



## MN Wetland Professional Certification Program Basic Class- Day 3

**m** BOARD OF WATER AND SOIL RESOURCES



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### Quiz

**1) The Wetland Conservation Act is a:**

- a) Federal Law passed in 1972.
- b) State Rule, passed as a bipartisan bill passed in 1991, implemented by Local Government Units.
- c) State Rule, passed in 1991, which is administered by the MNDNR.
- d) Recommended set of best management practices for activities in wetlands.

**2) The Wetland Conservation Act regulates activities:**

- a) In all areas which have wetland characteristics and meet the technical criteria.
- b) In Public Waters and Public Water Wetlands.
- c) In wetlands used in normal farming practices that does not result in the draining of the wetland.
- d) That result in the draining or filling of all wetland types.

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**3) Which Agency has administrative oversight and Rulemaking authority for the WCA?**

- a) Local Government Units
- b) MN Board of Water and Soil Resources
- c) MN Department of Natural Resources
- d) Local Soil & Water Conservation Districts

**4) Which of the following soil textures has the greatest percentage of sand?**

- a) Sandy clay loam
- b) Loamy fine sand
- c) Loam
- d) Fine sandy loam

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**5) For the following description of a soil layer, what is the value of the matrix?**

0– 10" 10YR 3/2 with 2% 7.5YR 4/6 concentrations

- a) 6
- b) 4
- c) 3
- d) 10

**6) Which of the following is true regarding hydric soil indicators?**

- a) The final version is located in the regional supplements
- b) Their applicability varies by region
- c) They all require the presence of iron in the soil
- d) They can all be assessed within 2 feet of the soil surface

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**7) Circle the three processes that normally occur in a soil when it is saturated for an extended period?**

- a) It becomes aerobic
- b) It becomes anaerobic
- c) Iron becomes reduced
- d) It becomes a wetland
- e) Organic matter accumulates

**8) The hydric soil indicators A, F, and S are used for what soil types. Use the table below.**

Indicator	Soils
A	All Soils
F	Loamy Soils
S	Sandy Soils

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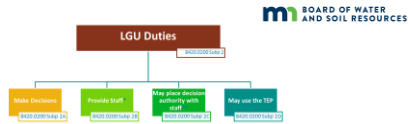
9) Which of the following is not used in identifying Hydric Soil Indicators:

- a) Land Resource Region
- b) Soil textures
- c) Soil colors
- d) Flood frequency >25%

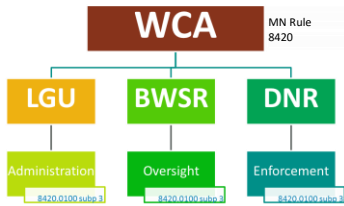
10) What are some of off-site data sources you would examine prior to a wetland delineation?

- NWI
- Soil
- Topographic
- Current and historic aerial photos
- PWI
- Past Delineations

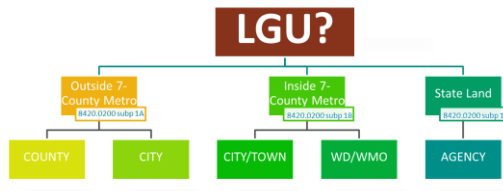
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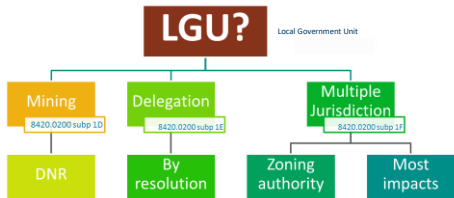
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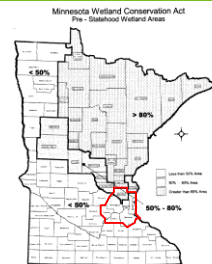
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- Outside the 7-County Metro area – County or City
- Inside 7-County Metro – City, town, or WMO



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### Who is the LGU (cont.)

- In 7-County Metro, watershed plan will indicate LGU, but lacking an indication, LGU must be City or town.
- For activities on State land, the LGU is the State agency with administrative responsibility for the land (e.g. DNR, MnDOT). However, State agencies must coordinate with LGU that would otherwise have jurisdiction.

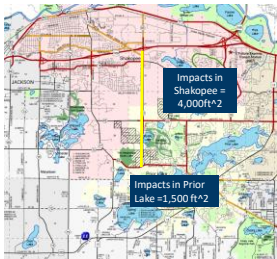
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### Who is the LGU (cont.)

- LGU's can delegate some or all of their authority to another entity provided that both parties pass resolutions (see BWSR website for example resolutions).
- If project overlaps LGU jurisdiction, then the LGU is:
  - One with zoning authority over the project
  - If both have zoning authority, then the one in which the most impact occur.
  - Both LGUs can maintain separate jurisdiction if agreed upon.

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### Example



Scenario 1 – Shakopee delegates duties to PL but is still noticed and comments. Prior Lake responsible for LGU duties.  
 Scenario 2 – Per rule (most impact) Shakopee reviews entire application and is responsible for LGU duties  
 Scenario 3 – Cities agree that both review and approve application within their respective jurisdictions, and both administer LGU duties. Result: two applications.

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### Who defines a project?

#### The LGU defines the project

Definition of “project” (8420.0111 Subp. 54):

Project means a specific plan, contiguous activity, proposal, or design necessary to accomplish a goal as defined by a local government unit. As used in this chapter, a project may not be split into components or phases for the purpose of gaining additional exemptions.

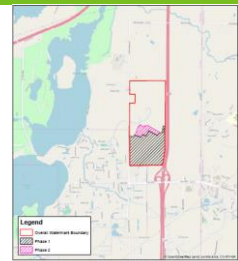


Figure 1 - Site Location

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### LGU List

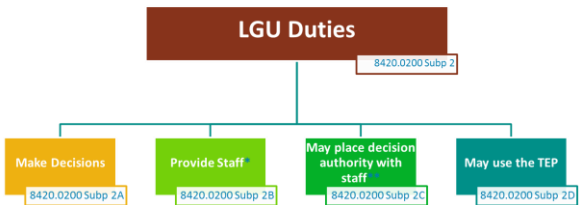
#### WCA Contacts

City/Town	Contact Name	Phone	Email
...	...	...	...

City/Town	Address	Phone	Website
...	...	...	...

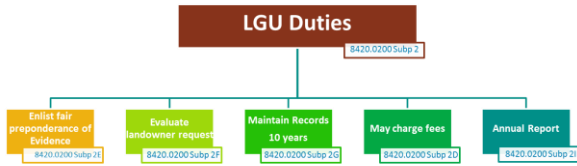
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### LGU Duties



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### LGU Duties, cont.



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### Delegation of Decision-Making Authority to Staff

- Decision authority by default rests with the elected/appointed governing board (City Council, County Board, WMO Board, etc.)
- However, the LGU *may, through resolution, rule, or ordinance*, place decision-making authority with staff according to procedures it establishes.

