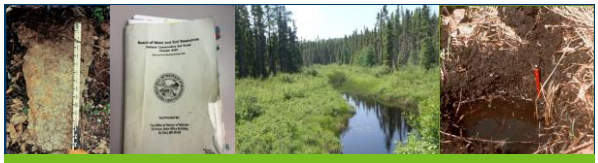
Day One



MN Wetland Professional Certification Program Basic Class

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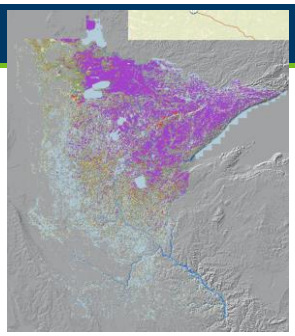
1

Intro



Minnesota Wetland Professional Certification Program

2

Class Purpose

The purpose of the MWPCP Basic Delineation and Regulation Course is to teach the fundamental subjects of wetland delineation and regulation in Minnesota. The course takes a field-based, multi-disciplinary approach to wetland science and resource management for private and public sector professionals.

Subjects covered include a comprehensive study of the 3-parameter (hydrology, vegetation, soil) approach to wetland delineation, along with their indicators and tests; wetland classification systems; wetland functions; restoration and monitoring; and wetland regulatory programs in MN with an emphasis on the basic administration of the Wetland Conservation Act including Local Government Unit duties, Technical Evaluation Panel procedures, decision types, application procedures, wetland banking, and enforcement procedures.

3

MWPCP CORE CURRICULUM

1) **Wetland Conservation Act (WCA)**- MN Rule Chapter 8420 and underlying Statutes, Agency Guidance
2) **Purpose**- No net loss; increase quantity, quality & biological diversity: avoid, minimize, replace
3) **Scope**- What WCA Regulates & does NOT regulate
4) **Other Regulatory Programs**- Section 404 of the Clean Water Act, MN Public Waters Program, NRCS Swampbuster
5) **Local Government Unit (LGU)**-Determining the LGU & LGU Duties
6) **Technical Evaluation Panel (TEP)**- TEP members, procedures, meetings, recommendations, and findings of fact.
7) **Critical Definitions**- Important WCA and delineation manual definitions
8) **Wetland Classification Systems**-Circular 39, Cowardin, Eggers & Reed, Hydrogeomorphic method
9) **Wetland Ecology & Functional Assessment**- Understanding wetland functions and values, assessment methods
10) **Wetland Delineation**- USACE 1987 Manual and Regional Supplements & guidance documents
    a) **Vegetation**- Plant ID, plant communities, definition of a hydrophyte, National Wetland Plant List, plant indicator status, determining hydrophytic vegetation, problematic vegetation
    b) **Soil**- Definition of hydric soil, key physical properties, textural divisions, Web Soil Survey, Field Indicators of Hydric Soils
    c) **Hydrology** - Hydrology technical standard, hydrology indicators, antecedent precipitation, offsite aerial imagery review
11) **Application Procedures**- General WCA application requirements, determining a complete application, file management
12) **Noticing Requirements**- Notice of Application, Notice of Decision, timelines
13) **Boundary and Type Applications**- Required report components, site review
14) **No-Loss Criteria**- Activities with no permanent loss or impact to wetlands
15) **Exemption Standards**- Impacts to wetlands that do not require replacement
16) **Replacement plans**- Purpose & requirement, application requirements, approval conditions, special considerations, sequencing, replacement standards
17) **Wetland Banking** – Purpose, bank types, actions eligible for credit, establishing a wetland bank, restoration construction methods, certification and deposit of credits, replacement for public road projects, monitoring and corrective actions, withdrawals and transfers
18) **Enforcement & Appeals**- Enforcement procedures, Agency Roles in violations, restoration methods, voluntary restorations, appeal process

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Basic Agenda

Monday

- 3 Parameters, Wetland Function, Delineation Methods, Classification Systems, Critical Definitions, Hydrology Indicators, Data Sheet Field Exercise

Tuesday

- Quiz 1, Offsite Resources and Hydrology Methods, Soil Concepts, Hydric Soil Indicators, Web Soil Survey, Antecedent Precipitation, Soil Texture Lab, Soil profile description field exercise

Wednesday

- Quiz 2, Intro to Regulatory Programs, LGU Duties, Technical Evaluation Panel, WCA Application Procedures, Wetland Vegetation, Vegetation Field Plots Exercise

Thursday

- Quiz 3, WCA Basic Decision Types, Replacement Plans, Wetland Banks, Altered Hydrology and Wetland Restoration, Monitoring and Functional Assessments, Small Group delineation Field Exercise

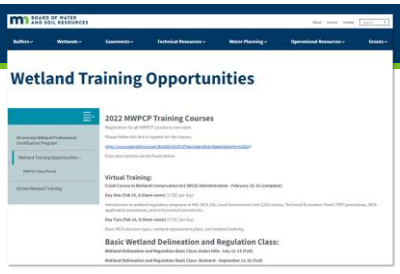
Friday

- WCA Enforcement, Submitting Delineations, Course Summary & Quiz

- MWPCP Professional Exams

5

Resources



- https://bwsr.state.mn.us/wetland-training-opportunities

6

Resources

MWPCP Class Portal

7

Pop Quiz

According to the 2019 Minnesota update of the National Wetland Inventory, how many acres of wetlands are in MN?

A) 6.3 million acres

B) 10.5 million acres

C) 12.2 million acres

D) 24.4 million acres

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Science first, then apply policy

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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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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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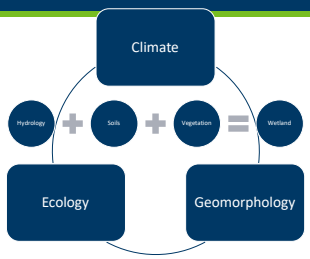
Key factors

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



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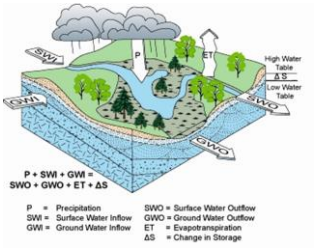
Hydrology



- Inputs
  - Precipitation
  - Surface water inflow
  - Groundwater inflow
- Outputs
  - Surface water outflow
  - Groundwater outflow
  - Evapotranspiration

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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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Soil

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

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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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Hydric Soil Indicators

Based on key physical properties: color & texture

And the depth & thickness where they are found

20

Vegetation

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

Wetland Indicator Status	Definition
Obligate Wetland (OBL)	Almost always occur in wetlands
Faculative Wetland (FACW)	Usually occur in wetlands, but may occur in non-wetlands
Faculative (FAC)	Occur in wetlands and non-wetlands
Faculative Upland (FACU)	Usually occur in non-wetlands, but may in occur in wetlands
Obligate Upland (UPL)	Almost never occur in wetlands

https://wetland-plants.sec.usace.army.mil/nwpl_static/v34/home/home.html

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Hydrophytes

Adaptations to saturated environment:

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

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Dominance Tests

Methods to determine dominance of hydrophytic vegetation:

- Rapid test
- Dominance test (50/20)
- Prevalence Index
- Morphologic adaptations

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Rapid Test Example

Hydrophytic Vegetation?

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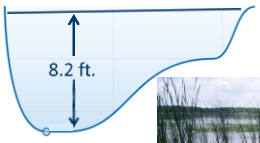
Limits of wetland (depth)- Deepwater Habitat

Important Considerations for Wetlands

- Must be capable of supporting rooted, emergent vegetation.
- Must have soil.

If the water is too deep or fast flowing, cannot support rooted vegetation and soil cannot form (unconsolidated bottom).



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Quiz

- What are the three parameters that define a wetland?

Hydrology + Vegetation + Soil = Wetland

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Wetland Functions

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BWSR Wetland Section | www.bwsr.state.mn.us/wetlands

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Wetland Functions & Values

Wetland Functions: in scientific assessments means natural processes

Wetland Value: wetland goods and services providing monetary or social welfare benefit.

