



## MN Wetland Professional Certification Delineation Refresher

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## 2023 MWPCP Schedule

- WCA Regulatory Training- St Cloud MNDOT Training Facility- April 20
- Regional Training: Rochester - May 16-17
- Wetland Delineation and Regulation Basic Class: Arden Hills- June 12-16
- Floristic Quality Assessment (FQA)- MNDOT Shoreview Training Center – June 20
- Basic Wetland Plant ID- Farmington (July 18) or Brainerd (July 20)
- Wetland Delineation Refresher- Prairie Woods ELC- Spicer- August 8
- Regional Training: Fergus Falls – August 15-16
- Wetland Delineation and Regulation Basic Class: Brainerd - September 11-15



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## End of the current renewal period

- Current certification renewal period ends on December 31, 2023 for all who transferred to the MWPCP from the U of MN Wetland Delineation Certification Program.
- Credit reporting deadline for this renewal period is January 1, 2024.
- Submit the [Credit Hour Reporting Form](#) with proof of attendance no later than January 1, 2024.
- Not required to submit a credit hour reporting form for MWPCP courses.
- COVID-related [temporary continuing education policies](#) will lapse at the end of 2023.

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## Next renewal period

- The next credit renewal period begins January 1, 2024 and ends on December 31, 2026.
- [MWPCP Continuing Education policy](#) requires 18 credit hours of MWPCP-approved training.
- Six of those may be online training.

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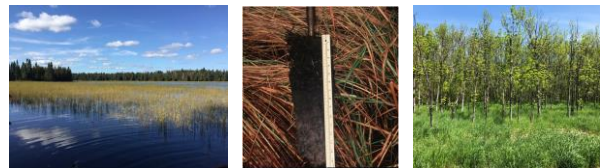
## MWPCP Delineation Refresher Agenda

- Overview of the 3 Parameter Approach to Wetland Delineations with Critical Definitions
- Top of the Data Sheet and Veg Plot Exercise
- Offsite Resources
- Lunch
- Soil Profile Description & Hydrology Indicators Exercise
- Submitting Delineation Reports & Common Data Sheets Errors
- Small group delineation exercise



Class Portal: <https://bwsr.state.mn.us/node/4681>

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## Three Parameters of a Wetland

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## What is a Wetland?

Definition: Those areas 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 to life in saturated soil conditions.



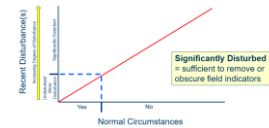
Hydrology + Vegetation + Soil = Wetland

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## Normal Circumstances

- The full range of **pristine to highly disturbed** conditions may constitute the normal circumstances
- The **long-term condition** of a site including any authorized or other legal alterations, such as highways, dams, and other relatively permanent infrastructure and development
- The **extent, duration and relative permanence** of the physical alteration(s) are key
- Maintenance** is a factor – if a physical alteration (e.g., ditch system) is **abandoned** and wetlands reestablish, the NC is wetlands
- The conditions indicated by the soils and hydrology normally present on a site, in cases where the vegetation has been altered or removed

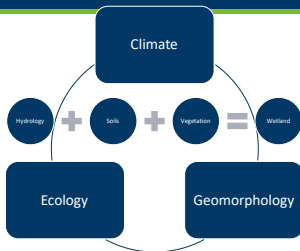
### Extent and Relative Permanence Test



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## Key factors

- Climate
- Ecology
- Hydrology
- Geomorphology
- Soil
- Plant Communities
- Wetlands



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## 3 Parameters of a Wetland

- 3 Parameters of a wetland
- Hydrology- frequency and duration of movement of water through a landscape
- Soil- organic and mineral surfaces which often exhibit characteristics that it has been in saturated conditions
- Vegetation- plant community and prevalence of species that have made adaptations to live in saturated conditions



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## Land Resource Regions

Regions dictate which indicators are used and how they are used

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## Chapter 5- Difficult Wetland Situations

- Atypical situations
  - Agricultural Land (NE/NC, Midwest)
  - Silviculture (NC/NE)
- Problem areas
  - Problematic vegetation
  - Problematic soil
  - Seasonal hydrology
- Procedural problems
  - Wetland/non-wetland mosaics

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## Normal Circumstances?

Not Normal Circumstances:  
removal of natural vegetation



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## Wetland Classification Systems in Minnesota

### Circular 39

- Based on hydrology and vegetation

### Cowardin

- Based on hierarchy system, class, veg, water regime, special modifiers

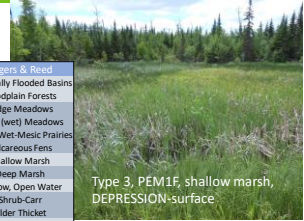
### Eggers & Reed

- Based on plant communities & "typical" associated hydrologic regimes

### Hydrogeomorphic Method

- Based on landscape position, water source, hydraulics

Circular 39	Eggers & Reed
1	Seasonally Flooded Basins
1	Floodplain Forests
2	Sedge Meadows
2	Fresh (wet) Meadows
2	Wet to Wet-Mesic Prairies
2	Calcareous Plains
3	Shallow Marsh
4	Deep Marsh
5	Shallow, Open Water
6	Shrub-Carr
6	Alder Thicket
7	Hardwood Swamp
7	Coniferous Swamp
8	Open Bog
8	Coniferous Bog



Type 3, PEM1F, shallow marsh, DEPRESSION-surface

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## Wetland Hydrology

1987 Corps Manual: "The sum total of wetness characteristics in areas that are inundated or have saturated soils for a sufficient duration to support hydrophytic vegetation."

Regional Supplements: "Wetland hydrology indicators are used in combination with hydric soil and hydrophytic vegetation to determine whether an area is wetland under the Corps manual."



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## Hydrology Technical Standard

... "inundated or saturated by surface or ground water at a frequency and duration"

Technical standard if hydrology indicators not observed:

- 14 or more consecutive days of flooding or ponding;
- Water table 12 in. or less below soil surface;



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## Hydrology Indicators

Evidence that there is continuing hydrology and confirms that an episode of inundation/saturation occurred recently.

Wetland hydrology indicators are divided into two categories:

Primary – provide stand-alone evidence of a current or recent hydrologic event; and

Secondary – provide evidence of recent hydrology when supported by one or more other hydrology indicators.



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## Hydrology Indicator Groups



Group A – direct observation of water



Group B – evidence of flooding/ponding



Group C – evidence of current or recent saturation.



Group D – Landscape and veg. characteristics that indicate contemporary wetland conditions.

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### A2: High water table

Category: Primary

Water table 12 in. (30 cm) or less below the surface in a soil pit, auger hole, or shallow monitoring well.



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### B1: Water Marks

Category: Primary

Water marks are discolorations or stains on the bark of woody vegetation, rocks, bridge supports, buildings, fences, or other fixed objects as a result of inundation.

