- ___ 1
- ___ 2
- ___ Re
- ___ Pi
- ___ An
- ___ Re
- ___ Ve
- ___ Ot

[3]

Layer 1

Layer 2

Restrictive Layer (if observed):

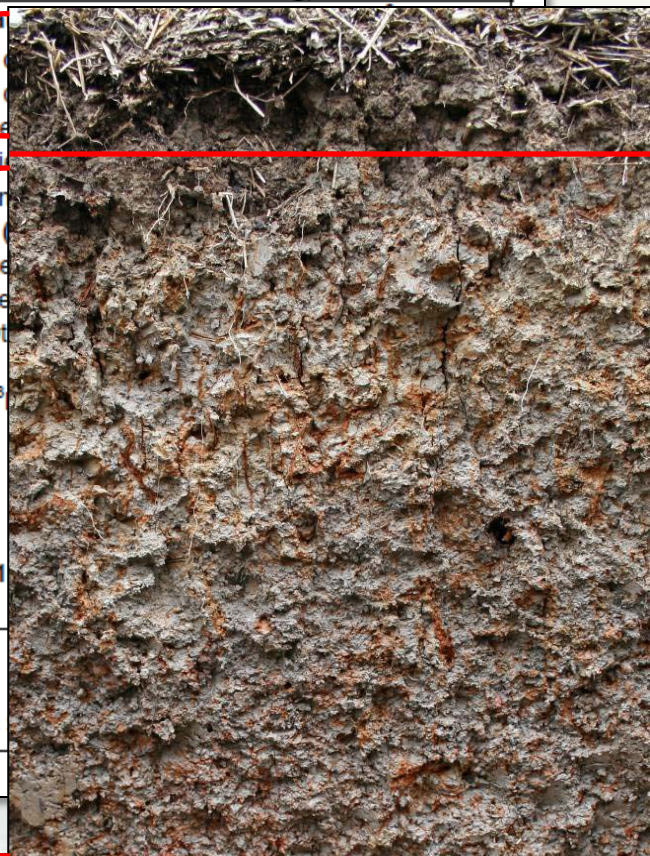
Type: _____

Depth (inches): _____

Hydric

Remarks:

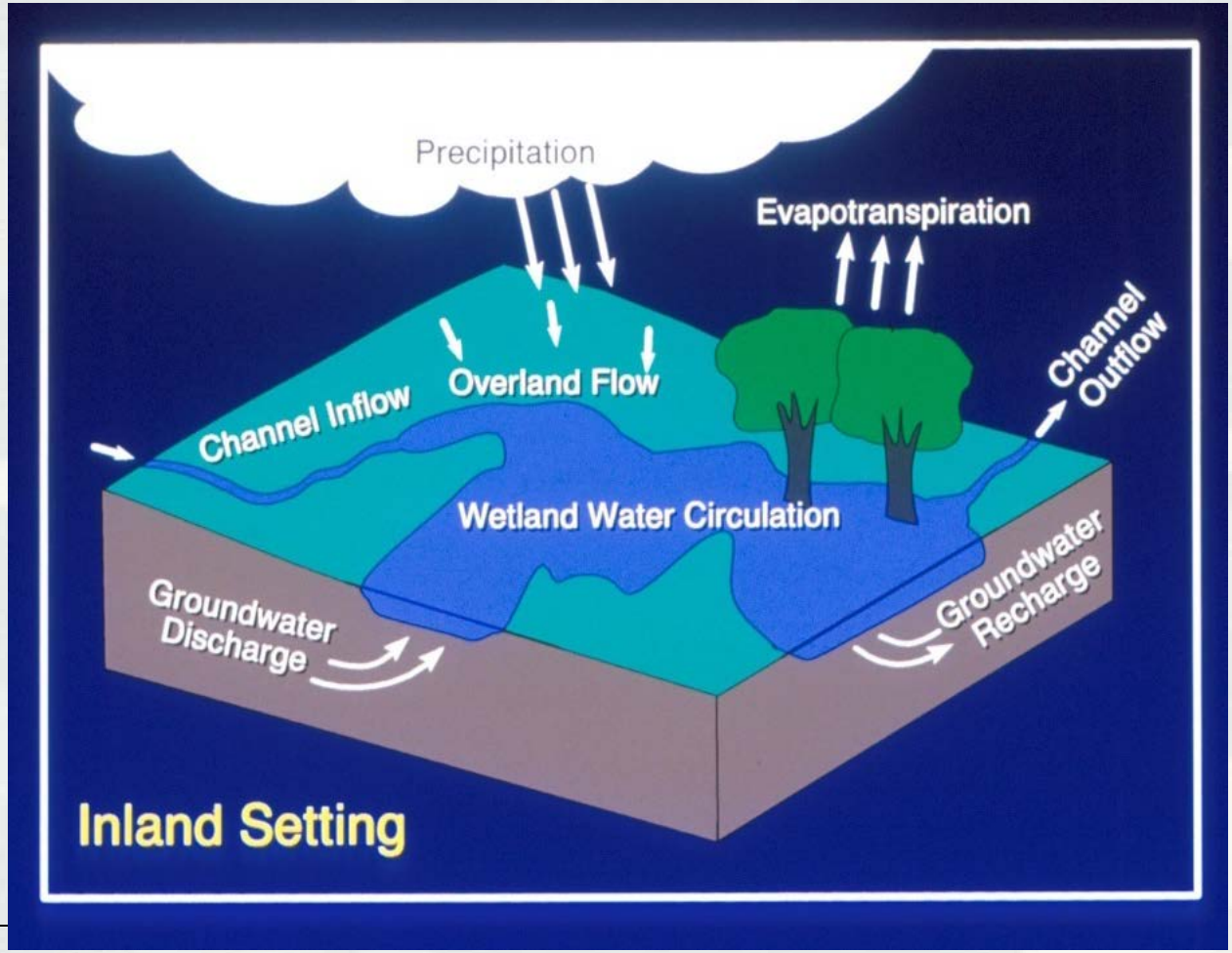
Meets indicator F3: chroma & value



Wetland Hydrology Indicators

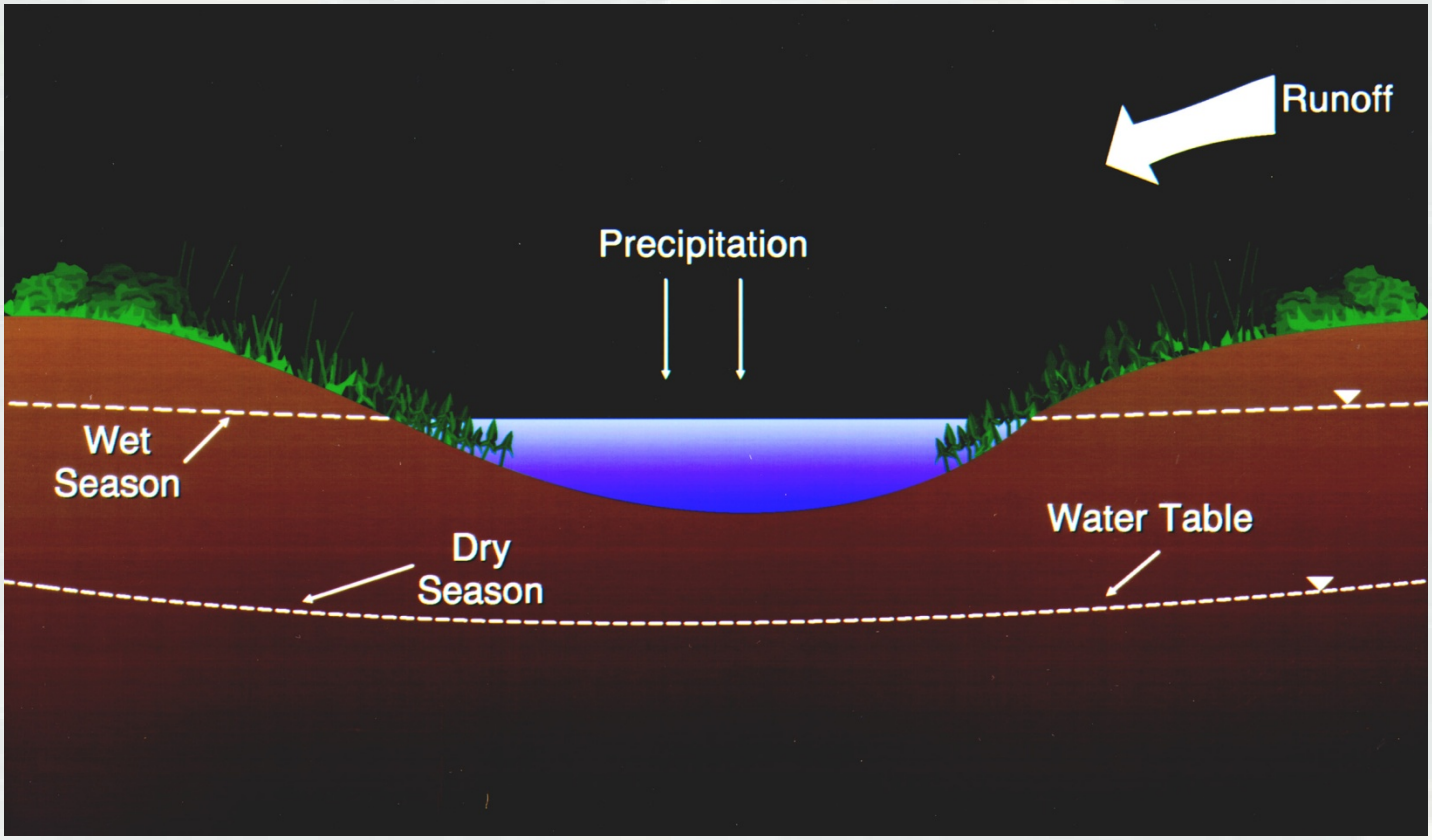
Wetland Hydrology

Wetlands gain and lose water constantly through a variety of pathways



Wetlands in Landscapes

Closed depression with fluctuating water table



Criteria for Wetland Hydrology

Area is inundated or saturated to the surface for at least 5% of the growing season in most years

From: 1987 Corps Manual, Table 5 and paragraphs 49.b(2) and 55. STEP 8i

Criteria for Wetland Hydrology

1987 Manual:

Table 5
Hydrologic Zones[1] - Nontidal Areas

Zone	Name	Duration[2]	Comments
I[3]	Permanently inundated	100 percent	Inundation >6.6 ft mean water depth
II	Semipermanently to nearly permanently inundated or saturated	>75 - <100 percent	Inundation defined as ≤6.6 ft mean water depth
III	Regularly inundated or saturated	>25 - 75 percent	
IV	Seasonally inundated or saturated	>12.5 - 25 percent	
V	Irregularly inundated or saturated	≥ 5 - 12.5 percent	Many areas having these hydrologic characteristics are not wetlands
VI	Intermittently or never inundated or saturated	<5 percent	Areas with these hydrologic characteristics are not wetlands

[1] Zones adapted from Clark and Benforado (1981).
[2] Refers to duration of inundation and/or soil saturation during the growing season.
[3] This defines an aquatic habitat zone.

Criteria for Wetland Hydrology

Area is inundated or saturated to the surface for at least 5% of the growing season in most years

For Charleston: 300 days x 5% = 15 days

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ 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:

Wetland Hydrology Indicators

Presence of hydric soils and hydrophytic vegetation reflect a site's medium to long-term wetness history.

Wetland hydrology indicators provide evidence that a site has a continuing wetland hydrologic regime and that hydric soils and hydrophytic vegetation are not relicts of a past hydrologic regime.

Hydrology Indicator Groups:

Atlantic and Gulf Coastal Plain

Table 10. Wetland hydrology indicators for the Atlantic and Gulf Coastal Plain Region.

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		
B1 – Water marks	X	
B2 – Sediment deposits	X	
B3 – Drift deposits	X	
B4 – Algal mat or crust	X	
B5 – Iron deposits	X	
B7 – Inundation visible on aerial imagery	X	
B9 – Water-stained leaves	X	
B13 – Aquatic fauna	X	
B15 – Marl deposits	X (LRR U)	
B6 – Surface soil cracks		X
B8 – Sparsely vegetated concave surface		X
B10 – Drainage patterns		X
B16 – Moss trim lines		X
Group C – Evidence of Current or 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 tilled soils	X	
C7 – Thin muck surface	X	
C2 – Dry-season water table		X
C8 – Crayfish burrows		X
C9 – Saturation visible on aerial imagery		X
Group D – Evidence from Other Site Conditions or Data		
D2 – Geomorphic position		X
D3 – Shallow aquitard		X
D5 – FAC-neutral test		X
D8 – Sphagnum moss		X (LRR T, U)

Primary Indicators

Indicator A1: Surface water

Direct observation of inundation

Primary Indicators

Indicator A2: High water table

Direct observation of water table within 12 in. of the surface in a soil pit, auger hole, or monitoring well.

Primary Indicators

Indicator A3: Saturation

Observation of soil saturation within 12 in.