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Values

Food Production

Wild Rice

Cranberries

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Values

More than a billion people make a living from wetlands across the world.

- Fishing
- Eco-tourism
- Farming
- Drinking water

Source: www.worldwildlife.org
Photos: www.ramsar.org

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Values

Recreation, Aesthetics, Education

31

Values

Hunting, Fishing, Bird watching, photography

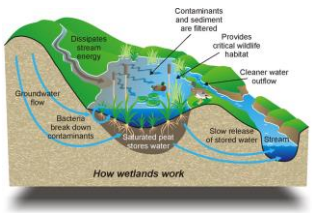
www.nps.org

Mud Duck Boats

32

Wetland Functions

- Act as a natural "filter" to maintain water quality
- Facilitates infiltration recharging groundwater
- Stabilize base flow
- Decreases fluid velocity during high flow events which decreases turbidity
- Storm water retention (i.e. storage)
- Provides habitat
- Shoreline protection



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Functions

Water Quality

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Functions

Floodwater Retention

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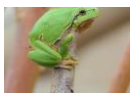
Functions

Habitat

- Many insects, reptiles and amphibians rely on wetlands to complete their life cycle.
- Some mammals are semi-aquatic: beavers, muskrat, mink, otters.
- Many birds feed and nest in wetlands.
- Fish rely on wetlands for breeding, feeding and shelter.



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Functions

Sediment Trap

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Functions

Groundwater Recharge

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Functions

Carbon Storage

Although wetlands only account for 5-8% of earths terrestrial landscape they may provide carbon sinks of about 300 to 700 billion tons of carbon. Peatland wetlands make up the majority of carbon sinks.

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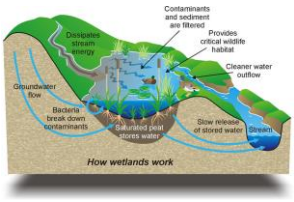
Review

- Functions- natural processes
  - Water quality, flood retention, habitat, groundwater recharge, carbon storage
- Values- provide monetary or social welfare benefit
  - Wild rice, recreation, education, aesthetics, fishing



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Basic Overview of Wetland Delineation

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3-Parameter/ Indicator Approach

1. **Soils** –Longest term evidence, Historic conditions, may not reflect current condition.
2. **Hydrology** –Current condition, shortest term evidence but heavily influenced by recent climate conditions
3. **Vegetation** – Somewhere between

The 87 Manual requires 3 parameters because no one source typically gives the answer in all situations

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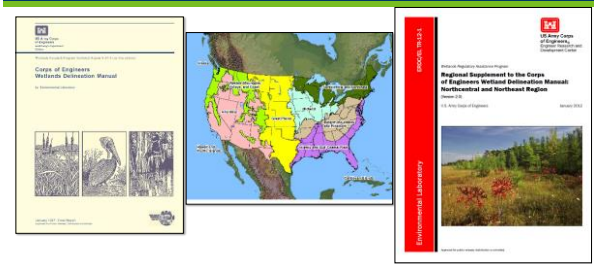
87 Manual and Regional Supplements



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Wetland Delineation Types

Routine – Qualitative Data
- Indicator based (veg, soil, hydro)
- Representative sample points
- Estimate and interpret data
- 3-Types of delineations

Comprehensive – Quantitative Data
- Systematic sampling
- Precise measurements

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Wetland Delineation Types

ROUTINE

Level 1 - Onsite Inspection Unnecessary

Level 2 - Onsite Inspection Necessary

Level 3 - Combination of Levels 1 and 2

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Wetland Delineation Types

Routine Level 1

Use when exact wetland boundary **not necessary**

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Routine Level 1

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Routine Level 1

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Routine Level 1

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Routine Level 1 Examples

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Wetland Delineation Types

Routine Level 2

- Use when an accurate boundary is critical
- Need a formal boundary approval
- Most used and focus of class

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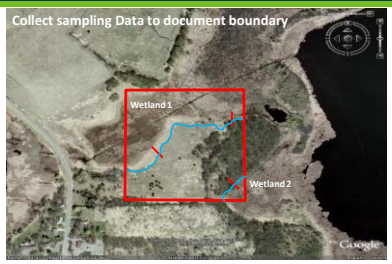
Routine 2



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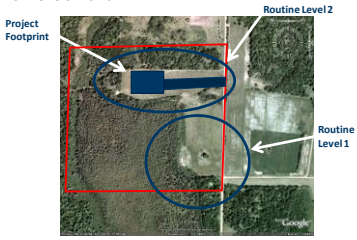
Routine Level 3

Combination of Levels 1 and 2



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Routine Level 3

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Wetland Delineation Types

Comprehensive Delineation Method

- Complex, requiring rigorous documentation and coordination
- Quantitative Measurements of:
  - Hydrology
  - Vegetation
  - Soils
- Combine with other methods

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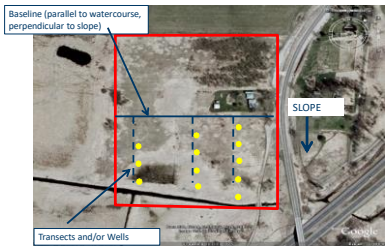
Comprehensive Delineation



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Guidance

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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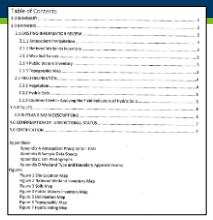
Routine Level 2 Process



1. Research data sources
   - Know site before visit
   - Saves time and effort
2. Field visit and data collection
   - Data collection
   - Preponderance of evidence
3. Delineate wetland boundary
   - Document indicators of wetland/non-wetland decision
   - Only after multiple informal observations

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Offsite Resources = Data Sources

- Aerial Photos (current and historic)
- Soil map (Web Soil Survey)
- Topographic\LiDAR
- NWI Map (updated)
- DNR Public Waters Map

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Routine Level 2 Process

- **Field Visit and Data Collection**
- Use preliminary map to make a plan
- Recon site and make informal observations and samples
- Make notes about general characteristics
  - Plant Communities
  - Topographic changes-Landscape position
  - Changes in soils
  - Precipitation conditions (wet-dry)
  - Data collection/data sheets
- Delineate Wetland Boundary

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Field Equipment

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Sample Points

1. Top section of data sheet
   - Documents sample location and landscape setting
   - Site conditions Wet-Dry

2. Vegetation
   - ID species to determine if plant community is hydrophytic
   - Record comments on changes in vegetation

3. Soil
   - Describe soil and determine if it is hydric
   - Record comments on changes in soil

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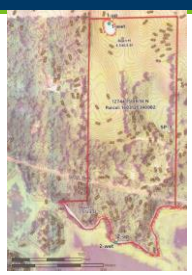
Sample Points

4. Topography
   - Record changes in topography
     - Abrupt
     - Gradual
     - Geomorphic position

5. Other notable remarks and observations
   - Basis for delineation line (sharp topo/veg break)
   - Hydrology inputs and outputs



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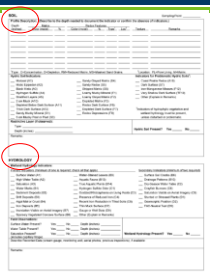
It's all about the documentation!



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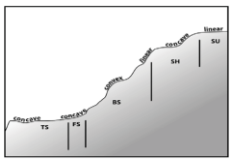
It's all about the documentation!



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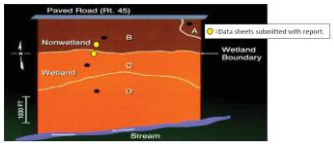
Sampling Location Should Be Representative

- 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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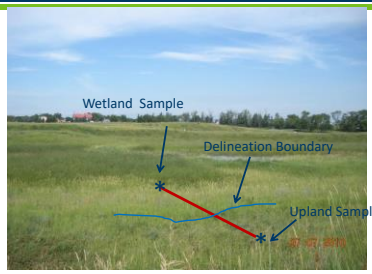
Routine Level 2 Sampling Transects



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Sample location is important!