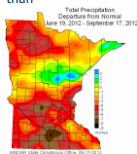


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### C2: Dry season water table

Category: Secondary

Visual observation of the water table between 12 and 24 in. (30 and 60 cm) below the surface during the normal dry season or during a drier-than-normal year.

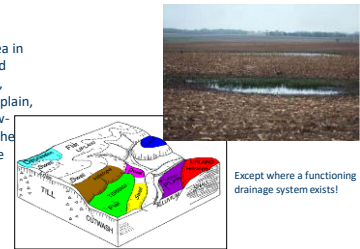


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### D2: Geomorphic position

Category: Secondary

This indicator is present if the area in question is located in a localized depression, linear drainageway, concave position within a floodplain, at the toe of a slope, on the low-elevation fringe of a pond or other water body, or in an area where groundwater discharges.



Except where a functioning drainage system exists!

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### D5: FAC – neutral test

Category: Secondary

The plant community passes the FAC-neutral test:

1. Compile list of dominant plant species across all strata
2. Drop any with FAC
3. >50 % of remaining dominant species are FACW and/or OBL

If it's an equal number of each, then use non-dominant

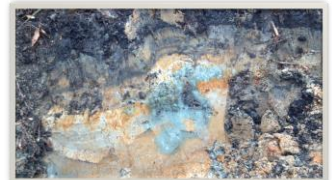
\*This indicator uses the longer term nature of plants

Herb stratum	(Plot size)	U	W	total cover
1. <i>Andropogon gerardii</i>		40	Y	FAC
2. <i>Solidago gigantea</i>		12	Y	FACW
3. <i>Bromus inermis</i>		10	N	FACU
4. <i>Sonchus olerensis</i>		10	N	FACU
5. <i>Cirsium arvense</i>		8	N	FACU
6. <i>Plantago arvensis</i>		5	N	FACW
7. <i>Melilotus officinalis</i>		5	N	FACU
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### Hydric Soil

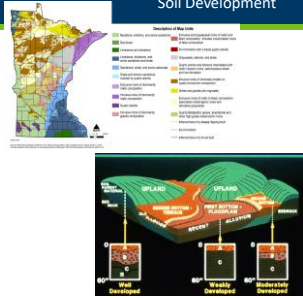
A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.



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### Factors That Influence Soil Development

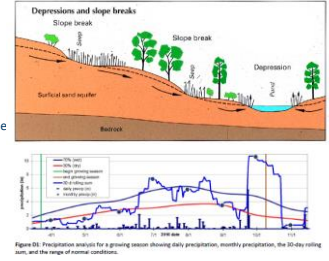
- Climate- weather conditions prevailing over long period of time
- Parent material- geologic material from which soils form
- Topography- landscape position and slope processes
- Organisms- essential role of microbes in the soil, includes humans
- Time- soil doesn't "age", it develops. vegetation, organisms and climate "act on" parent material and topography to develop soil.



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### Landscape and formation of hydric soils

- Landscape position
  - Surface shape (linear, concave, convex)
  - Erosional or depositional
- Hydraulics
  - How water moves
- Hydroperiod- seasonal pattern of water table depth in a wetland
  - Long term- organic
  - Seasonal inundation- thick O, dark A
  - Seasonal saturation- thin O
  - Floodplain- thin, stratified layers



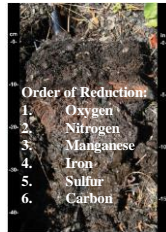
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### Hydric Soil Development

Soil microbes that drive reduction require:

1. Anaerobic conditions i.e. (saturated soil)
2. Organic matter (energy source)
3. Soil temperature warm enough for microbial respiration (>41F)
4. Duration of conditions (Time)

In anaerobic conditions decomposition slows and leads to organic accumulation



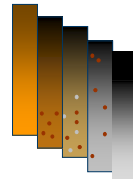
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### Hydric Soil Development

Hydric soils indicators develop in **anaerobic** conditions by the process of :

1. **Reduction** and Re-oxidation of Iron
2. **Organic Matter** Accumulation

Foundation of the Field Indicator Manual.



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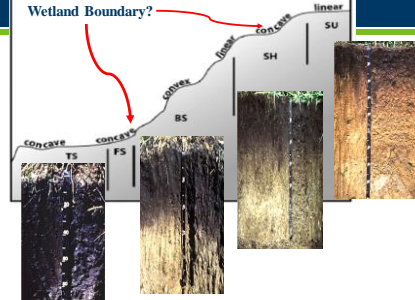
### Soil Horizon- layer of soil with similar physical, chemical, and biologic properties



- O horizon- Organic horizon, thickness varies
- A Horizon- Organic accumulation (typically ~10%), ideally granular structure
- E Horizon- Coloring agents (Fe, Organics) removed
- B Horizon- Subsoil accumulation of minerals, organics, and sometimes chemicals, blocky structure
- C Horizon - Similar to parent material, often less developed with little structure
- R Horizon- Parent material

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### Wetland Boundary? Soil Catena

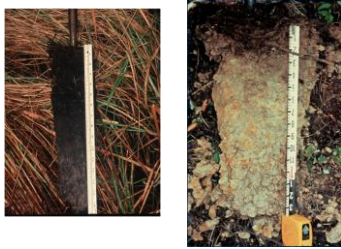


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### Hydric Soil Indicators

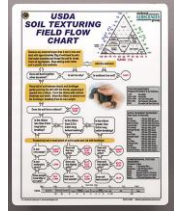
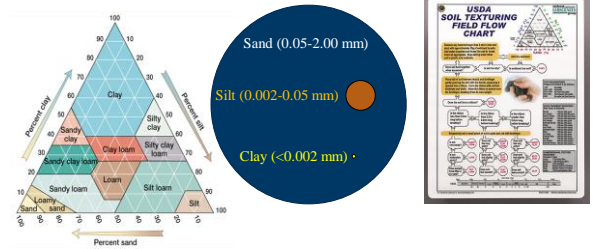
Based on key physical properties: color & texture

And the depth & thickness where they are found



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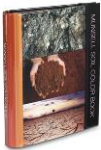
### Soil Texture- Relative proportion of soil particles



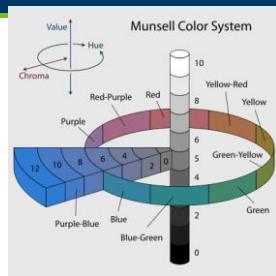
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### Color

- Hue- the spectrum color
- Value- lightness or darkness
- Chroma- "purity" or grayness of color



Hue Value Chroma  
10YR 2/1



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### Field Indicators of Hydric Soils

- Natural Resources Conservation Service
- National Technical Committee for Hydric Soils
- Used for **on-site verification** of hydric soils



Field Indicators of Hydric Soils in the United States  
A Guide for Identifying and Delineating Hydric Soils, Version 2.2, 2018

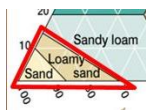


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### Soil Indicator Groups- Texture