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### Failure to Apply Law

If the LGU is not following WCA:

- 1) BWSR notify LGU in writing of its concerns
- 2) Spot Checks, PRAP, Audits
- 3) Can then impose moratorium on making decisions

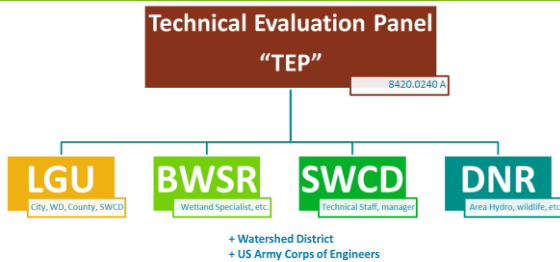
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### Local Wetland Ordinances

- WCA provides minimum standards
- Local governments may require more procedures and more wetland protection, but not less

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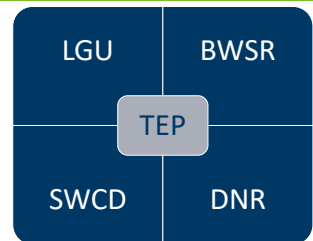
### TEP



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### Technical Evaluation Panel

- Plays a key role in implementation.
- Representative from LGU, SWCD, BWSR and DNR (if project effects public waters and/or in shoreland zone).
- Primary role is to advise LGU on decisions. Some decisions depend on TEP recommendation/concurrence.
- TEPs often advise landowners/applicants during pre and post application reviews.



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## Key Roles in WCA Implementation

- **LGU** – make WCA decisions, leads Technical Evaluation Panel
- **SWCD** – serve on TEP, write restoration plans for violation orders
- **BWSR** – serve on TEP, hear appeals, administer wetland bank, oversee and train LGUs.
- **DNR** – serve enforcement orders and coordinate/collaborate with TEP, LGU and SWCD on enforcement process.

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## TEP



A TEP



Too many people for a TEP

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## TEP Roles

- Determine technical issues
- Generates findings Document specific evidence
- Makes recommendations to LGU
- Operate objectively, clearly, concisely, and timely

**The TEP does not:**

- Make decisions
- Perform LGU duties (notices, extensions, etc.)

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## LGUs rely on the TEP to:

- Help them through the regulatory process.
- Interpret the rules and associated policies in relation to their proposal(s).
- To be fair and objective.



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## TEPs can and do operate informally

- Not subject to open meeting law.
- Field reviews.
- Open discussions.
- Healthy debates.
- Gather info.



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## When should you hold a TEP meeting?

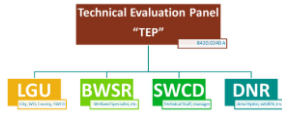
- Complex or difficult projects
- Visible, high-profile, or public projects
- LGU is applicant
- Enforcement cases
- Bank plan and monitoring report reviews
- Local Government Road Wetland Replacement Program projects



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## When is TEP required to make findings?

- Requested by LGU, landowner, or a member of TEP
- LGU extends decision timeline beyond 5 years
- Enforcement when determining whether restoration is not possible or prudent



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## TEP

### Who can Request a TEP?

- LGU
- TEP member
- Landowner



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## TEP Meetings

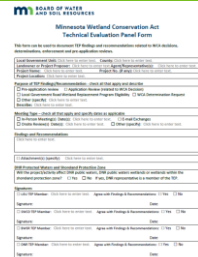
- Step 1: Define purpose of TEP discussion/review (set a formal agenda)
- Step 2: Have an open discussion (there will be disagreements)
- Step 3: Summarize and agree to conclusions (find common ground)
- Step 4: Write Findings Report (be clear and concise)



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## TEP findings & recommendations:

- Communicate the cumulative result of field visits, report reviews & informal discussions.
- Give the applicant/landowner direction on next steps (if any).
- Often provide the LGU with the basis for their decision.



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## Well-written TEP findings:

- Stand up in court/hearings involving appeals.
- Give clear direction to applicant/landowners.
- Protect the TEP from “they said this” (verbal discussions) issues.
- Are concise and *focused on the decision that needs to be made.*



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## Efficiency

There are ways to be more efficient such as:

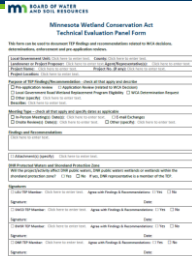
- Having a TEP findings template ready to go (see BWSR template or customize for your area).
- For pre-application situations, creating simple forms for landowners to complete that make them clarify what they are looking for from the TEP.

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## Tips on Well-Written TEP Findings

We will cover the following topics:

- Purpose & audience
- Timing
- Active voice
- Subjective language & “legal-ease”
- Relevant
- Findings vs minutes
- Honesty



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## Purpose & Audience

Know purpose and your audience. Answer the following questions before writing findings (or before even convening a TEP):

- **Who is the primary audience for the findings?** (applicant, LGU, both?)
- **What is the decision that needs to be made?** (complete application, exemption determination, delineation approval, sequencing, bank plan, etc.)

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## Timing

Only write findings when they will be **useful for the intended audience**. Think about:

- Is there enough information to say anything meaningful?
- Can I convey the information informally without composing formal TEP findings?
- Is the project controversial or contentious? (consider the landowner you are dealing with?)

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## Avoid Subjective/Emotional Lingo

~~“The TEP feels.....”~~  
~~“The TEP believes .....”~~

The TEP is supposed to use judgment, no need to soften it with “feel” and “think” and other words that indicate a subjective opinion based on emotions.

Use **alternative language** like “determined” or “in our opinion based on Rule reference ...”

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## Avoid Legal- Ease

~~“herein”~~ ~~“hereby”~~  
~~“thereto”~~ ~~“let the record show”~~

This is not a legal agreement and it is not being prepared as a court document.

Leave the legal-ease to the lawyers.

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## Findings should be *Relevant to the Decision*

For example, don’t talk about the loss of wildlife habitat due to a project if you are reviewing cropping history for an ag exemption.

Individual TEP members can provide their own comments, but they do not all have to be *part of the findings*.

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### Findings are *not* Meeting Minutes or Testimony

Minutes are for public meetings that generally involve elected officials - TEP members are not elected officials



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### TEP recommendations

- TEP may recommend approval, approval with conditions or denial
- LGU must consider TEP findings and recommendations
- TEP cannot make findings without having at least one member make a site visit
- Findings and recommendations must be endorsed by a majority of members

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### What if the LGU doesn't agree with TEP?

- The LGU must provide detailed reasons for rejecting the [TEP] finding of fact or recommendation in its record of decision; otherwise, the LGU has not sufficiently considered the TEP report.

I'm not arguing, I'm just explaining why I'm right.

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### Detailed reasons for not following TEP recommendation?

"The Board felt that the TEP's recommendation to deny the application was unreasonable and therefore we approve the application."

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### Reasons for not following TEP recommendation

"The Board finds that the TEP's recommendation to reject the application based on the availability of a reasonable and prudent alternative alignment to the proposed road (impacting less wetland) did not give due consideration to the decreased public safety associated with alternative alignments. The alternative alignments mentioned in the TEP's recommendation result in unsafe sighting distances at road intersections according to national safety standards. Therefore, the Board finds that there are no feasible and prudent alternatives and approves the application."

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## WCA Application Procedures

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## BWSR website

• [WCA Forms and Templates](#)

**2021 WCA Reporting Form**  
**2021 WCA Reporting Form with Instructions**  
 Form created and reviewed by all WCA Local Government Units and released to BWSR at [WCA\\_Reporting@state.gov](#) by February 9, 2022.