Good data collection cannot compensate for poor sampling location choices.

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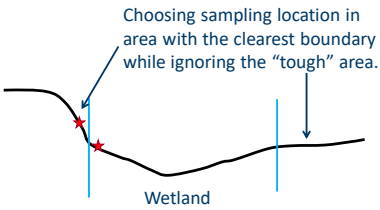
Common Errors – The "safe" approach



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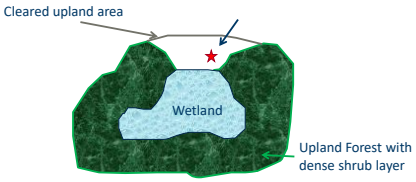
Common Errors – The "lazy" approach

Choosing sampling location in most accessible location while ignoring the dominant transition area



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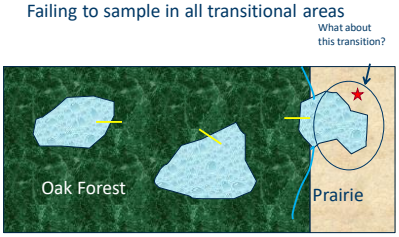
Common Errors – The "anti-community" approach

Failing to sample in all transitional areas



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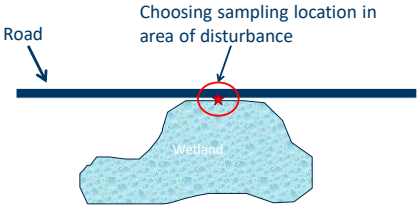
Common Errors – The "disturbed" approach



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Make a Plan:

- Examining your offsite mapping before heading to the field.
- Do an initial site reconnaissance before settling on a sampling location.
- In tough areas, do "preliminary" sampling to help determine where you should do your "official" representative sampling (i.e. full data sheets).

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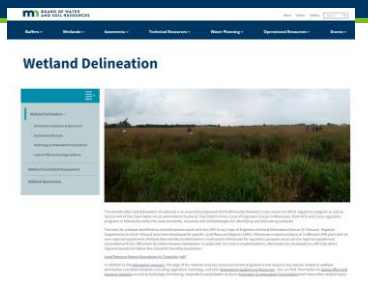
Guidance

BWSR Wetland Delineation page



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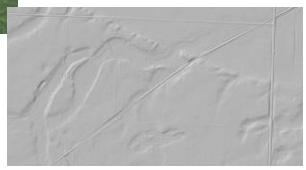
Level One Delineation Exercise



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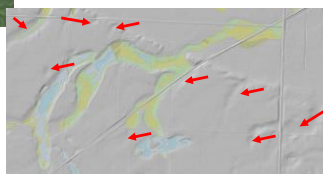
Level One Delineation Exercise



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Wetland Classification Systems

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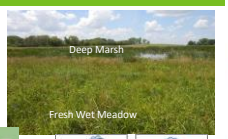
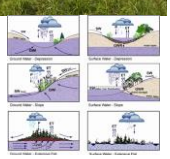
Wetland Classification Systems in MN

- Circular 39
- Cowardin et al.
- Eggers & Reed
- Hydrogeomorphic Method





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Why Classify Wetlands?

- To establish a consistent organizational structure for:
  - Understanding functions
  - Inventory/mapping
  - Scientific study and tracking
  - Regulation

Most systems use

- Vegetation (emergent or forested?)
- Hydrology (standing water or saturation?)
- Water depth (6 inches or 3 feet?)

Some use

- hydrologic source (surface or groundwater fed)
- geomorphic position (position on the landscape).

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Wetland Classification Systems

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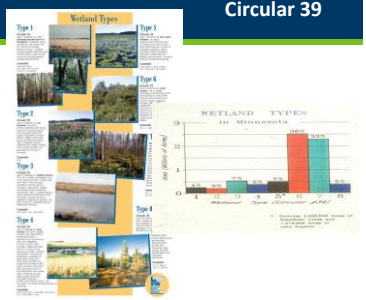
Circular 39

Developed in 1956 for wildlife habitat (waterfowl)

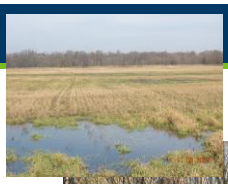
Used in Minnesota Wetland Conservation Act

Based on hydrology and vegetation
let's also apply landscape position



81

Type 1



Seasonally flooded basins

Landscape position: depressional basins, floodplains

Hydrology: Seasonally Flooded, dry for much of growing season

Vegetation: Highly Variable plant communities

82

Type 2

Inland fresh meadow

Landscape position: depressions, lake fringes

Hydrology: saturated, without standing water for most of the growing season

Vegetation: grasses, sedges, rushes, or broadleaf plants

83

Type 3

Inland shallow marshes

Landscape position: lake fringe, seep areas of on irrigated land

Hydrology: flooded up to 6” in depth

Vegetation: Grasses, bulrushes, cattails, arrowhead

84

Type 4

Deep marsh

Landscape position: shallow basins, lake fringe

Hydrology: 6" to 3' of near permanent surface water with open water components

Vegetation: Cattails, reeds, spike rush, bulrushes, pondweeds, duckweeds, water lilies, wild rice

85

Type 5

Inland open water

Landscape position: shallow basins, lake fringe

Hydrology: <6' deep

Vegetation: pondweeds, water milfoils, fringed by emergent vegetation

86

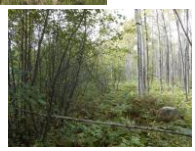
Type 6

Shrub swamps

Landscape position: sloped, along river and lake fringes

Hydrology: Saturation with seasonal shallow inundation

Vegetation: Shrub swamps dominated with willow, dogwood and alder as well as grasses/forbs.



87

Type 7

Wooded swamps

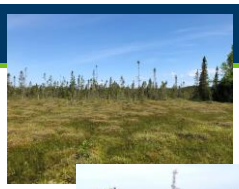
Landscape position: mineral flats, sloped

Hydrology: saturated with seasonal inundation for short periods

Vegetation: Forested, often dominated with tamarack, black ash, spruce, red maple, balsam fir, cedar

88

Type 8



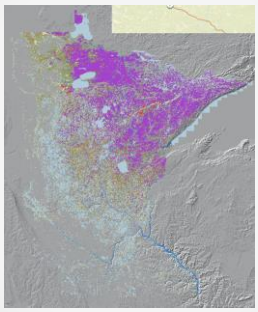
Bogs

Landscape Position: organic flats, lake fringe

Hydrology: permanently saturated

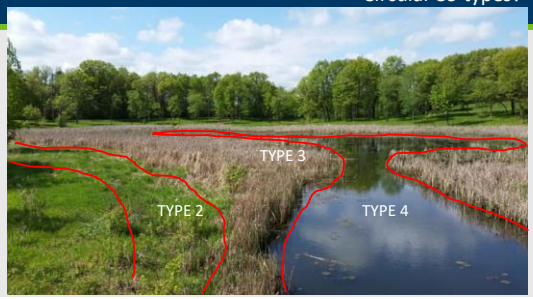
Vegetation: Herbaceous strata dominated by sphagnum moss, leatherleaf, Labrador tea, sedges, black spruce and tamarack trees

89



90

Circular 39 types?