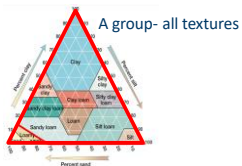
Sandy Soil Indicators (S):

- Use when texture is:
  - Loamy Fine Sand or coarser



Fine Grained Soil Indicators (F):

- Use when texture is:
  - Loamy Very Fine Sand or finer



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### Depleted Matrix

Iron removed or re-organized in profile leaving Grey matrix

- Value 4 or More
- Chroma 2 or Less



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### Depleted Matrix Requirement

Do Not Need Concentrations

Need Concentrations (2%)

High Value (4 or more)

Low Chroma (2 or Less)

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### Problematic Hydric Soils

- Covered in Chapter 5 of the regional supplements
- Problematic hydric soils are the norm in some landscapes
- **Red Parent Material** (*inhibited, or difficult to see redox features*)
- **Active floodplains** (*deposition of new material*)
- **Drained systems** (*relict hydric indicators*)
- **High Value (bright) / Low Chroma (grey)**,
- **Thick prairie soils**
- **Sandy soils**

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### Wetland Plant Communities

“...sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions”

[https://wetland-plants.sec.usace.army.mil/nwpl\\_static/v34/home/home.html](https://wetland-plants.sec.usace.army.mil/nwpl_static/v34/home/home.html)

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### Dominated by Hydrophytes

Adaptations to saturated environment:

- morphological (multiple trunks, floating leaves)
- physiological (metabolic pathways)
- reproductive (floating seedlings)

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### Plant Indicator Status

Wetland Indicator Status	Indicator Symbol	Definition
Obligate Wetland	OBL	Plants that almost always grow in wetlands. Estimated probability of 99% for growing in wetland.
Facultative Wetland	FACW	Plants that usually occur in wetlands. Estimated probability of 67% - 99% for growing in wetland (1%-33% in upland)
Facultative	FAC	Plants with similar likelihood of occurring in both wetland and upland. Estimated 33%-67% for growing in wetland.
Facultative Upland	FACU	Plants that sometimes grow in wetland. Estimated 1% - <33% for growing in wetland (>67% - 99% in upland).
Obligate Upland	UPL	Plants that rarely occur in wetland. Estimated probability of <1% for growing in wetland (>99% in upland).

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### Individual Plant Indicator Status

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### Plant Indicator Status

Great Plains LRR F  
NCNE LRR K  
Midwest LRR M

US Army Corps of Engineers  
2019 RMP, v3.0 - Species Sheet Tool  
Populist Interpretation  
Literature by CREL

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### From Individual to the Community

Vegetation Component Focus is on plant communities and not individual plants

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### Vegetation Strata

Trees: woody plants 3 inches or more DBH regardless of height

Shrubs/Saplings: woody plants less than 3 inches DBH and taller than 1 meter (3.28 feet) in height

Herbaceous: all non-woody plants regardless of size AND woody plants less than 1 meter (3.28 feet) in height

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### Vegetation Sampling Adjustments

Circular plot overlaps two different plant communities?  
Then use rectangular plot of same square footage.

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### Determining Dominance- Sampling

Count as areal cover within plot  
Do Not Count  
Veg Plot  
PEAT  
NON-HYDRIC MINERAL SOILS

To contribute to areal cover, a plant does not have to be rooted in the plot, but does have to be within the same plant community

Photo credit USACE

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### Determining Hydrophytic Vegetation

The procedure for using hydrophytic vegetation indicators is as follows:

1. Apply Indicator 1 ([Rapid Test for Hydrophytic Vegetation](#)).
2. Apply Indicator 2 ([Dominance Test](#)).
  - a) If the plant community fails the dominance test, but indicators of hydric soil and wetland hydrology are both present, proceed to step 3.
3. Apply Indicator 3 ([Prevalence Index](#)).
4. Apply Indicator 4 ([Morphological Adaptations](#)).
  - a) If none of the indicators is satisfied, then hydrophytic vegetation is absent unless indicators of hydric soil and wetland hydrology are present and the site meets the requirements for a problematic wetland situation

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### Hydrophytic Plants – Rapid Test



All dominant species across all strata are rated OBL or FACW, or a combination of these two categories, based on a visual assessment

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### Rapid Test Example



Rapid Test Example

Hydrophytic Vegetation?

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### Hydrophytic Plants – Dominance Test

- Dominance Test AKA 50/20 Rule
  - Used to determine which species are dominant in each strata (layer of veg)
  - Once dominate species are identified their percent cover does not matter; all treated equally
    - Example: Tree Strata may have low number of species compared to Shrub Strata, but may still have a dominant component.
  - IF greater than 50% of the dominant species across all strata are OBL, FACW, or FAC, THEN hydrophytic plant community exists
    - Example: 5 dominant species are identified. 3 dominant species are FACW and 2 dominants are FACU. MEETS CRITERIA FOR HYDROPHYTIC PLANT COMMUNITY; 3/5=.6 or 60% FACW dominants

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### Hydrophytic Vegetation – Dominance Test (50/20 Rule)

1. Estimate absolute percent cover of each species in first stratum. Species must be at least 5% to be considered dominant.
2. Rank species from most to least abundant
3. Calculate the total percent cover of all species (usually not 100 percent) in that stratum
4. Calculate 50% of total cover
5. Calculate 20% of total cover
6. Begin at top of list and add percent covers together until 50% threshold is met
7. Continuing after last species in 50%, next identify species that ALONE meet or exceed 20% threshold
8. Repeat for each stratum

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### Hydrophytic Vegetation – Dominance Test

#### 50/20 Rule Example

Species	% Cover	Calculation
Species a	45	$120 \times 50\% (0.50) = 60$
Species b	30	$120 \times 20\% (.20) = 24$
Species c	25	
Species d	10	
Species e	5	
Species f	5	
Total Cover	120	

Species a + Species b = 75 --- Together exceed 50%  
 Species c = 25 --- individually meet/exceed 20%

Species a, b, and c are dominant

Note: if species percent cover is a tie, include both

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### Hydrophytic Vegetation – Dominance Test

#### 50/20 Example #2

Species A: 55%	} Tied; count both	} 125 Dominants
Species B: 35%		
Species C: 35%		
Species D: 25%		
Species E: 20%		
Species F: 10%		
TOTAL: 180		
$50\% = 180 \times 0.50 = 90$		$20\% = 180 \times 0.20 = 36$