**Notice Forms**  
**WCA Notice of Application Form (WCA-NOA)** (03/22/18) and **Instructions**. This form is to be used by Local Government Unit (LGU) representatives to notify BWSR of an application for TEP review and public review. The notice of application for WCA review must be submitted to BWSR within 15 business days of receipt of a complete application for a replacement plan, exemption plan or bank plan. Exemption plans, replacement plans and bank plans do not require a notice of application, but LGUs are encouraged to provide notice of application either formally or informally to BWSR before the TEP.

**WCA Notice of Application Form (WCA-NOA)** (03/22/18) and **Instructions**. This form is to be used by LGU representatives to notify TEP members and others required to review notices of WCA decisions. WCA decisions are issued for replacement plan, bank plan, exemption and no loss. WCA only requires the LGU to have a notice of application within 15 business days of the date of decision.

**WCA Interim Notice Form (WCA-INT)** (03/22/18) and **Instructions**. This form is to be used by LGU and local Water Conservation District (WCD) representatives to notify TEP members, staff, and other interested parties of an interim decision made by the TEP. The WCA-INT form includes a form for an interim construction certification, local government road and drainage program certification, certification of successful replacement and retention, government credit rating agency, ensuring regulatory compliance, financial resources review, and other applicable and appropriate information. The form covers the full process of notifying and requesting review of interim decision results and pending certification of government and water supply.

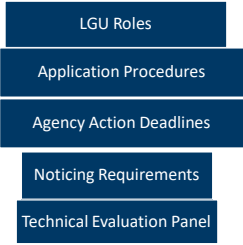
**TEP and Enforcement Forms**  
**Technical Evaluation Panel Form (TEP-TEP)** (03/22/18). This form is to be used by the TEP for department findings and recommendations. It is required in cases of the WCA. The form is typically completed by the WCD and sent to an enforcement officer.

**WCA Enforcement Order Form (WCA-EO)** (03/22/18) and **Instructions**. This form is used to order a government or responsible party to replace wetlands. It is required in cases of the WCA. The form is typically completed by the WCD and sent to an enforcement officer.

**Calculation of Statutory Basis/Deadline/Response** - see the above WCA Decision Notice Form, check the appropriate box, and add description as necessary.

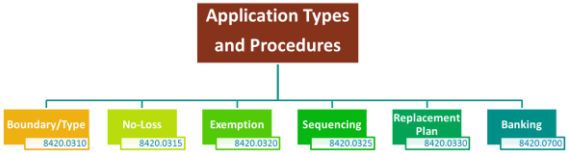
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## WCA Application Procedures



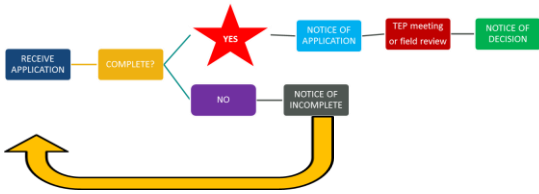
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## Application



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## Procedures and Process



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## Timelines and deadlines- MN Statute 15.99

- Determine Complete Application**
  - 15 Business days from the date of receipt (date stamp)
- Send the Notice of Application**
  - 15 Business days from date of receipt of a complete application
- Set the Comment Period**
  - MINIMUM 15 Business days from the date of sending the Notice of Application
  - Can be longer
- Make a Decision**
  - 60 Calendar days from the receipt of a complete application
  - Can extend 60 days, additional extension requires applicant approval
- Send the Notice of Decision**
  - 10 Business days from date of decision

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## Timelines

- Appeal a Decision**
  - 30 Calendar days from the date of decision
- How long is the Decision Valid?**
  - 5 Years
  - Unless longer is specified by LGU when TEP advises longer period
- How long do I (LGU) keep all this paperwork?**
  - 10 Years

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### Application

**Joint Application Form for Activities Affecting Water Resources in Minnesota**

- You should receive:
  1. A **"Joint Application"**
  2. Applicable attachment(s)
  3. Supporting documentation

**Attachment A**  
Request for Delineation Review, Wetland Type Determination, or Jurisdictional Determination

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### Is the application complete?

**Joint Application Form for Activities Affecting Water Resources in Minnesota**

- Application must contain sufficient/required information found on 1<sup>st</sup> page of application
- Consider what is being asked, where it fits in Rule, what information the Rule requires
- Local application requirements such as fees?

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### Application Review

- Use checklists/guidance
- Missing Information = Incomplete Application
- Notify applicant
  - Within 15 business days of receipt
  - Provide list of what is missing

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### It's Complete! Notice of Application

- Complete BWSR form
- Mark all decision types
- Specify comment Period (min 15 days)
- Decision time information
- Send to applicant, agent, TEP and others who requested notice

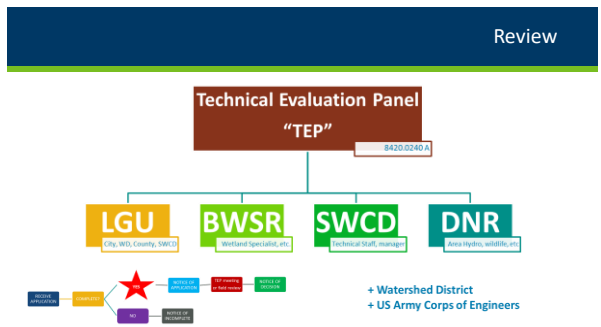
**MISSOURI WETLAND CONSERVATION ACT**  
Notice of Application

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### NOA Use

Summary of LGU Application Types		
Decision Type	NOA Required	NOD Required
Boundary or Ty	Yes	Yes
No-Loss	No	Yes
Exemption	No	Yes
Sequencing	Yes	Yes
Replacement PI	Yes	Yes
Bank Plan	Yes	Yes

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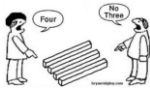


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## Summary of LGU Review Process

- Discussion (pre app meeting?),
- Review of application,
- On-site review,
- TEP meeting(s)/Rec.,
- Amendment(s)?
- more discussion.....



**\*\* Don't forget to include our Army Corps of Engineers partners!**

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## WCA Application Procedures Review

- LGU Roles
- Application Procedures
- Agency Action Deadlines
- Noticing Requirements
- Technical Evaluation Panel



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## Hydrology Indicators

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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:

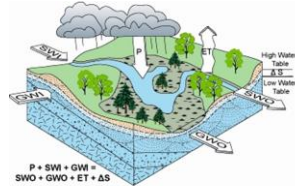
- 14 or more consecutive days of flooding or ponding;
- Water table 12 in. or less below soil surface;



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## Hydrology

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



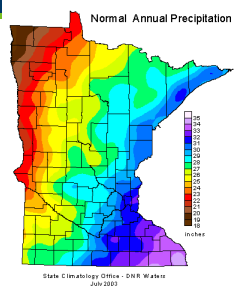
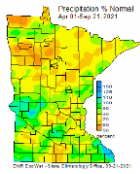
- **Inputs**
  - Precipitation
  - Surface water inflow
  - Groundwater inflow
- **Outputs**
  - Surface water outflow
  - Groundwater outflow
  - Evapotranspiration