91

Cowardin Classification System

- Created in 1979
- Includes wetlands and other aquatic habitats (streams, lakes, etc.)
- Used for NWI maps
- Nationwide system

92

Cowardin System

Hierarchy uses symbols to describe System, Class, plant community, hydrology and modifiers

Examples of common symbols:

Systems:
P = Palustrine, L= Lacustrine, R = Riverine

Palustrine Classes:
EM = Emergent, SS = Scrub shrub, FO = Forested

Plant Community:
EM: Persistent=1, Non persistent=2
SS & FO: Broad-leaved deciduous=1, Needle-leave deciduous= 2, Broad-leaved evergreen=3, Needle-leaved evergreen=4

Water regime modifiers:
A = Temporarily Flooded, B= Seasonally Saturated, C = Seasonally flooded, D= Continuously Saturated, F=semi-permanently flooded, G=Intermittently Exposed, H=permanently flooded

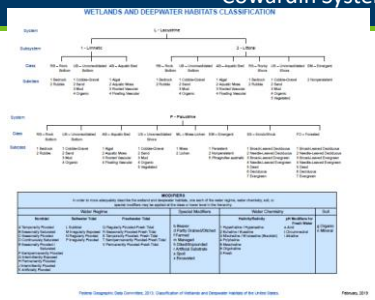
Special Modifiers:
b = Beaver, d = Partially Drained/Ditched, f = Farmed, x = Excavated

93

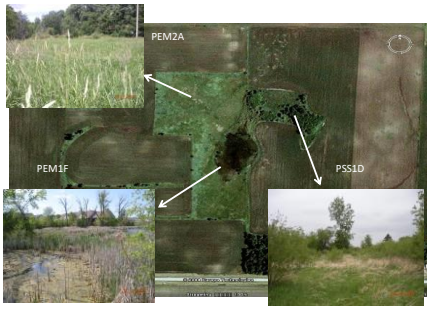
Cowardin System - NWI

94

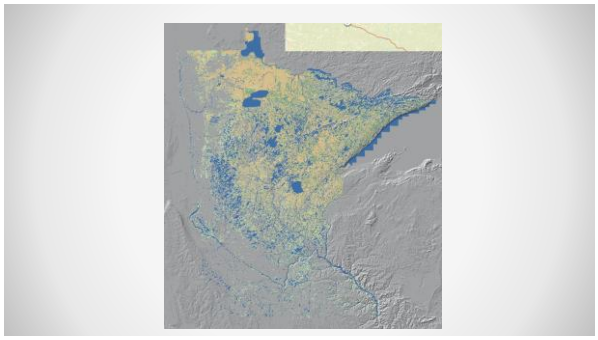
Cowardin System - NWI



95



96

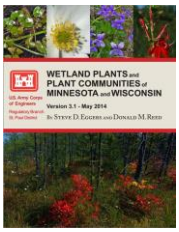


97

Eggers & Reed Classification System

Primarily based on plant communities, but includes "typical" associated hydrologic regimes

- **Shallow, Open Water**
- **Deep Marsh**
- **Shallow Marsh**
- **Sedge Meadow**
- **Fresh (Wet) Meadow**
- **Wet/Wet-Mesic Prairie**
- **Calcareous Fen**
- **Open Bog/Coniferous Bog**
- **Shrub-Carr/Alder Thicket**
- **Hardwood Swamp/Coniferous Swamp**
- **Floodplain Forest**
- **Seasonally Flooded Basin**



98

Eggers & Reed Classification System

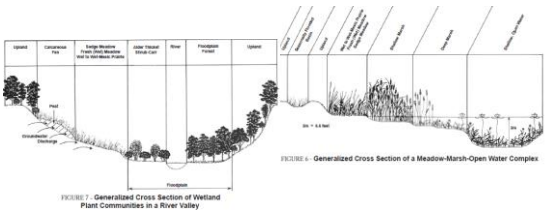


FIGURE 7 - Generalized Cross Section of Wetland Plant Communities in a River Valley

FIGURE 6 - Generalized Cross Section of a Meadow-Marsh-Open Water Complex

99

Shallow, Open Water

Hydrology: **permanently inundated,** Water depths less than 8.2 feet (2.5 meters)

Vegetation: Dominated by submergent, floating and floating-leaved species

100

Deep Marshes

Hydrology: **semi-permanently inundated** by 6 inches to 3 feet or more of water during the growing season

Vegetation: Dominated by herbaceous emergent, submergent, floating and floating-leaved species

101

Shallow Marshes

Hydrology: Soils saturated to the surface to inundated up to 6 inches of water for a significant portion of most growing seasons

Vegetation: Wild rice, reed canary grass and bur reed

102

Fresh (Wet) Meadows

Hydrology: Water table often drop below 12 inches after early portion of growing season

Vegetation: Dominated by grasses, such as reed canary grass and redtop, and/or forbs such as giant goldenrod and marsh aster

103

Sedge Meadows

Hydrology: Saturated soils most of the growing season.

Vegetation: Dominated by sedges, primarily *Carex,* but also woolgrass and other sedge family members, Canada blue-joint grass may be subdominant, can have floating mat (Sedge Mat) when fringing deeper hydrologic regimes

104

Wet to Wet-Mesic Prairies

- Hydrology: Saturated soils most of the growing season
- Vegetation: Dominated by native prairie grasses, often with a rich diversity of hydrophytic prairie forbs such as Prairie cord-grass, big bluestem, gayfeather, green bulrush, mountain mint, sawtooth sunflower, New England aster, white lady-slipper, etc.

105

Seasonally Flooded Basins

Hydrology: seasonally flooded, Typically ponded for a few weeks early in the growing season then drying out

Vegetation: Mudflats left by receding water are colonized by annuals such as smartweeds

Condition shown is in May -- cropped corn field. By mid- to late growing season, annual species such as wild millet (FACW) and smartweeds (FACW-OBL) would dominate

106

Shrub-Carr and Alder Thickets

Hydrology: saturated to seasonally flooded

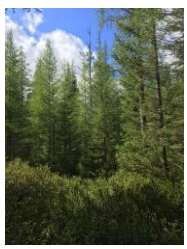
Vegetation: Native willows, dogwoods and/or alders dominate. Disturbed sites may have non-native buckthorns.

107

Hardwood and Coniferous Swamps

Hydrology: saturated, may be seasonally inundated

Vegetation: Black Ash, Tamarack/Black Spruce, no continuous sphagnum moss



108

Calcareous Fens

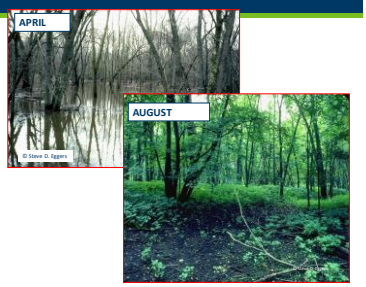
- Hydrology: upwelling groundwater discharge continuously saturates organic soils, Specific soil and water chemistry (CaCo)
- Vegetation: Rarest wetland type in MN. Supports disproportionate number of T & E species: sterile sedge, beaked spikerush, hardstem bulrush, Grass of Parnassus, Kalm's lobelia, white lady-slipper, Riddell's goldenrod

109

Floodplain Forests

Hydrology: seasonally inundated, relatively well-drained for most of the growing season

Vegetation: silver maple, American elm, river birch, green ash, black willow, box elder, eastern cottonwood



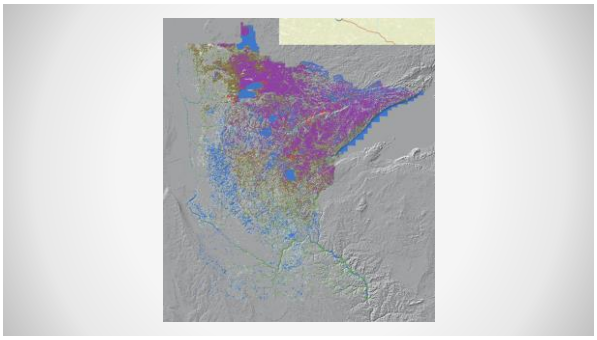
110

Open and Coniferous Bogs

Hydrology: saturated, with acidic, peat soils low in nutrients

Vegetation: tamarack, black spruce, continuous mat of *Sphagnum* moss, bog sedge, wire-grass sedge, cottongrass, leatherleaf, labrador tea and unique flora not found in any other habitat. Many orchid species.