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Stratum	Species Name	Indicator (Design #)	Abundance Percent Cover	Dominant?
Herb	<i>Desmodium illinoense</i>	FACW	25	Yes
	<i>Geranium carolinianum</i>	UPL	7	Yes
	<i>Tricoidendron ovatum</i>	FAC	5	No
	<i>Lonicera latifolia</i>	FACU	2	No
	<i>Sparganium angustifolium</i>	OBL	2	No
	<i>Parthenocissis quinquefolia</i>	FACU	1	No
Shrub/sapling	<i>Asimina speciosa</i>	FACU	0.5	No
	<i>Carex lasiocarpa</i>	FACU	0.5	No
	<b>Total cover</b>		<b>33.0</b>	
	SO 20 Threshold: 50% of total cover = 16.5% 20% of total cover = 6.6%			
	<i>Carpinus caroliniana</i>	FAC	30	Yes
	<i>Corylus rostrata</i>	FACU	20	No
Tree	<i>Acer saccharinum</i>	FACU	5	No
	<i>Quercus rubra</i>	FACU	5	No
	<b>Total cover</b>		<b>55.0</b>	
	SO 20 Threshold: 50% of total cover = 27.5% 20% of total cover = 11.0%			
	<i>Quercus laevis</i>	FACU	40	Yes
	<i>Fraxinus pennsylvanica</i>	FACU	17	Yes
Woody vine	<i>Lonicera americana</i>	FACU	8	No
	<i>Cercis canadensis</i>	FACU	8	No
	<b>Total cover</b>		<b>76.0</b>	
	SO 20 Threshold: 50% of total cover = 38.0% 20% of total cover = 15.2%			
	<i>Tricoidendron ovatum</i>	FAC	1	No
	<i>Hydrophytic vegetation Determination</i>	Total number of dominant species across all strata = 5 Percent of dominant species that are OBL, FACW, FACU, or FAC = 80%. Therefore, this community is hydrophytic by indicator 2 (Dominance Test).		

### Dominance Test

- Tally number of dominants across all strata – 5
- Tally number of dominants that are FAC, FACW, or OBL – 4
- Calculate if FAC, FACW, OBL dominants comprise more than 50% of plant communities – 4/5 = 80%

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### Class exercise

How many dominant species are there in the sample point data?

- 1, 2, 3, or 4?

Species	Strata	% Coverage
Species A	Herbaceous	30
Species B	Herbaceous	30
Species C	Herbaceous	20
Species D	Herbaceous	20
Species E	Herbaceous	15
Species F	Shrub/sapling	5
Species G	Tree	3

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### Class exercise

How many dominant species are there in the sample point data?  
3

Species	Strata	% Coverage
Species A	Herbaceous	30
Species B	Herbaceous	30
Species C	Herbaceous	20
Species D	Herbaceous	20
Species E	Herbaceous	15
Species F	Shrub/sapling	5
Species G	Tree	3

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### Apply indicator – Result?

- Does this pass the dominance test?
- If greater than 50% of the dominant species across all strata are OBL, FACW, or FAC, THEN hydrophytic plant community exists

Species	Strata	Ind. Status
Species A	Herbaceous	FACW
Species B	Herbaceous	FAC
Species C	Herbaceous	FAC
Species D	Herbaceous	FACW
Species E	Herbaceous	FAC
Species F	Shrub/sapling	FACU
Species G	Tree	OBL

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### Hydrophytic Vegetation – Prevalence Index

- Prevalence Index
  - A numerical calculation used to determine whether a hydrophytic plant community is present
  - Uses a weighted average and uses all plant species in the plot, not just dominant
  - Values range from 1 to 5
  - Values less than or equal to 3 indicate hydrophytic plant community

Prevalence Index worksheet:	
Total % Cover of	Multiply by
OBL species	x 1 =
FACW species	x 2 =
FACU species	x 3 =
FAC species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)
Prevalence Index = B/A =	

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### Hydrophytic Vegetation – Prevalence Index

Species	% Cover	Indicator
Tree Strata		
Species a	45	FACW
Species b	30	OBL
Species c	25	FAC
Species d	10	FAC
Species e	5	FACU
Species f	5	UPL
Herbaceous Strata		
Species A	35	OBL
Species B	35	FACW
Species C	35	FACW
Species D	25	FAC
Species E	20	FACU
Species F	10	UPL

Prevalence Index worksheet:		
Total % Cover of	Multiply by	
OBL species	85	x 1 = 85
FACW species	115	x 2 = 230
FAC species	60	x 3 = 180
FACU species	25	x 4 = 100
UPL species	15	x 5 = 75
Column Totals: (A)	300	(B) 670
Prevalence Index = B/A = 2.23		

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# Hydrophytic Vegetation – Morphological Adaptations

## Morphological Adaptations

- Use when more than 50% of FACU plants exhibit morphological adaptations to saturated soil conditions AND criteria for hydric soils and hydrology is present

  - For each FACU species exhibiting adaptations, record percentage of individuals with morphological adaptations on data sheet so long as the adaptations are not also common in the same species within nearby uplands areas.
  - If more than 50% have adaptations then re-assign indicator status for that species from FACU to FAC
  - Recalculate dominance test and/or prevalence index

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# Top of the Data Sheet Exercise

**WETLAND DETERMINATION DATA FORM – Great Plains Region**

Project/Site: \_\_\_\_\_ City/County: \_\_\_\_\_ State: \_\_\_\_\_ Sampling Date: \_\_\_\_\_  
 Applicant/Owner: \_\_\_\_\_ Section, Township, Range: \_\_\_\_\_ Sampling Point: \_\_\_\_\_  
 Landform (hillside, terrace, etc.): \_\_\_\_\_ Local relief (concave, convex, none): \_\_\_\_\_ Slope (%): \_\_\_\_\_  
 Subregion (LFR): \_\_\_\_\_ 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.)

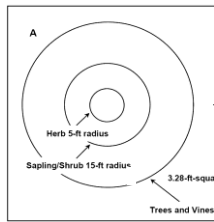
**SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

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: \_\_\_\_\_

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# Vegetation Sampling Field Exercise



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**VEGETATION – Use scientific names of plants.**

Tree/Shrub	(Her size)	Absolute Count	Relative Count	Dominance Test Worksheet
1.				Number of Dominant Species That Are OBL, FACU, or FAC (excluding FACU)
2.				Total Number of Dominant Species Across All Sites
3.				Percent of Dominant Species That Are OBL, FACU, or FAC
4.				
Prevalence Index Worksheet				
1.				Total % Cover of _____
2.				Prevalence Index
3.				
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**Online resources**

Available resources:

- MN Geospatial Commons
- MN Topo
- NRCS Web Soil Survey
- MN NWI
- MN DNR Ecological Classification System
- MN Natural Resource Atlas
- MN Historic Aerial Photographs Online
- EnviroAtlas

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# Good Aerial Photos Are Essential

- Google Earth
- MN Geospatial Information Office <http://www.mngeo.state.mn.us/>
- County Land Explorers



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Results = preliminary wetland map with possible transect locations and areas to investigate.