P = Precipitation  
 SWI = Surface Water Inflow  
 GWI = Ground Water Inflow  
 SWO = Surface Water Outflow  
 GWO = Ground Water Outflow  
 ET = Evapotranspiration  
 ΔS = Change in Storage

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## Precipitation

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



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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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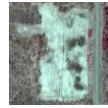
## Hydrology Indicator Groups



**Group A** – direct observation of water



**Group B** – evidence of flooding/ponding



**Group C** – evidence of current or recent saturation.

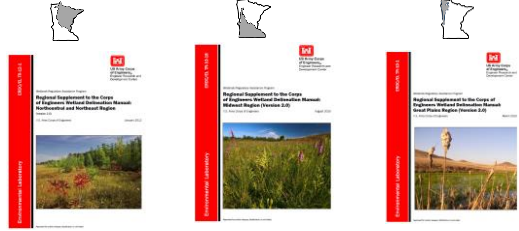


**Group D** – Landscape and veg. characteristics that indicate contemporary wetland conditions.

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## Land Resource Regions

Regions dictate which indicators are used and how they are used



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## Flipbook

**m** BOARD OF WATER AND SOIL RESOURCES

**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: LRR F (Great Plains), LRR K (North Central/North East), LRR M (Midwest)

Adapted from:  
 NRCS Field Indicators of Hydric Soils in the U.S. (Version 6.2, 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

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## Group A Indicators

Direct observation of water

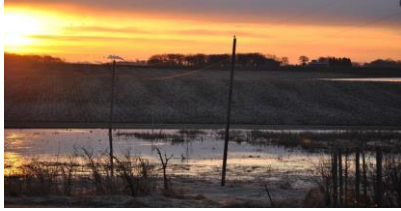


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### A1: Surface water

Category: Primary

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



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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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### 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.



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### Group B Indicators

Evidence of ponding or flooding – past or present



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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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### 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



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### 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.



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### 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.



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### 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.



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### 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



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### 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.



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### 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.

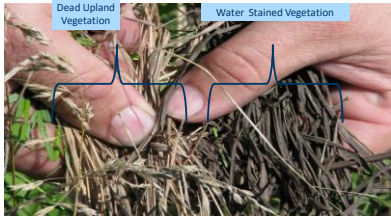


90

**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.



91

**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



92

**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.*



93

**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.



94

**Group C Indicators**

**Evidence of soil saturation – past or present**

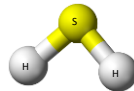


95

**C1: Hydrogen sulfide odor**

**Category:** Primary

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



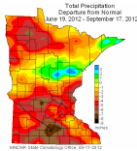
96



**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.

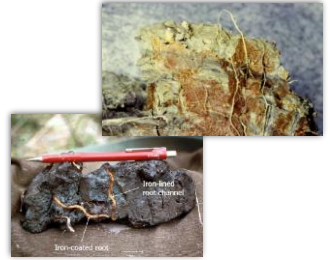


97

**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.



98

**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

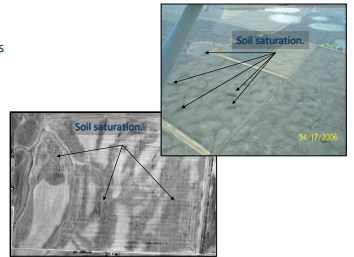


99

**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.



100

**Group D Indicators**

Landscape and vegetation characteristics that indicate contemporary wet conditions



101

**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.

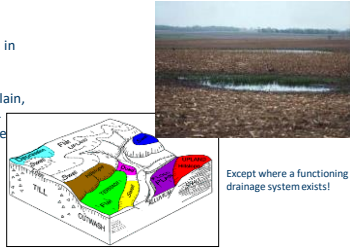


102

## 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.



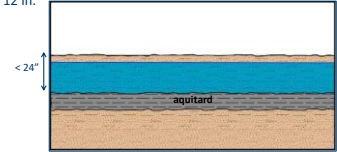
Except where a functioning drainage system exists!

103

## 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.



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## 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



105

## 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: )	0	1	total cover	
1 Andropogon gerardii	40	Y			FAC
2 Solidago gigantea	12	Y			FACW
3 Sorghus nemorosus	10	N			FACU
4 Sorghus arvensis	10	N			FACU
5 Cirium arvense	8	N			FACU
6 Phalaris arundinacea	5	N			FACW
7 Melilotus officinalis	5	N			FACU
8					
9					

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## 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"

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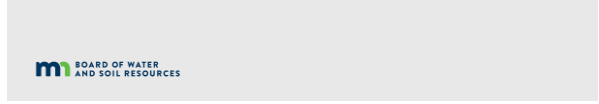
### Hydrology Indicators?



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### Interpreting Hydrology Data



110

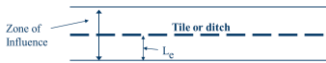
### Hydrology Data in Wetland Delineation

#### Altered Hydrology

- Lateral Effect
- Setback Tables

#### Monitoring Well Data

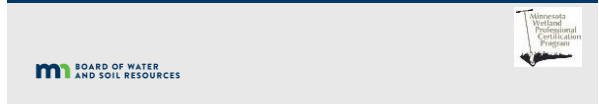
- Hydrographs



111



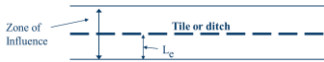
### Altered Hydrology



112

### Lateral Effect

- Lateral Effect ( $L_e$ )
- The distance on each side of a tile or ditch in its longitudinal direction where the ditch or tile has an influence on the hydrology
- Measured perpendicular from midpoint of tile line or toe of ditch bank

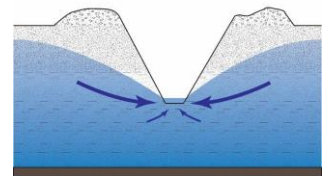


113

### Lateral Effect

#### Factors influencing Lateral Effect

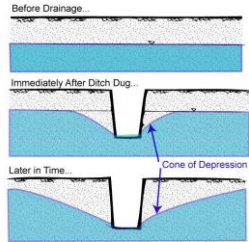
- Depth
- Soil Properties
  - Hydraulic conductivity
  - Drainable porosity
- Grade
- Impermeable Layer



114

### Why Is Lateral Effect Important?

- Wetland impacts from a drain
- Distance needed to avoid a wetland impact



115

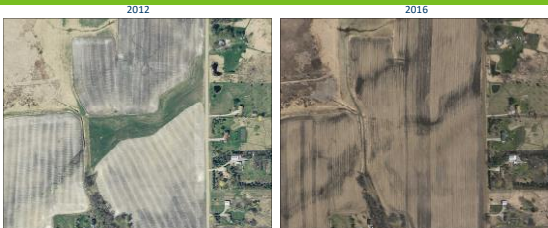
### 2 Primary types of drainage

- Surface drainage via ditches
- Subsurface via
  - Clay tile
  - Concrete tile
  - Corrugated plastic



116

### Drained Wetland



117

### Effectively Drained

- A condition where ground or surface water has been removed by artificial means to the point that an area no longer meets the wetland hydrology criterion
- “Artificial means” is usually a ditch, tile or diversion
- The area will not support a dominance of hydrophytes but hydric soil will persist