111



112

Eggers & Reed?

113

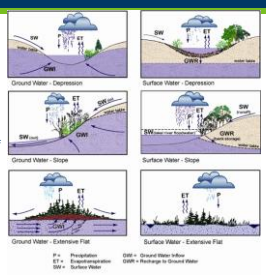
Hydrogeomorphic Method

Assesses functional conditions of a specific wetland referenced to data collected from wetlands across a range of physical conditions

- Developed by Brinson (1993), modified by Smith et al. (1995)
- Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the NRCS (2008 NRCS Technical Note No. 190-8-76)

Established Classes based on geomorphic, hydrology and hydraulic functions of palustrine wetlands

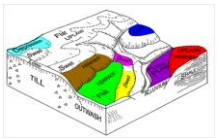
- RIVERINE, DEPRESSIONAL, SLOPE, MINERAL SOIL FLATS, ORGANIC SOIL FLATS, ESTUARINE FRINGE, LACUSTRINE FRINGE



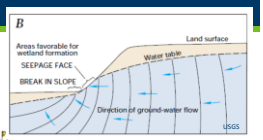
114

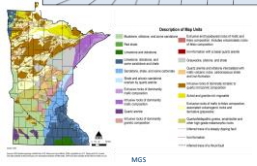
Parameters of HGM

- Geomorphology- landscape position
- Hydrology- water source and output
- Hydraulics- hydrodynamics



USGS

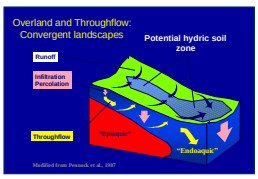


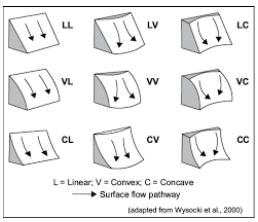

MGS

115

Landscape Position- surface shape

- Convex- surface curves outward
- Concave- surface curves inward
- Linear- flat, one-dimensional surface



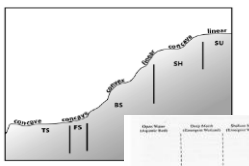


116

Landscape Position- slope processes

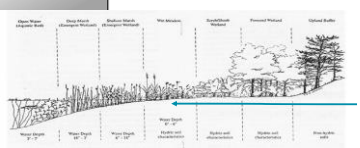
Landscape position:

- Summit
- Shoulder
- Backslope
- Foot slope
- Toe slope



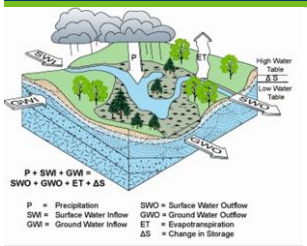
Slope processes:

- Erosional- summit, shoulder, backslope
- Depositional- foot slope, toe slope



117

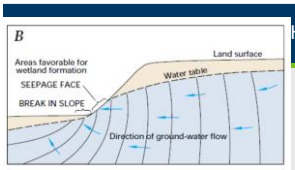
Hydrology



- Inputs
  - Precipitation
  - Surface water inflow
  - Groundwater inflow
- Outputs
  - Surface water outflow
  - Groundwater outflow
  - Evapotranspiration

118

Hydraulics- how water moves



- Uni-directional
- Bi-directional
  - Estuarine and lacustrine fringe

119

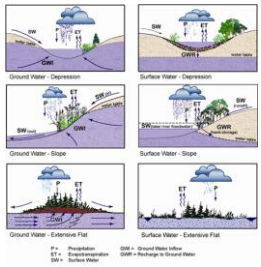
HGM Classes

- RIVERINE
- DEPRESSIONAL
- SLOPE
- MINERAL SOIL FLATS
- ORGANIC SOIL FLATS
- ESTUARINE FRINGE
- LACUSTRINE FRINGE

120

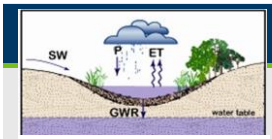
HGM Subclasses

- Influenced by:
  - Groundwater input
  - Surface water input
  - Hydrology Outputs
    - Surface
    - Ground



121

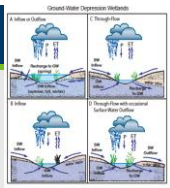
Depressional- surface



- Landscape position- concave, foot slope/toe slope, closed contours
- Hydraulics- unidirectional
- Water source- surface flow and precipitation, seasonal
- Outputs- Evapotranspiration, groundwater recharge

122

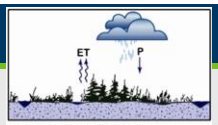
Depressional- groundwater



- Landscape position- concave, foot and toe slopes, closed contours
- Hydraulics- unidirectional
- Water source- groundwater and precipitation, *seasonal*
- Outputs- Evapotranspiration, groundwater recharge, intermittent overland flow

123

Mineral Soil Flats

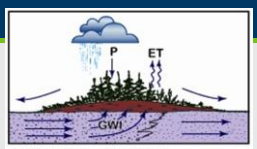


Surface Water - Extensive Flat

- Landscape position- relic land bottoms and floodplains, intergrades to multiple other classes (sloped, riverine, lacustrine)
- Hydraulics- vertical groundwater fluctuations
- Water source- precipitation, no groundwater interaction
- Outputs- evapotranspiration, saturated "seepage" flow

124

Organic Soil Flats



Ground Water - Extensive Flat

- Landscape position- summit (interfluves- broad "plateau" between drainage systems, depressions filled with organics, vertical accretion of organics
- Hydraulics- precipitation, unidirectional groundwater
- Water source- precipitation, groundwater
- Outputs- saturated overland seepage, evapotranspiration

125

Riverine

- Landscape position- floodplains and riparian corridors, often intergrade to sloped or depressional
- Hydraulics- unidirectional, surface overbank flow, groundwater, interflow (both surface and ground) from adjacent uplands
- Water source- precipitation, groundwater
- Outputs- overland surface flow (perennial flow not required), evapotranspiration

126

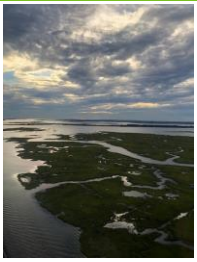
Lacustrine Fringe

- Landscape position- adjacent to lakes, toe slope, often intergrade to sloped
- Hydraulics- bidirectional (inflow from adjacent uplands and lake)
- Water source- precipitation, groundwater
- Outputs- return flow to lake, saturated surface seepage, evapotranspiration

127

Estuarine Fringe

- Landscape position- along coasts and estuaries, often intergrade to riverine
- Hydraulics- bidirectional (tidal flow)
- Water source- surface via frequent tidal flooding, precipitation
- Outputs- tidal exchange, saturated overland flow, evapotranspiration



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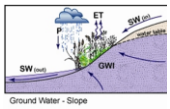
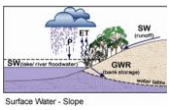
Sloped

- Landscape position- linear or convex, predominately found at foot and toe slope, can be found on back slope and shoulder slope, often intergrades to other classes (mineral flat, riverine, depression)
- Hydraulics- unidirectional
- Water source- groundwater, surface runoff, precipitation Outputs-



Ground Water - Slope



Surface Water - Slope

129

HGM Class (subclass)	Hydrology Inputs	Hydrology Outputs	Hydraulics
RIVERINE	surface flow precipitation groundwater	surface flow evapotranspiration	bidirectional (both surface and ground)
DEPRESSIONAL- surface	surface flow precipitation	groundwater recharge evapotranspiration	unidirectional
DEPRESSIONAL- ground	groundwater precipitation	intermittent surface flow evapotranspiration groundwater recharge	unidirectional
SLOPED- surface	surface flow precipitation	surface flow evapotranspiration groundwater recharge	unidirectional
SLOPED- ground	groundwater surface water precipitation	surface flow evapotranspiration	unidirectional
MINERAL SOIL FLATS	precipitation intermittent surface flow	evapotranspiration intermittent surface flow	unidirectional
ORGANIC SOIL FLATS	groundwater precipitation	intermittent surface flow Evapotranspiration	unidirectional
ESTUARINE FRINGE	surface flow tidal exchange precipitation	tidal exchange surface flow Evapotranspiration	bidirectional
LACUSTRINE FRINGE	surface flow groundwater precipitation	return flow to lake surface flow evapotranspiration	bidirectional

130

HGM?