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St. Paul District REGULATORY US Army Corps of Engineers®



Guidance

March 4, 2015

Guidance for Submittal of Delineation Reports to the St. Paul District Army Corps of Engineers and Wetland Conservation Act Local Governmental Units in Minnesota, Version 2.0

3.7.6 Using Aerial Imagery to Assess Wetland Hydrology

Procedures have been updated and improved for the assessment of wetland hydrology based on aerial imagery. The interagency approach to off-site wetland determinations on agricultural lands (also referred to as the state "Mapping Conventions") is required for CWA and WCA purposes. Refer to the guidance

Guidance for Offsite Hydrology

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Evaluating Images

Signatures:

- CS: Crop stress
- DO: Drowned Out
- NC: Not cropped
- SW: Standing water
- NV: Normal vegetative cover
- NSS: No soil wetness
- AP: Altered pattern
- SS: Soil wetness signature
- CS/DO... (can have multiple, use the /)

Wetland Signatures are a positive "hit"

75

Evaluating Images

Crop Stress (CS)



76

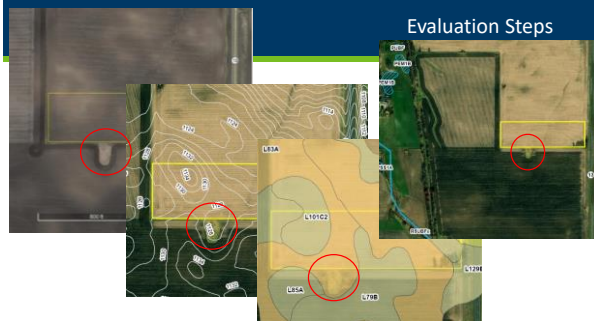
Evaluating Images

Drowned Out (DO)

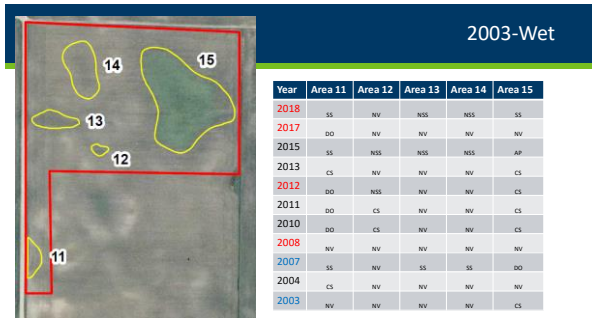


77

Evaluation Steps



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Year	Area 11	Area 12	Area 13	Area 14	Area 15
2018	SS	NV	NSS	NSS	SS
2017	DO	NV	NV	NV	NV
2015	SS	NSS	NSS	NSS	AP
2013	CS	NV	NV	NV	CS
2012	DO	NSS	NV	NV	CS
2011	DO	CS	NV	NV	CS
2010	DO	CS	NV	NV	CS
2008	NV	NV	NV	NV	NV
2007	SS	NV	SS	SS	DO
2004	CS	NV	NV	NV	NV
2003	NV	NV	NV	NV	CS

79

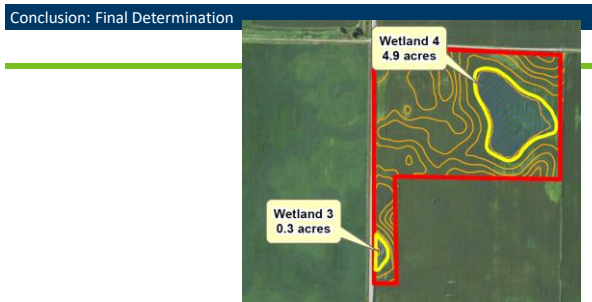
### Document

Hydric Soils present <sup>1</sup>	Identified on NWI or other wetland map <sup>2</sup>	Percent with wet signatures from Exhibit 1	Field verification required <sup>3</sup>	Wetland? <sup>4</sup>
Yes	Yes	>50%	Yes	Yes
Yes	Yes	30-50%	No	Yes
Yes	Yes	<30%	Yes	Yes, if other hydrology indicators present
Yes	No	>50%	No	Yes
Yes	No	30-50%	Yes	Yes, if other hydrology indicators present
Yes	No	<30%	No	No
No	Yes	>50%	No	Yes
No	Yes	<30%	No	No
No	No	>50%	Yes	Yes, if other hydrology indicators present
No	No	30-50%	Yes	Yes, if other hydrology indicators present
No	No	<30%	No	No

Area	Hydric Soils Present	Identified on NWI or other wetland map	Percent with wet signatures from Exhibit 1	Other hydrology indicators present	Wetland?
11	Yes	No	100	NA	Yes
12	Yes	No	40	NA	No
13	Yes	No	0	NA	No
14	Yes	No	0	NA	No
15	Yes	Yes	80	NA	Yes

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### Other uses

#### Level 1 Delineations

Delineation Method	Review of offsite mapping resources	Site Visit	Sampling Approach	Complete Field Data Forms	Field Staking of Wetland Boundaries
Routine Level 1	Yes	Sometimes	Offsite	No	No
Routine Level 2	Yes	Yes	Onsite, qualitative	Yes	Yes
Comprehensive	Yes	Yes	Onsite, quantitative	Yes	Yes

WCA Application Type Examples	Commonly Used Delineation Method
Temporary impact under No-Loss	Routine Level 1
Banking application: pre-application scoping	Routine Level 1
Banking application: full application	Routine Level 2
Road Program: Wetland Impact Documentation—Road project through a large continuous wetland	Routine Level 1
Road Program: Wetland Impact Documentation—Scattered wetlands within construction corridor	Routine Level 2
Replacement plan	Routine Level 2
Enforcement actions	Routine Level 2 or Comprehensive
Wetland boundary approval (no project application)	Routine Level 2
Agricultural exemption determination (8420.0420, Subpart 2A)	Routine Level 1

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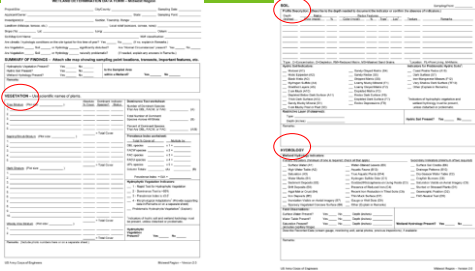
- ### Sample Points
- Top section of data sheet
    - Documents sample location and landscape setting
    - Site conditions Wet-Dry
  - Vegetation
    - ID species to determine if plant community is hydrophytic
    - Record comments on changes in vegetation
  - Soil
    - Describe soil and determine if it is hydric
    - Record comments on changes in soil

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- ### Sample Points
- Topography
    - Record changes in topography
    - Abrupt
    - Gradual
    - Geomorphic position
  - Other notable remarks and observations
    - Basis for delineation line (sharp topo/veg break)
    - Hydrology inputs and outputs

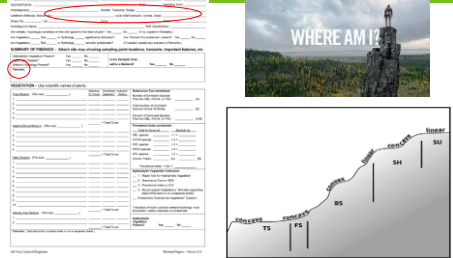
84

### It's all about the documentation!



85

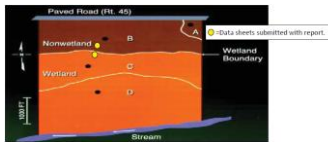
### It's all about the documentation!