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### Drainage Setback Tables

- Developed by NRCS using the van Schilfgaarde equation from the ND-Drain program
- **Setback distance** is the minimum distance from the wetland boundary to the tile line or ditch necessary to minimize adverse hydrologic impacts to adjacent wetlands
- Developed by NRCS to advise farmers

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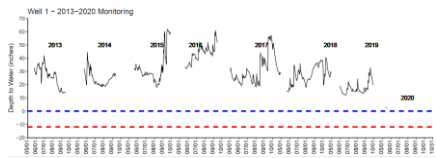
### Drainage Setback Tables

- County-specific
- MN NRCS uses setback distance rather than lateral effect.
- **Setback distance** and **lateral effect** are not the same thing!!
- Setback tables not directly applicable for use in determining drainage impact.
- <https://bwsr.state.mn.us/lateral-effect-drainage-setback>

120

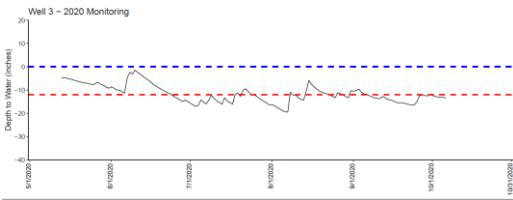


### Permanent inundation



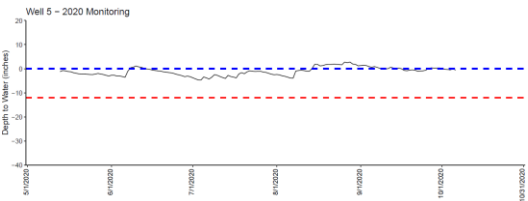
127

### Seasonally Saturated



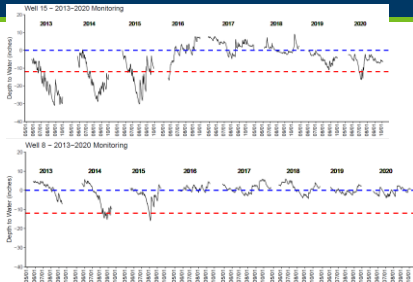
128

### Shallow Inundation



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### Shows restoration of mid 2015



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### Antecedent Precipitation Analysis

**m** BOARD OF WATER AND SOIL RESOURCES



Precipitation | [dwr.state.mn.us](http://dwr.state.mn.us)

131

### Precip

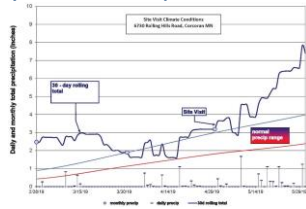
- [Hydrology and Antecedent Precipitation](#)

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Precip.

What do we mean by Antecedent Precipitation?

The prior or preceding precipitation events or conditions, leading up to the site visit or when aerial photography was taken.



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Precipitation

Who Conducts the Analysis?

- The Delineator is responsible as part of the delineation process and report completion.
- All Reports (Level 1 and Level 2) should include a precipitation analysis

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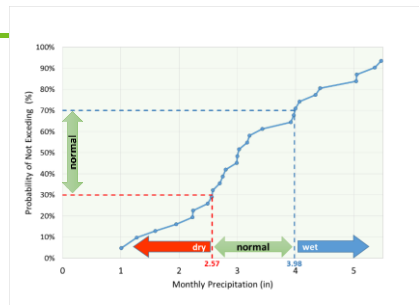
Why is Antecedent Precipitation Important?

To better interpret the data collected or observation made in the proper context.



135

What does NORMAL mean? What does WET or DRY mean?



136

When in the process is it needed?

As part of the delineation

Off-site/Level 1

- Gather precipitation data prior to assessing imagery (for each year of imagery)
- Helps to understand hydrology or vegetation signatures observed
- Required for a Level 1 and any delineation in an agricultural setting

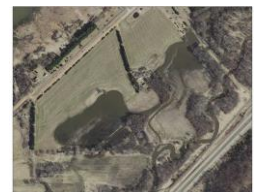


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When in the process is it needed?

On-site/Level 2

- Recommend this be done prior to site visit if possible (for wetlands in an ag setting)...
- Puts better perspective on site data collection
- Can be done after; may require adjustment of line...



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## When in the process is it needed?

**Other Observations Types**

- For interpreting Well or Stage Gauge Data
- Establish baseline conditions for a potential wetland bank/monitoring post construction
- Further defining a wetland boundary/questionable wetland area in difficult/are cases
- May not be needed in advance but will be when interpreting data set.

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## Apply the Evaluation

**Aerial photo Review**

- Used for off site analysis of hydrology/wetland determinations. Sure this is standing water, but was this during a very wet period?
- To interpret the data or give it proper weight.



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## How to do it...

**Three-Prior Month Method**

- Using State Climatology Tool
- Manual Completion

**Thirty Day Rolling Total**

- Summing the prior 30-day precipitation totals for each day and plotting this "rolling total" on a daily basis

**Hybrid Method**

- Essentially combines above methods



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## Precip

**Evaluating Antecedent Precipitation Conditions**  
Using Climate Data Available in Minnesota

May, 2015

**Purpose:** This document describes procedures that can be used to evaluate antecedent precipitation using climate data and tools available in Minnesota.

**Audience:** Those involved in jurisdictional wetland delineation, restoration, mitigation, regulation, or any other activity requiring the use of hydrologic data, observations, or imagery.

**Use:** These accepted methods can be used to compare antecedent precipitation conditions between different dates for sites in Minnesota. They make the best use of data and tools readily available via the web from the Minnesota State Climatology Office. The ability to compare antecedent precipitation conditions is often relevant to assessing wetland hydrology.

[https://bwsr.state.mn.us/sites/default/files/2019-12/WETLANDS\\_delin\\_Eval\\_Antecedent\\_Precip\\_MN\\_Guidance.pdf](https://bwsr.state.mn.us/sites/default/files/2019-12/WETLANDS_delin_Eval_Antecedent_Precip_MN_Guidance.pdf)

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## Method 1: 3-prior-month method

3rd prior month							2nd prior month							1st prior month							observation																																								
MAY							JUNE							JULY							AUGUST																																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

- It is the "default standard" for many applications.
- Commonly Used for
  - Aerial imagery analysis
  - Offsite hydrology determination
  - Site visits

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## 3-prior-month method

3rd prior month							2nd prior month							1st prior month							observation																																								
MAY							JUNE							JULY							AUGUST																																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

- Compares **monthly** precipitation data from the **3 months prior** to the normal long-term records.
- Assigns **Wet, Normal, or Dry** to each of the 3
- Data weighted: the more recent the data= the more weight it is given in the final assignment (**W, N, D**).

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## 3-prior-month method

### The Good News

- State Climatology Office = EASY
- Can't find new data
- Easy to understand

### The Bad News

- Assumes even rain distribution (intensity);



- Assumes 3 months is acceptable time frame

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## Normal Monthly Precipitation at your fingertips...

Precipitation data for target wetland location:  
 county: Morrison township number: 40N  
 township name: Little Falls range number: 32W  
 nearest community: Little Falls section number: 8

Minnesota: [climate.umn.edu](http://climate.umn.edu)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90%	0.30	0.29	0.87	1.48	2.39	3.37	2.62	2.41	2.45	1.26	0.66	0.43
70%	0.87	0.85	1.54	2.57	3.44	5.26	4.32	3.71	3.38	1.54	0.95	
Mean	0.71	0.62	1.41	2.28	3.01	4.43	3.56	3.24	3.28	2.67	1.30	0.77

Minnesota Climatology Working Group  
 State Climatology Office - DNR Division of Ecological and Water Resources - University of Minnesota

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## With the State Climatology Tool

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## Precip.