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Mapping HGM- Depression

132

Mapping HGM- Lacustrine Fringe

133

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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

135

Hydrology Indicators

Minnesota Wetland Professional Certification Program

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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.*"

137

Hydrology Technical Standard

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

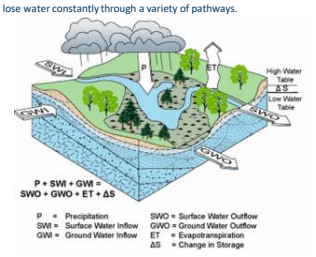
Technical standard if hydrology indicators not observed:

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

138

Hydrology

Wetlands gain and lose water constantly through a variety of pathways.

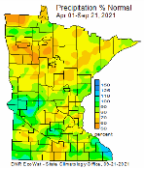


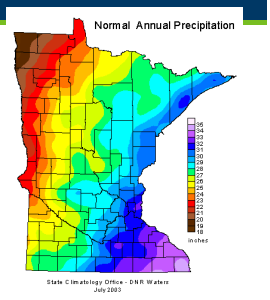
- Inputs
  - Precipitation
  - Surface water inflow
  - Groundwater inflow
- Outputs
  - Surface water outflow
  - Groundwater outflow
  - Evapotranspiration

139

Precipitation

- Average Annual precipitation varies significantly from one side of the state to the other
- A difference of 14 inches from Houston to Kittson





140

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:

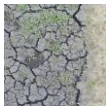
Primary – provide stand-alone evidence of a current or recent hydrologic event; and

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

141

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.

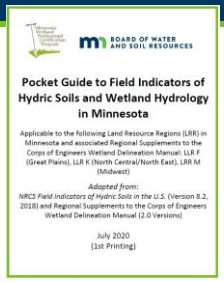
142

Land Resource Regions

Regions dictate which indicators are used and how they are used

143

Flipbook

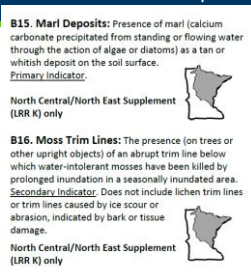


Pocket Guide to Field Indicators of Hydric Soils and Wetland Hydrology in Minnesota

Applicable to the following Land Resource Regions (LRR) in Minnesota and associated Regional Supplements to the Corps of Engineers Wetland Delineation Manual: LLR F (Great Plains), LLR K (North Central/North East), LRR M (Midwest)

Adapted from:
NRCS Field Indicators of Hydric Soils in the U.S. (Version 8.2, 2018) and Regional Supplements to the Corps of Engineers Wetland Delineation Manual (2.0 Versions)

July 2020
(1st Printing)



B15. Marl Deposits: Presence of marl (calcium carbonate precipitated from standing or flowing water through the action of algae or diatoms) as a tan or whitish deposit on the soil surface.
Primary Indicator.

North Central/North East Supplement (LRR K) only

B16. Moss Trim Lines: The presence (on trees or other upright objects) of an abrupt trim line below which water-intolerant mosses have been killed by prolonged inundation in a seasonally inundated area.
Secondary Indicator. Does not include lichen trim lines or trim lines caused by ice scour or abrasion, indicated by bark or tissue damage.

North Central/North East Supplement (LRR K) only

144

Group A Indicators

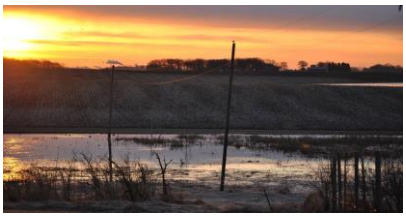
Direct observation of *water*

145

A1: Surface water

Category: Primary

Direct, visual observation of surface water during a site visit.



146

A2: High water table

Category: Primary

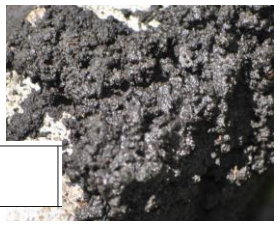
Water table 12 in. (30 cm) or less below the surface in a soil pit, auger hole, or shallow monitoring well.

147

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.



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):

*Must include water table observation.

148

Group B Indicators

Evidence of ponding or flooding – past or present

149

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.

150

B2: Sediment Deposits

Category: Primary

Sediment deposits are thin layers or coatings of fine-grained mineral material or organic matter remaining on tree bark, plant stems or leaves, rocks, and other objects after surface water recedes

151

B3: Drift Deposits

Category: Primary

Drift deposits consist of rafted debris that has been deposited on the ground surface or entangled in vegetation or other fixed objects.

152

B4: Algal mat or crust

Category: Primary

This indicator consists of a mat or dried crust of algae, perhaps mixed with other detritus, left on or near the soil surface after dewatering.

153

B5: Iron deposits

Category: Primary

General Description: This indicator consists of a thin orange or yellow crust or gel of oxidized iron on the soil surface or on objects near the surface.

154

B6: Surface soil cracks

Category: Secondary

Water destroys the soil structure which facilitates the cracking. Surface soil cracks consist of shallow cracks that form when fine-grained mineral or organic sediments dry and shrink

155

B7: Inundation on aerial imagery

Category: Primary

One or more* recent aerial photographs or satellite images that show the site to be inundated during the growing season.

* Use Off-site Guidance Methods.

156

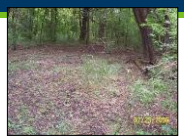
B8: Sparsely vegetated concave surface

Category: Primary. (Secondary in LRR F)

On concave land surfaces, the ground surface is either unvegetated or sparsely vegetated due to long-duration ponding during the growing season.

Sparsely vegetated concave surfaces should contrast with vegetated slopes and convex surfaces in the same area. Less than 5% ground cover.

Secondary

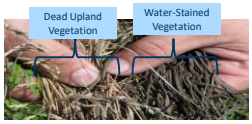


157

B9: Water-stained leaves

Category: Primary

Water-stained leaves are fallen or recumbent dead leaves that have turned grayish or blackish in color due to inundation for long periods.



158

B10: Drainage patterns

Category: Secondary

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

159

B15: Marl deposits

Category: Primary

Presence of marl on the soil surface.

Found mainly in calcareous fens, seeps, or white cedar swamps in areas underlain by limestone bedrock.

160

B16: Moss Trim Lines

Category: Secondary

Moss trim lines on trees or other upright objects in seasonally inundated areas.

Formed when water-intolerant mosses growing on tree trunks and other upright objects are killed by prolonged inundation.

161

Group C Indicators

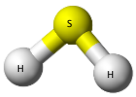
Evidence of soil saturation – past or present

162

C1: Hydrogen sulfide odor

Category: Primary

A hydrogen sulfide (rotten egg) odor within 12 in. of the soil surface.



163

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.

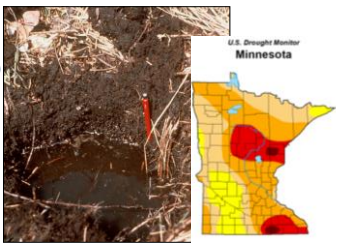
Dry Season Dates per Region:

Great Plains (F): July 1

Midwest (M): July 15

NC/NE)K): August 1

Reference: Corps of Engineers Drought Newsletter



164

C3: Oxidized rhizospheres along living roots

Category: Primary. In LRR F Secondary in tilled areas

Presence of a layer containing iron-oxide coatings or plaques on the surfaces of living roots and/or iron-oxide coatings or linings on soil pores immediately surrounding living roots within 12 inches of the soil surface.