86

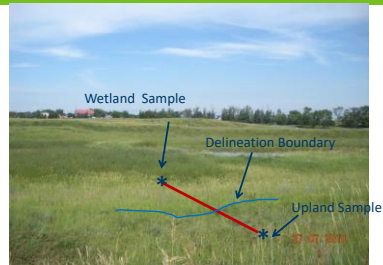
### Sampling Location Should Be Representative

- Representative of soil changes (from upland to wetland)
- Representative of vegetation changes
- Representative of hydrology indicator changes
- Representative of landscape changes



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### Routine Level 2 Sampling Transects



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### Guidance for Submitting Delineation Reports in MN

- Delineation report content
- Delineation Method and data collection
- On-site field demarcation
- Guidance on each parameter
- Field Notes
- Basic Report Components
- Field Review
- Non-Routine Wetland Delineations



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### Marking Wetland Boundaries

- Mark with:
  - Flagging tape, lath, pin flags
  - Will vary depending on situation.
- Locate via GPS or land survey methods (find out local requirements).
- Wetland boundaries must be usable for the regulatory purposes intended (grading plans, plat maps, etc.).



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## Typical Report Format

- Introduction
- Methods
- Results
- Discussion (optional)
- Figures
- Field Data Forms

Avenue NE <small>Zone, State, County, Watershed</small> Wetland Delineation Report	
TABLE OF CONTENTS	
Title	Page
1. WETLAND DELINEATION SUMMARY	1
2. OVERVIEW	2
3. METHODS	2
4. RESULTS	3
4.1 Review of 1982 Soils, Public Waters, and 1982 Submittals	3
4.2 Wetland Delineations and Delineations	4
4.3 Other Data	6
4.4 Excuse for Wetland Boundary and Jurisdictional Determination	6
5. CERTIFICATION OF DELINEATION	7
<b>FIGURES:</b>	
1. Site Location	
2. Existing Conditions	
3. National Wetland Inventory	
4. Soil Survey	
5. 1982 Public Waters Inventory	
6. National Hydrography Dataset	
<b>APPENDICES:</b>	
A. Inset Application Form for Activities Affecting Water Resources in Missouri	
B. Wetland Delineation Data Forms	
C. Supporting Information	

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## Text Examples

**Wetland Type &Vegetation:**

“Wetland 1 is a Type 3 (PEMC/F) with an interior shallow marsh community surrounded by a fringe of wet meadow.

Dominant vegetation in the shallow marsh includes broadleaf cattail, and water plantain.

The wet meadow fringe include reed canary grass, with a few scattered willow shrubs.”

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## Text Examples

**Soils:**

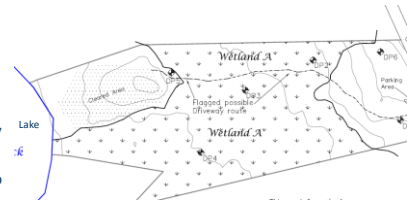
“Soils in the wetland consisted of a deep layer of organic sapric material overlying fine sand consistent with the mapped soil unit. Indicator A1 (histosol) was observed in the wetland.

Adjacent upland soils lacked the organic surface layer and consisted of high chroma loamy fine sand over sand. No hydric soil indicators were observed in the upland.”

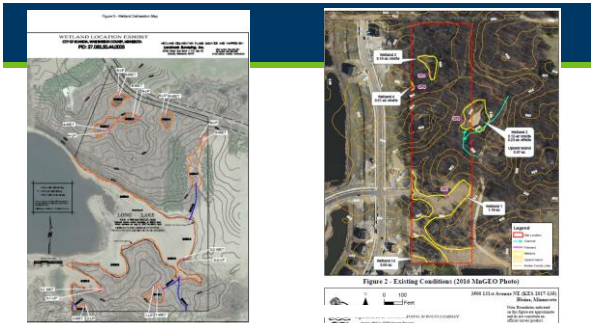
93

## Report Components – Figures

1. Site Location
  2. National Wetland Inventory (NWI)\*
  3. Soils
  4. Public Waters Inventory (PWI)\*
  5. Wetland Boundary Map
- \*often combined



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## Data Forms

- Completely filled out
- Correspond to sample locations indicated on a map
- Remember that sample locations should be representative
- Not needed if doing a Routine Level 1
- Do a complete job, but keep in mind that these are field assessments, not a scientific study, spend a reasonable amount of time.

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## Field Review

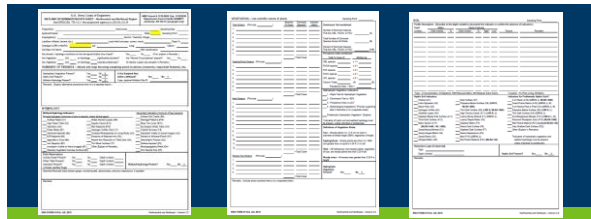
Who should conduct site review?

- At least 1 member of TEP
- LGU may request assistance from TEP (SWCD and BWSR) or other tech. prof.
- Corps invited/coordination
- Delineator invited (but does not need to be present)



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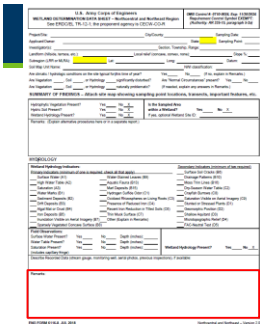


### Common Data Sheet Errors

[bwsr.state.mn.us/minnesota-wetland-professional-certification-program](http://bwsr.state.mn.us/minnesota-wetland-professional-certification-program)



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### Common Data Sheets Errors- Page 1

- Normal circumstances checked on ag land
- Normal circumstances vs normal climatic conditions
- Noting disturbance on ag land
- Recognizing naturally problematic areas
- Indicating water table depth with A1, A2, A3 hydrology indicators
- Not using remarks

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### Normal Environmental Conditions vs. Normal Circumstances

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Title \_\_\_\_\_ City/County \_\_\_\_\_ State \_\_\_\_\_ Sampling Date \_\_\_\_\_  
 Applicant/Owner \_\_\_\_\_ Section, Township, Range \_\_\_\_\_ Section, Township, Range \_\_\_\_\_  
 (containing) (hillside, terrace, etc.) \_\_\_\_\_ Local relief (concave, convex, none) \_\_\_\_\_ Datum \_\_\_\_\_  
 Slope (%) \_\_\_\_\_  
 Soil Map (s) \_\_\_\_\_  
 Are climatic, hydrologic conditions on the site typical for the time of year? Yes No **Normal Environmental Conditions?**  
 Are vegetation, soil, or hydrology significantly disturbed? **Normal Circumstances?** present? Yes No