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## Precip.

### Wetland Delineation Precipitation Data Retrieval from a Gridded Database

Obtaining a long-term precipitation data time-series for wetland delineation efforts can be a difficult and time-consuming process. Locating the nearest precipitation monitoring station to the wetland often proves challenging. Once a nearby monitoring location is identified, retrieving the data, accounting for gaps in the record, and generating the summary statistics can provide further challenges. By offering access to "synthetic" data, this application assists users in overcoming some of the challenges inherent in assembling a precipitation data set. The synthetic data are made up of regularly-spaced grid nodes whose values were calculated using data interpolated from Minnesota's outstanding, but spatially and temporally irregular, precipitation data base.

Precipitation data for target wetland location:  
 county: Anishinibew township number: 44N  
 township name: Selkirk range number: 20W  
 nearest community: Malmo section number: 4

Color key:  
 total in 19 20th and 41 70th percentiles  
 total in 19 20th and 41 70th percentiles  
 total in 19 20th and 41 70th percentiles

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WYTOT	ANN	1981
90%	0.42	0.34	0.91	1.52	2.02	3.14	2.97	2.48	1.99	1.14	0.79	0.48	19.70	24.93	24.19
70%	0.96	0.94	1.64	2.74	4.10	5.16	4.41	4.16	4.02	2.90	1.71	1.06	20.56	24.61	25.32
Mean	0.79	0.73	1.34	2.19	3.00	4.32	3.94	3.43	2.95	2.20	1.41	0.86	19.24	27.61	27.63

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## Precip. Worksheet Using Gridded Database

### Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:  
 county: Aitkin township number: 44N  
 township name: Seavey range number: 24W  
 nearest community: Malmø section number: 4

Aerial photograph or site visit date:  
 Wednesday, June 08, 2016

Score using 1981-2010 normal period

values are in inches	first prior month	second prior month	third prior month
A 1° following a monthly total indicates a provisional value derived from radar-based estimates.	May 2016	April 2016	March 2016
estimated precipitation total for this location:	1.97	2.76	2.99
there is a 30% chance this location will have less than:	1.44	1.61	0.90
there is a 30% chance this location will have more than:	3.06	3.91	1.92
type of month: dry normal wet	dry	normal	wet
monthly score	3 * 1 = 3	2 * 2 = 4	1 * 3 = 3
multi-month score	10 (Normal)		
0 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)			

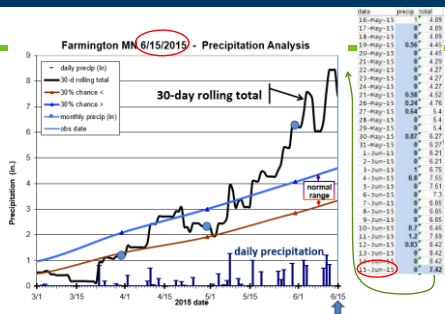
151

## Method 2: 30-day rolling total

- Uses **daily** precipitation data, not monthly
- Rolling total is the sum of the past 30 days precipitation for each day
- Helps evaluate over entire month, will not miss events within the month.
- Graphic display "at-a-glance"
- Often used for monitoring wells

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## Farmington MN 6/15/2015 - Precipitation Analysis



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## Method 3: Hybrid Method

30-day rolling total  
 with  
 3-prior-month method

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## Precipitation Analysis - Farmington MN 6/15/15



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## Precip.

"Hybrid" method - ERDC/EL TR - WRAP 00 - 01				
Date	15-Jun-2014		Project W/DCP	
Location	Farmington, MN		State: MN	
County	Dakota		Growing Season	
Soil Name				
Photo/obs date	15-Jun-2015			
Prior Period	Condition Dry, Wet, Normal	Condition Value	Period Weight Value	Product of Previous 2 Columns
1st prior 30 days	W	3	3	9
2nd prior 30 days	N	2	2	4
3rd prior 30 days	N	2	1	2
				Sum
Note: If sum is				Condition value:
6 - 9 prior period has been drier than normal				Dry = 1
10 - 14 prior period has been normal				Normal = 2
15 - 18 prior period has been wetter than normal				Wet = 3

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## Corps Antecedent Precipitation Tool



<https://www.epa.gov/wotus/antecedent-precipitation-tool-apt>

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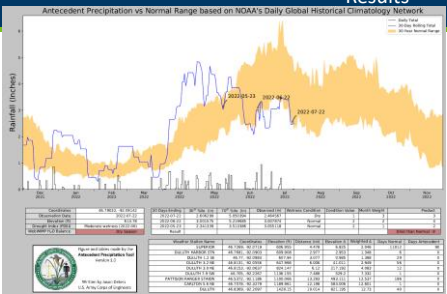
## Enter Lat-Long, Date and Calculate



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## Results

- Tool opens pdf in a temporary folder on desktop
- Open pdf to view results:



159

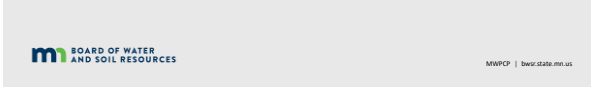
## Antecedent Precipitation Evaluation Review

- Important for accurate interpretations/observations
- Done by the delineator
- Included in the report
- Should support your conclusion.
- Not always clear...Best Professional Judgement needed.
- Several methods available, each with certain strengths/weaknesses...
- Discussed in detail via BWSR and other Guidance Documents.

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## Hydrophytic Vegetation Indicators and Determination



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## Outline

- Hydrophytic Vegetation Definition
  - Define Hydrophyte
  - What makes a plant a hydrophyte
  - Why it matters
- Hydrophytic Vegetation Indicators
  - Indicator status
  - Field indicators
  - Dominance
- Determining Hydrophytic Plant Community
  - Rapid Test
  - 50/20 Rule
  - Prevalence Index
  - Morphological Adaptations

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### Hydrophytic Vegetation Definition

Wetland definition includes the language: "...and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

1987 Manual says in a wetland, "The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions described above. Hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions."

**Hydrophytic Vegetation:** Hydrophytic vegetation is defined herein as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.

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### Hydrophytic Vegetation Definition

What is a Hydrophyte

Hydro = Water  
Phyte = Plant

OR

Any plant that is adapted to grow in water or in wet habitats



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### Hydrophytic Vegetation Definition

- What makes a plant a hydrophyte?.....ADAPTATIONS!
  - Morphological adaptations ----> visible changes/growth habits
  - Reproductive adaptations ----> changes in how the reproduce
  - Physiological adaptations ----> internal chemical process changes

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### Morphological Adaptations

#### List of Examples

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

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### Morphological Adaptations



Buttressed bases

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### Examples

Multiple Trunks



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### Examples

#### Shallow Roots - Adventitious Roots



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### Morphological Adaptations



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### Reproductive Adaptations



Overcup oak seedlings tolerate shallow inundation

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### Why Hydrophytes Matter

- They have adapted to life in saturated/ponded/anaerobic conditions
- A prevalence of hydrophytes in a plant community indicates the area likely experiences a period of ponded or saturated soils such that they out compete the non-hydrophytes
- The vegetation component in wetland delineation requires each species be classified as a hydrophyte or non-hydrophyte, and then apply to the community as a whole



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### What about bryophytes?