Secondary

165

C6: Recent iron reduction in tilled soils

Category: Primary

Redox concentrations as pore linings or soft masses in the tilled surface layer of soils cultivated within the last two years.

Must be within the plow layer

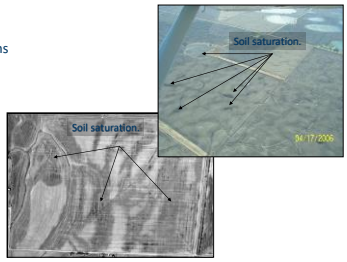
166

C9: Saturation visible on aerial imagery

Category: Secondary

One or more* recent aerial photographs or satellite images indicate 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.

* Use Off-site Guidance Methods.



167

Group D Indicators

Landscape and vegetation characteristics that indicate contemporary wet conditions

168

D1: Stunted or stressed plants

Category: Secondary

In agricultural or planted vegetation located in a depression, swale, or other topographically low area, this indicator is present if a majority of individuals of the same species* growing in the potential wetland are clearly of smaller stature, less vigorous, or stressed compared with individuals growing in nearby drier landscape situations.

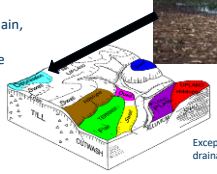
*applicable in natural plant communities.

169

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 othe water body, or in an area where groundwater discharges.



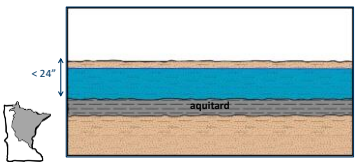
Except where a functioning drainage system exists!

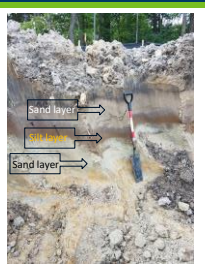
170

D3: Shallow Aquitard

Category: Secondary

Presence of an aquitard within 24 in. of the soil surface that is potentially capable of perching water within 12 in. of the surface.





171

D4: Microtopographic relief

Category: Secondary

Microtopographic features that occur in areas of seasonal inundation or shallow water tables:

- Hummocks
- Tussocks
- Flark-and-strang topography

- Microhighs < 36 in. above the base soil level

172

D5: FAC – neutral test

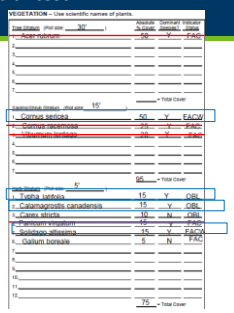
Category: Secondary

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



Does this pass?
Yes, 100% remaining species are FACW or OBL

173

Indicator D7: Frost-heave hummocks

Category: Secondary

This indicator consists of hummocky microtopography produced by frost action in saturated wetland soils.

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Hydrology Indicators

Take home message

- Wetland hydrology is dynamic
- Indicators prove current or recent evidence of hydrology
- Proof = minimum of 1 Primary or 2 Secondary
- Lack of indicator(s) does not confirm absence of wetland hydrology! CH 5 (Difficult Wetland Situations) is a "must read"

175

Hydrology Indicators?

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Critical Definitions for Wetland Delineation

177

Critical Definitions

- Wetlands
- Deepwater Aquatic Habitat
- Semipermanently and permanently flooded
- Growing Season
- Disturbed (Atypical Situations)
- Naturally Problematic (Problem Areas)
- Normal Environmental Conditions
- Normal Circumstances

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Two-Step Process

Step 1: Delineate Wetlands, if Present, Within a Site

Every Data Sheet

- Normal Circumstances?
- Normal Environmental Conditions?
- Disturbed (Atypical Situations)?
- Problem Area (Naturally Problematic)?

Step 2: Apply regulations, policy and guidance

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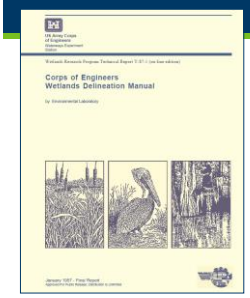
Definitions



180

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

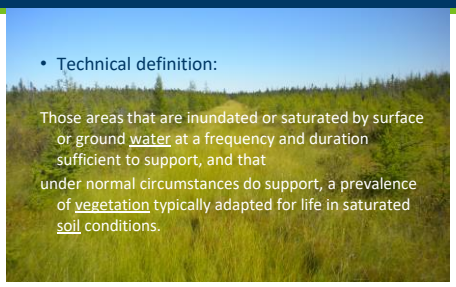
181

What is a Wetland?

"Wetlands are sometimes wet areas where people meet to argue."

Greg Larson

182



183

Deepwater Habitat

Deepwater aquatic habitats are areas that are permanently inundated at mean annual water depths >8.2 ft or permanently inundated areas less than or equal to 8.2 ft that do not support rooted-emergent or woody plant species

They have the follow diagnostic characteristics:

1) vegetation- no rooted-emergent or woody plant species are present in these permanently inundated areas

2) Soil- the sustrate technically is not defined as a soil if the mean water depth is >8.2 ft or if it will not support rooted emergent or woody plants

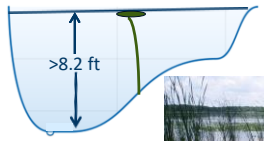
184

Limits of wetland (depth)- Deepwater Habitat

Important Considerations for Wetlands

- Must be capable of supporting rooted, emergent vegetation.
- Must have soil.

If the water is too deep or fast flowing, cannot support rooted vegetation and soil cannot form (unconsolidated bottom).



Wetland Water Depth Guidance

185

Permanently and Semipermanently flooded areas

- 2009 Rule language:
- Subp. 51. **Permanently and semipermanently flooded area of a ~~type 3, 4, or 5~~ wetland.** "Permanently and semipermanently flooded area of a ~~type 3, 4, or 5~~ wetland" means the portion of a ~~type 3, 4, or 5~~ wetland below the level where the water has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

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Permanently and Semipermanently flooded areas- Circular 39 & Eggers & Reed

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 Fens
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

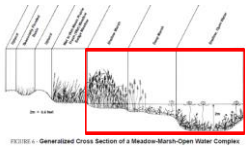

FIGURE 4 - Generalized Cross Section of a Meadow-Marsh-Open Water Complex

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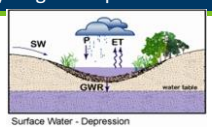
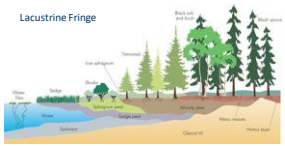
permanently and semipermanently flooded areas- Hydrogeomorphic Method

HGM Class	Typical Water Regimes
Mineral Flat	All regimes except permanently flooded (Saturated most of growing season)
Organic Flat	All regimes except permanently flooded (Saturated most of growing season)
Organic Flat	Saturated
Sloped	Saturated
Riverine	Temporary Flooded
Lacustrine Fringe	Semi permanently to permanently flooded (up to 8.2')
Depression	Seasonally Flooded
Depression	Saturated
Depression	Semi permanently flooded (up to 6")



Surface Water - Depression

Lacustrine Fringe



188

Permanently and Semipermanently Flooded areas- Cowardin

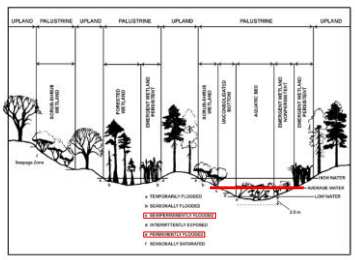


Figure 6. Distinguishing features and examples of habitats in the Palustrine System.

- Depression

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Lacustrine Fringe

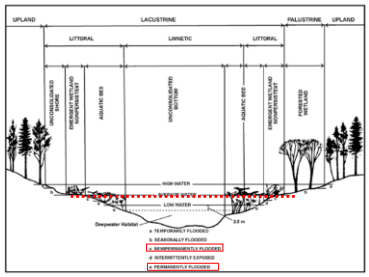

Figure 5. Distinguishing features and examples of habitats in the Lacustrine System.