Primary Indicators

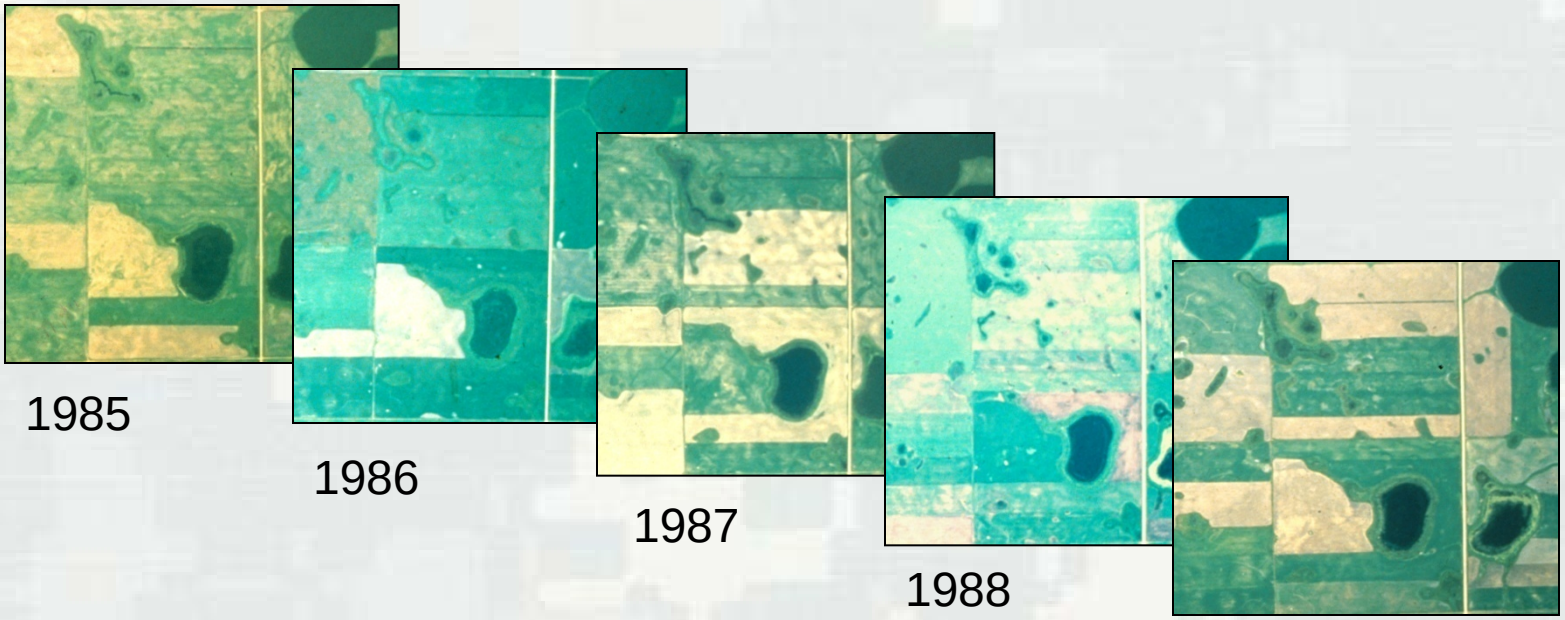
Indicator B1: Water marks

Primary Indicators

Indicator B2: Sediment deposits

Primary Indicators

Indicator B7: Inundation visible on aerial imagery



1985

1986

1987

1988

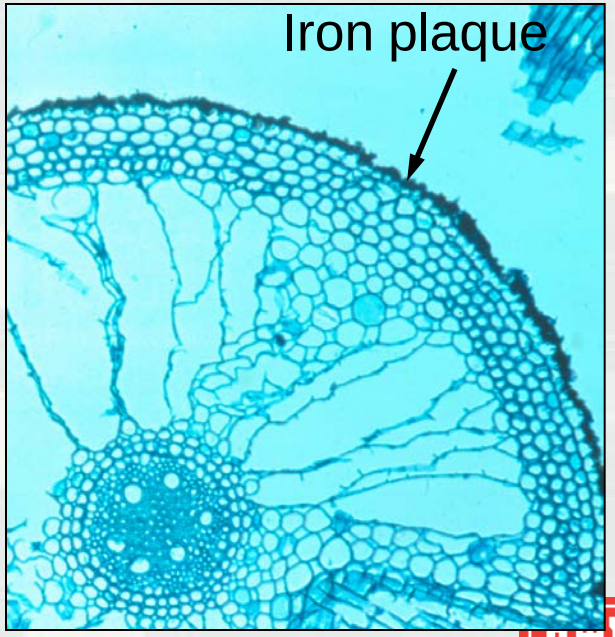
1989

Primary Indicators

Indicator B9: Water-stained leaves

Primary Indicators

Indicator C3: Oxidized rhizospheres along living roots



Secondary Indicators

Indicator B10: Drainage patterns in wetlands

Questions?