- Bryophytes are not vascular plants.
- Sphagnum moss is listed as bog plant community species but does not have an indicator status



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### Individual Plant Indicator Status



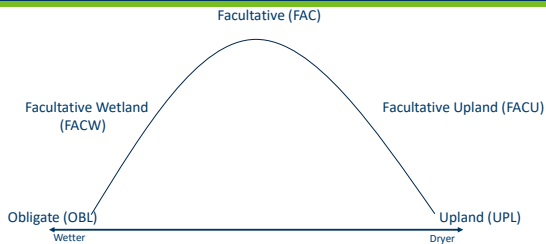
174

### 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).

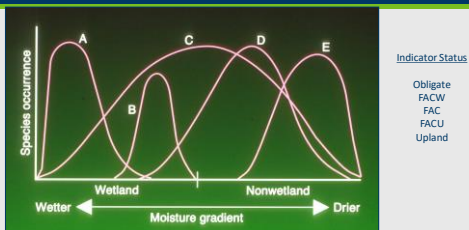
175

### Plant Indicator Status



176

### Plant Indicator Status Distributions



177

### NWPL Regions = Supplement Boundaries



178

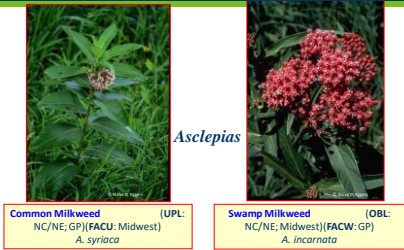
### Plant Indicator Status

179

### Indicator Status Comparisons

180

### Indicator Status Comparisons



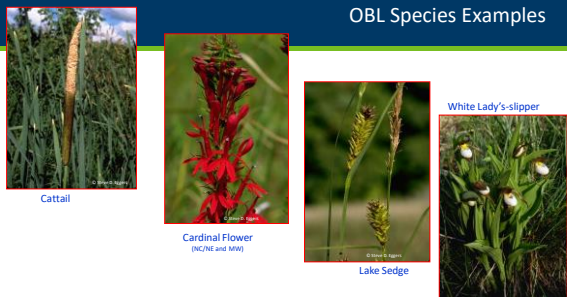
181

### Indicator Status Trust



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### OBL Species Examples



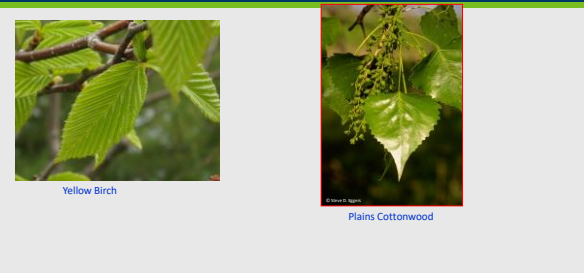
183

### FACW Species Examples



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### FAC Species Examples



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### FACU Examples



186

### UPL Species Examples



Smooth Brome  
(INC/NE, GP)



Common Milkweed  
(INC/NE, GP)



Butter and Eggs

187

### Reed Canary Grass - FACW



Is RCG a true hydrophyte because it occasionally occurs in uplands?

RCG fits well within the concept of a FACW species as it usually occurs in wetlands, but may occur in non-wetlands

The fact that RCG occasionally occurs in uplands is why it wasn't assigned an OBL indicator status

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### Indicator Status

Plant species is not on the list...



Malus sylvestris  
(crab apple)



- Using incorrect name or synonym?
- Searching under most current scientific name? (some have changed)
- If still not on the list then species is UPL

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### From Individual to the Community

Vegetation Component Focus is on plant communities and not individual plants



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### From Individual to the Community



How do I determine if it's a Hydrophytic Community?

Delineation relies heavily on FIELD based INDICATORS applied to the whole veg community

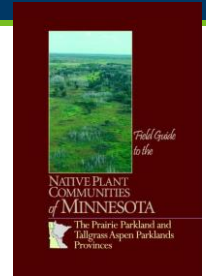
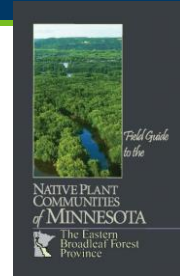
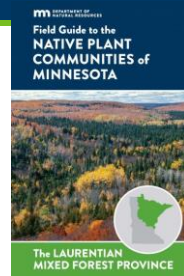
Field Indicators for Hydrophytic Vegetation relies on the dominance or prevalence of hydrophytes in the community

\*\* Data collection/sampling is required to demonstrate/prove the veg community is dominated by hydrophytes for an indicator to be met.

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### Native Plant Communities of Minnesota



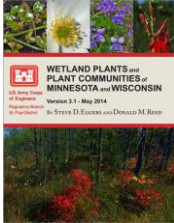
192



### 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

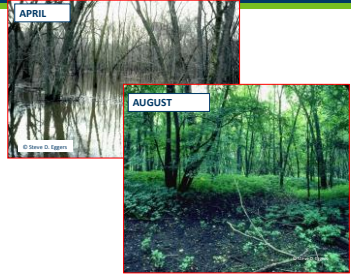


193

### 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



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### 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



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### 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



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### Shrub-Carr and Alder Thickets

Hydrology: saturated to seasonally flooded

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

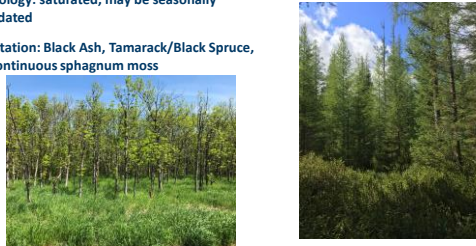


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### Hardwood and Coniferous Swamps

Hydrology: saturated, may be seasonally inundated

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



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### 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.



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### 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

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### Common Disturbed Community Types



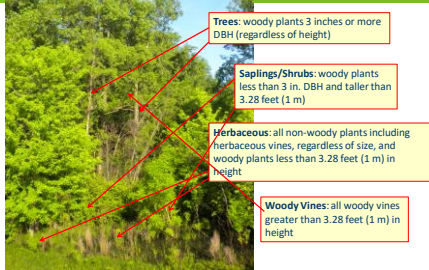
Reed Canary Grass



Common Buckthorn

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### Vegetation Strata (layers of vegetation)



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

**Saplings/Shrubs:** woody plants less than 3 in. DBH and taller than 3.28 feet (1 m)

**Herbaceous:** all non-woody plants including herbaceous vines, regardless of size, and woody plants less than 3.28 feet (1 m) in height

**Woody Vines:** all woody vines greater than 3.28 feet (1 m) in height

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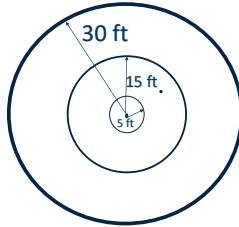
### Vegetation Strata

**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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### Typical Vegetation Sampling



5 ft Herbaceous; 15 ft Shrub/Sapling; 30 ft Tree/Woody Vine



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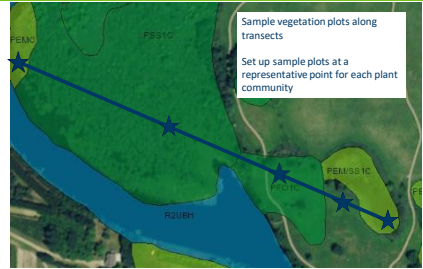
### Vegetation Sampling Adjustments

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



205

### Determining Dominance- Sampling



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### Determining Dominance- Sampling

• Within plots relative abundance of a species is used as the metric for determining dominance

• Typical abundance measures include:

- basal area for tree species
- **percent areal cover**
- stem density
- frequency based on point-intercept sampling.