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Mapping flooded areas

Nontidal

A Temporarily Flooded
B Seasonally Saturated
C Seasonally Flooded
D Continuously Saturated
E Seasonally Flooded / Saturated
F Semipermanently Flooded
G Intermittently Exposed
H Permanently Flooded
J Intermittently Flooded
K Artificially Flooded

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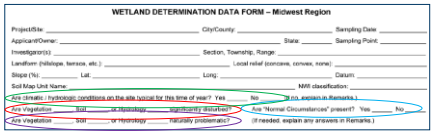
Data Sheets



WETLAND DETERMINATION DATA FORM – Midwest 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 (%): _____ 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.)

192

Why do we care about Growing Season?

Growing season dates are needed to:

- Evaluate and interpret certain wetland hydrology indicators
- Analyze recorded data to determine if wetland hydrology criterion is met

193

Indicators of Start of the Growing Season

1. **Soil temperature at 12 inches is 41° F. or higher**

Use a compost thermometer for each site

Research & Outreach Centers | College of Food, Agricultural and Natural Resource Sciences (umn.edu)

https://www.mda.state.mn.us/protecting/soilprotection/soiltemp

2. "Green-up" indicator

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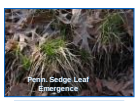
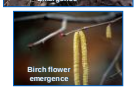
"Green-Up" Indicator for Start of Growing Season

Two or more species of non-evergreen plants show active growth in a wetland or surrounding area with similar elevation and aspect





195

Start of Growing Season

April site visit:

Two species of non-evergreen plants – reed canary grass and lake sedge – have new, green, aerial leaf/stem growth

Meets the "green-up" indicator for the start of the growing season

196

End of Growing Season

- woody deciduous species lose their leaves

and/or

- the last herbaceous plants cease flowering and their leaves die back

197

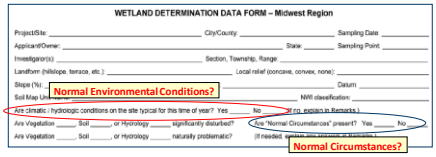
Normal Circumstance

- Those areas inundated or saturated by surface or groundwater 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

HISTORY: In early years of implementing the Section 404 regulatory program, wetland identification was based on vegetation – there were no delineation manuals/3-parameter approach. Cases arose where wetland vegetation was removed (plowed under, burned off, herbicided, etc.) in an attempt to evade wetland regulations. Corps/EPA then adopted the approach of determining whether the area in question would support dominance by wetland vegetation under normal circumstances.

198

Normal Environmental Conditions vs. Normal Circumstances



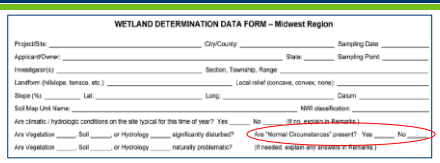
199

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

200

Normal Circumstances

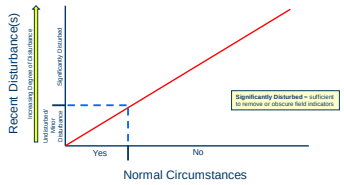


If "Yes", data collection is based on current conditions.

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

201

Relationship of Normal Circumstances and Recent Disturbance(s)



202

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

203

Not Normal Circumstances

Recent, unauthorized fill that buried natural vegetation and native soils, and altered hydrology

204

Normal Circumstances - Hydrology

Example A: Ditch legally constructed in 1950s and maintained since = ditch is established as **Normal Circumstances**. Partially drained is the normal circumstance for hydrology.

Example B: Ditch constructed last year; unauthorized side casting of fill materials in wetlands = **NOT Normal Circumstances**

205

Normal Circumstances

Authorized wetland fill meets the "extent and relative permanence test" -- establishes a new Normal Circumstance

3. Physical alteration(s) is legally established, maintained and represents the long-term condition of the site; OR is a newly-authorized physical alteration (e.g., a permitted fill, new concrete dam).....**Normal Circumstances**

206

Normal Circumstances – Soils

- **Normal plowing** (e.g., 8- to 9-inch depth) is not considered a "significant" disturbance to soils if does not remove or obscure field indicators of hydric soils
  - -- Examples: A1, A12
  - -- However, other field indictors (e.g., F8, some S indicators (sandy)) would be obscured or difficult to determine
- "Deep ripping" or other methods that disturb and mix soil layers at depths greater than normal plowing are **NOT Normal Circumstances**

207

Normal Circumstances - Vegetation

Removal of natural vegetation and replacement with a planted crop = NOT Normal Circumstances

IGNORE the planted crop for purposes of the hydrophytic vegetation determination

When natural vegetation has been removed, focus on soils and hydrology. If a site has wetland hydrology and hydric soils, it would support dominance by hydrophytes under normal circumstances.

208

Normal Circumstances - Vegetation

- Removing, manicuring, 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

209

Normal Circumstances - Vegetation

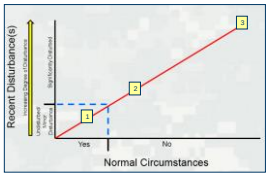
Light grazing of a sedge meadow – minor disturbance of natural vegetation = Normal Circumstances

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

210

Normal Circumstances - Vegetation

What about moderate grazing sufficient to result in a shift of the plant community to species more tolerant of grazing ("increasers") at the expense of other plant species ("decreasers")[see Table 10 in Midwest Supplement for examples]. Most cases: NOT Normal Circumstances. Follow Midwest Supplement guidance.



KEY:
1. Light Grazing – Sedge Meadow
2. Moderate Grazing
3. Overgrazed – Exposed Soils

211

Normal Circumstances - Vegetation

Natural vegetation removed and replaced by manipulated/manicured vegetation (seeding, mowing, fertilizing, selective herbicide applications) = NOT Normal Circumstances

212

Disturbed (Atypical Situations)

- **One or more parameters altered or absent due to recent human activities or natural event**

Filling, artificial drainage, stream channelization, mechanized land clearing, levee construction, mowing, cropping, plowing, logging, change in river course, high-capacity groundwater well pumping, tree farms, etc.

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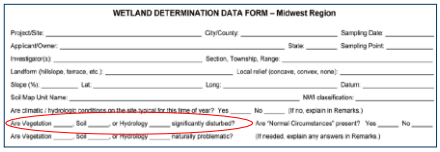
Degree of Disturbance(s)



WETLAND DETERMINATION DATA FORM – Midwest Region

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

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

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

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

Slope (%): _____ 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.)

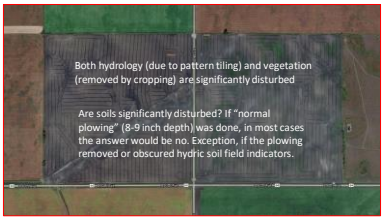
Significantly Disturbed = sufficient to remove or obscure field indicators

214

Disturbed (Atypical)

215

Disturbed (Atypical)



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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

217

Problem Areas

WETLAND DETERMINATION DATA FORM – Midwest 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 (%): _____ 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.)

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Seasonal Wetlands

219

Problem Areas

Wetlands dominated by non-hydrophytic species like white pine, a Facultative Upland species

220

Problem Areas and Normal Circumstances

- **EXAMPLE:** Vernal pools are naturally dry outside of the first few weeks of the growing season = **Normal Circumstances**

221

Problem Areas and Normal Circumstances

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 (%): _____ Lat: _____ Long: _____ Datum: _____
Soil Map Unit Name: _____ NWI classification: _____
Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No X (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
Are Vegetation _____, Soil _____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

Prairie pothole wetland in a drought year

222

Normal Circumstances?

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Top of the Data Sheet Exercise

WETLAND DETERMINATION DATA FORM – Great Plains 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:	

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