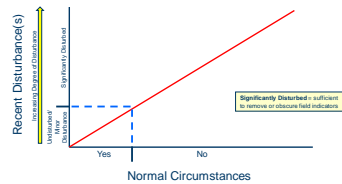
100

### Normal Environmental Conditions vs. Normal Circumstances

- **Short-term:** "normal environmental conditions" refers to the climatic conditions of the current year and growing season
- **Long-term:** "normal circumstances" refers to the multiple-year/decades-long condition of the site

101

### Relationship of Normal Circumstances and Recent Disturbance(s)



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### Normal Circumstances - Vegetation

- Removing, mauling, planting, cropping, or other means of altering vegetation that is more than minor = **NOT Normal Circumstances**



Overgrazed to the extent that alteration of vegetation is more than minor – including the extreme case shown above where vegetation has been removed = **NOT Normal Circumstances**

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### Normal Circumstances - Vegetation



Sample Point – vegetation not disturbed to the extent that dominant species cannot be accurately identified

Light grazing of a sedge meadow – minor disturbance of natural vegetation = **Normal Circumstances**

Example of an **unimproved** pasture = no interseeding, planting, etc.

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### Normal Circumstances

**WETLAND DETERMINATION DATA FORM – Midwest Region**

Project/Site: \_\_\_\_\_ City/County: \_\_\_\_\_ Sampling Date: \_\_\_\_\_  
 Applicant/Owner: \_\_\_\_\_ State: \_\_\_\_\_ Sampling Point: \_\_\_\_\_  
 Investigator(s): \_\_\_\_\_ Section, Township, Range: \_\_\_\_\_  
 Landform (hilllope, terrace, etc.): \_\_\_\_\_ Local relief (concave, convex, none): \_\_\_\_\_  
 Shape (N): \_\_\_\_\_ Lat: \_\_\_\_\_ Long: \_\_\_\_\_ Datum: \_\_\_\_\_  
 Soil Map Unit Name: \_\_\_\_\_ NWI identification: \_\_\_\_\_  
 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 why answers are "normal")

If "Yes", data collection is based on current conditions.

If "No", data collection is based on conditions that would exist in absence of recent disturbance(s).

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### Problem Areas (Naturally Problematic)



- One or more parameters are absent due to normal seasonal or annual variability, or permanently due to the nature of the soils or plant species
  - Seasonal wetlands
  - Prairie potholes
  - Red clay parent materials
  - FACU-dominated wetlands
  - Inter-dunal swales

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### Degree of Disturbance(s)

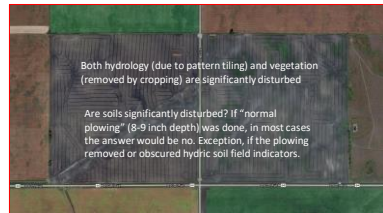
**WETLAND DETERMINATION DATA FORM – Midwest Region**

Project/Site: \_\_\_\_\_ City/County: \_\_\_\_\_ Sampling Date: \_\_\_\_\_  
 Applicant/Owner: \_\_\_\_\_ State: \_\_\_\_\_ Sampling Point: \_\_\_\_\_  
 Investigator(s): \_\_\_\_\_ Section, Township, Range: \_\_\_\_\_  
 Landform (hilllope, terrace, etc.): \_\_\_\_\_ Local relief (concave, convex, none): \_\_\_\_\_  
 Shape (N): \_\_\_\_\_ Lat: \_\_\_\_\_ Long: \_\_\_\_\_ Datum: \_\_\_\_\_  
 Soil Map Unit Name: \_\_\_\_\_ NWI identification: \_\_\_\_\_  
 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 why answers are "normal")

**Significantly Disturbed** = sufficient to remove or obscure field indicators

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### Disturbed (Atypical)



Both hydrology (due to pattern tiling) and vegetation (removed by cropping) are significantly disturbed

Are soils significantly disturbed? If "normal plowing" (8-9 inch depth) was done, in most cases the answer would be no. Exception, if the plowing removed or obscured hydric soil field indicators.

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### A3: Saturation

Category: Primary

Visual observation of saturated soil conditions 12 in. or less from the soil surface as indicated by water glistening on the surfaces and broken interior faces of soil samples.

*\*Must be associated with a water table immediately below the saturated zone except when zone of saturation is above a relatively impermeable layer of soil or bedrock ≤ 12 inches of the soil surface.*

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### Data Sheet Common Errors- Page 2

- Absolute % Cover always adding up to 100
- Using wrong indicator status for the LRR
- Must have 5% cover to be considered dominant in 50/20 rule
- Meets prevalence index at 3 or less
- Presence of hydrology and soil indicators when doing prevalence index
- Not using remarks

110

### Determining Dominance- Sampling

ESTIMATES OF PERCENT COVER

Percent Areal Cover

- Estimate can vary from person to person
- Almost NEVER adds up to 100%...sometimes more; sometimes less
- Is recommended method for determining cover
- Used by 50/20 Rule
- Used by Prevalence Index
- Is different that Absolute Cover = Actual or Total cover

111

### NWPL Regions = Supplement Boundaries

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### Individual Plant Indicator Status

113

### Hydrophytic Vegetation – Dominance Test (50/20 Rule)

1. Estimate absolute percent cover of each species in first stratum. Species must be at least 5% to be considered dominant.
2. Rank species from most to least abundant
3. Calculate the total percent cover of all species (usually not 100 percent) in that stratum
4. Calculate 50% of total cover
5. Calculate 20% of total cover
6. Begin at top of list and add percent covers together until 50% threshold is met
7. Continuing after last species in 50%, next identify species that ALONE meet or exceed 20% threshold
8. Repeat for each stratum

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## Hydrophytic Vegetation – Prevalence Index

- Prevalence Index
  - A numerical calculation used to determine whether a hydrophytic plant community is present
  - Uses a weighted average and uses all plant species in the plot, not just dominant
  - Values range from 1 to 5
- Values less than or equal to 3 indicate hydrophytic plant community

Prevalence Index worksheet:		
Total % Cover of		Multiply by:
OBL species	_____	x 1 = _____
FACW species	_____	x 2 = _____
FACU species	_____	x 3 = _____
UPL species	_____	x 4 = _____
Column Totals:	(A)	(B)
Prevalence Index = B/A = _____		

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## Hydrophytic Vegetation – Prevalence Index

Species	% Cover	Indicator
Tree Strata		
Species a	45	FACW
Species b	30	OBL
Species c	25	FAC
Species d	10	FAC
Species e	5	FACU
Species f	5	UPL
Herbaceous Strata		
Species A	35	OBL
Species B	35	FACW
Species C	35	FACW
Species D	25	FAC
Species E	20	FACU
Species F	10	UPL