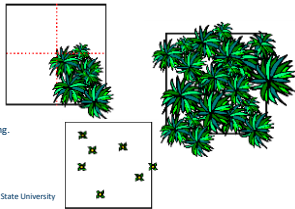


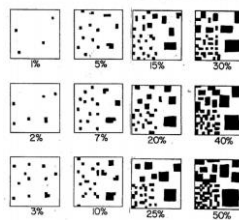
Photo Credit: © 2007 Mark V. Wilson and Oregon State University

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### 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

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### Determining Dominance- Sampling

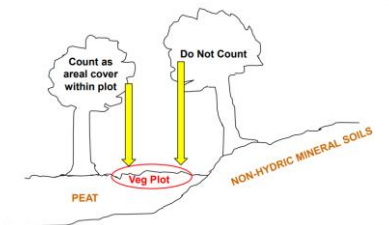


Photo credit: USACE

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

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### Determination of Hydrophytic Vegetation

Sequence of Field Indicators

1. Rapid Test
2. Dominance Test ("50/20 Rule")
3. Prevalence Index
4. Morphological Adaptations



Schubert, Barbara (2012). © 2012 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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## 1. Rapid Test for Hydrophytic Vegetation



All dominant species are rated OBL or FACW, or a combination of the two, based on a visual assessment  
 Example:  
 95% areal cover by reed canary grass (FACW)

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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	
Species a	45	$120 \times 50\% (0.50) = 60$
Species b	30	$120 \times 20\% (.20) = 24$
Species c	25	
Species d	10	Species a + Species b = 75 --- <u>Together</u> exceed 50%
Species e	5	
Species f	5	Species c = 25 --- <u>individually</u> meet/exceed 20%
<b>Total Cover</b>	<b>120</b>	Species a, b, and c are dominant

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

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50/20 Example #2

Species A: 55%  
 Species B: 35%  
 Species C: 35%  
 Species D: 25%  
 Species E: 20%  
 Species F: 10%

TOTAL : 180

50% = 180 x 0.50 = 90      20% = 180 x 0.20 = 36

**125 Dominants**

Tied; count both

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Dominance Test

Stratum	Species Name	Indicator Status (Region ID)	Abundance Percent Cover	Dominant?
Herb	Impatiens capensis	FACW	55	Yes
	Geranium carolinianum	UPL	7	Yes
	Ranunculus acris	FAC	5	No
	Lonicera caerulea	OBL	2	No
	Parthenocissus quinquefolia	FACU	1	No
	Achillea millefolium	FACW	0.5	No
	Carex lasiocarpa	FACU	0.5	No
	Total cover		33.0	
	50/20 Thresholds:			
	50% of total cover = 16.5%			
	20% of total cover = 6.6%			
Sapling/strub	Carpinus canadensis	FAC	35	Yes
	Carya ovata	FACU	10	No
	Acer spicatum	FACU	5	No
	Quercus rubra	FACU	5	No
	Total cover		55.0	
	50/20 Thresholds:			
	50% of total cover = 27.5%			
	20% of total cover = 11.0%			
Tree	Quercus bicolor	FACW	40	Yes
	Fraxinus pennsylvanica	FACW	17	Yes
	Ulmus americana	FACU	10	No
	Carya ovata	FACU	8	No
	Total Cover		75.0	
	50/20 Thresholds:			
	50% of total cover = 37.5%			
	20% of total cover = 15.0%			
Woody vine	Ranunculus scabra	FAC	1	No
Hydrophytic vegetation	Total number of dominant species across all strata = 5. Percent of dominant species that are OBL, FACW, or FAC = 80%. Therefore, this community is hydrophytic by Indicator 2 (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 = _____
FAC species _____	x 3 = _____
FACU 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	55	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
<b>Column Totals:</b>	<b>300 (A)</b>	<b>670 (B)</b>
Prevalence Index = B/A = 2.23		

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## Class Exercise

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## Class Exercise

Prevalence Index Worksheet		
Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	5	x 2 = 10
FAC species	85	x 3 = 255
FACU species	85	x 4 = 220
UPL species	20	x 5 = 100
<b>Column totals</b>	<b>165 (A)</b>	<b>585 (B)</b>
Prevalence Index = B/A = 3.55		

**Hydrophytic Vegetation Indicators:**

- \_\_\_ Rapid test for hydrophytic vegetation
- \_\_\_ Dominance test is >50%
- \_\_\_ Prevalence index is ≤3.0\*
- \_\_\_ Morphological adaptations\* (provide supporting data in Remarks or on a separate sheet)
- \_\_\_ Problematic hydrophytic vegetation\* (explain)

\*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

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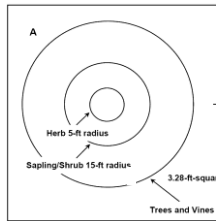
## Hydrophytic Vegetation – Morphological Adaptations

### 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
1. 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.
  2. If more than 50% have adaptations then re-assign indicator status for that species from FACU to FAC
  3. Recalculate dominance test and/or prevalence index

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## Vegetation Sampling Field Exercise



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

Tree Strata (Pkt size)	Herbaceous Strata (Pkt size)	Abundance	Dominance Test	Indicator	Remarks
1.	1.				
2.	2.				
3.	3.				
4.	4.				
5.	5.				
6.	6.				
7.	7.				
8.	8.				
9.	9.				
10.	10.				
11.	11.				
12.	12.				
13.	13.				
14.	14.				
15.	15.				
16.	16.				
17.	17.				
18.	18.				
19.	19.				
20.	20.				

**Dominance Test worksheet:**

Number of Dominant Species (including FAC, FACU, or FACW) \_\_\_\_\_ (A)

Number of Dominant Species (excluding FAC, FACU, or FACW) \_\_\_\_\_ (B)

Prevalence Index = A/B = \_\_\_\_\_

**Hydrophytic Vegetation Indicators:**

- \_\_\_ Dominance Test is >50%
- \_\_\_ Prevalence Index is ≤3.0\*
- \_\_\_ Morphological Adaptations\* (Provide supporting data in Remarks or on a separate sheet)
- \_\_\_ Problematic Hydrophytic Vegetation\* (explain)

\*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

**Hydrophytic Vegetation Worksheet:**

1. Species Name: \_\_\_\_\_

2. Indicator: \_\_\_\_\_

3. % Cover: \_\_\_\_\_

4. Morphological Adaptations: \_\_\_\_\_

5. Remarks: \_\_\_\_\_

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