Prevalence Index worksheet:		
Total % Cover of		Multiply by:
OBL species	85	x 1 = 85
FACW species	115	x 2 = 230
FACU species	60	x 3 = 180
FACU species	25	x 4 = 100
UPL species	15	x 5 = 75
Column Totals:	300 (A)	670 (B)
Prevalence Index = B/A = 2.23		

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## Determining Hydrophytic Vegetation

The procedure for using hydrophytic vegetation indicators is as follows:

1. Apply Indicator 1 (Rapid Test for Hydrophytic Vegetation).
2. Apply Indicator 2 (Dominance Test).
  - a) If the plant community fails the dominance test, but indicators of hydric soil and wetland hydrology are both present, proceed to step 3.
3. Apply Indicator 3 (Prevalence Index).
4. Apply Indicator 4 (Morphological Adaptations).
  - a) If none of the indicators is satisfied, then hydrophytic vegetation is absent unless indicators of hydric soil and wetland hydrology are present and the site meets the requirements for a problematic wetland situation

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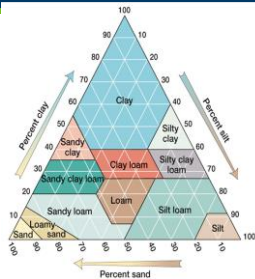
## Common Data Sheet Errors - Page 3

- Using wrong indicator group for texture
- Estimating redox percentages
- Every data sheet describes horizons exact same color across site
- Using uncommon indicators with no remarks

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## Field Indicator Organization- Texture

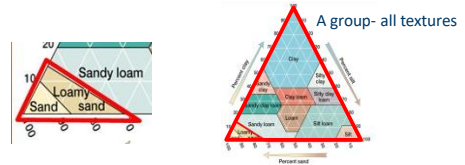
- Use regardless of texture(s)
  - All Mineral
  - All Organic
- Typically, organic matter influences near the surface
- Includes smell
  - Rotten egg



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## Soil Indicator Groups- Texture

- Sandy Soil Indicators (S):
  - Use when texture is:
    - Loamy Fine Sand or coarser
- Fine Grained Soil Indicators (F):
  - Use when texture is:
    - Loamy Very Fine Sand or finer



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### Abundance and Size of Redox

CHARTS FOR ESTIMATING PROPORTIONS OF MOTTLES AND COARSE FRAGMENTS

**Abundance**

- Few -- less than 2%
- Common -- 2 to 20%
- Many -- more than 20%

**Size**

- Fine -- < 5 mm
- Medium -- 5 to 15 mm
- Coarse -- > 15 mm

Several indicators require at least 2% abundance

121

### Contrast

• Contrast refers to the degree of visual distinction between associated colors

- Faint -- evident only on close examination
- Distinct -- readily seen at arms length
- Prominent -- contrast strongly

Several indicators require distinct or prominent contrast!

Contrast Class	S	C	Difference in Color Between Matrix and RHF (A means "difference between")	
			Hue (h)	Chroma (c)
Faint †	F	F	$\Delta h = 0;$	$\Delta v \leq 2$ and $\Delta c \leq 1$
			$\Delta h = 1;$	$\Delta v \leq 1$ and $\Delta c \leq 1$
			$\Delta h = 2;$	$\Delta v = 0$ and $\Delta c = 0$
Distinct †	D	D	$\Delta h = 0;$	$\Delta v \geq 2$ to < 4 and $\Delta c = 1$ to < 4
			$\Delta h = 1;$	$\Delta v \geq 1$ to < 3 and $\Delta c = 1$ to < 3
			$\Delta h = 2;$	$\Delta v = 0$ and $\Delta c = 0$ to < 2
Prominent †	P	P	$\Delta h = 0;$	$\Delta v \geq 4$ or $\Delta c \geq 4$
			$\Delta h = 1;$	$\Delta v \geq 3$ or $\Delta c \geq 3$
			$\Delta h = 2;$	$\Delta v \geq 2$ or $\Delta c \geq 2$

† If compared colors have both a value  $\geq 3$  and a chroma of  $\geq 2$ , the contrast is Faint, regardless of hue differences.

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### A12- Thick Dark Surface

- Applicable land resource regions (LRR)
- Use in all LRRs
- User notes
  - Most often associated with overthickened soils in concave landscape positions.

**Color Requirements**  
Value = < 2.5  
Chroma = 1

Value = < 3  
Chroma = 1  
Reduced or Depleted Matrix

chroma of 1 or less to a depth of at least 20 cm (12 inches) and value of 7.5 or less and chroma of 1 or less in any remaining layers above the depleted or gleyed matrix. In any sandy matrix above the depleted or gleyed matrix, at least 70 percent of the visible soil particles must be masked with organic material. Viewed through a 10x or 15x hand lens. Observed without a hand lens, the surface appears to be about to 100 percent masked.

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### Problematic Hydric Soils

- Covered in Chapter 5 of the regional supplements
- Problematic hydric soils are the norm in some landscapes
  - Red Parent Material (*inhibited, or difficult to see redox features*)
  - Active floodplains (*deposition of new material*)
  - Drained systems (*relict hydric indicators*)
  - High Value (*bright*) / Low Chroma (*grey*),
    - Thick prairie soils
    - Sandy soils

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### General Procedure for Difficult Wetlands

**General Procedure:**

- Verify at least one hydric soil indicator and one primary or two secondary hydrology indicators are present
- Consider landscape position  
concave, floodplain, toe slope, flat, fringes wetland, restrictive soil layers, groundwater discharge
- Procedures outlined in Chapter 5 for type of situation
- Long-term monitoring

Use of Reference sites, aerial photography, hydrology data, climatic data important!

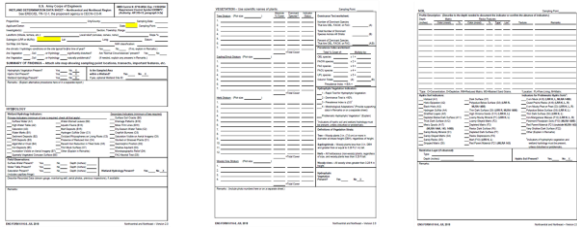
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### Procedure for Determining Problematic Soil

- Determine whether hydrophytic vegetation is present (or problematic) & hydrology indicators are present
- Describe the soil profile
- Interpret whether landscape position has potential to concentrate water
- Use one or more of the following approaches:
  - apply indicators common to problem soils (thin muck, dark surface, poly value)
  - Determine whether problematic soil situations are present (examples previously listed)
  - Soil changes when exposed to air
  - Hydrology monitoring

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### What other Data Sheet Errors do you see?



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### Questions?

[bwsr.state.mn.us/minnesota-wetland-professional-certification-program](https://bwsr.state.mn.us/minnesota-wetland-professional-certification-program)



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