Critical Definitions for Wetland Delineation

Critical Definitions

• Wetlands
• Growing Season
• Disturbed (Atypical Situations)
• Naturally Problematic (Problem Areas)
• Normal Environmental Conditions
• Normal Circumstances

What is a Wetland?

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

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

Indicators of Start of the Growing Season

1. "Green-up" indicator
2. Soil temperature at 12 inches is 40°F or higher

Growing Season

Green-up indicators 2 to 3 weeks earlier than safe planting period for agricultural crops

Observations of inundation/saturation 2 to 3 weeks earlier in the "wet" season for wetland hydrology determinations
• Record supporting information on data sheet
• Include the species observed, their abundance and location relative to the potential wetland, and type of biological activity observed
• Recommend photo documentation

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

End of Growing Season

• woody deciduous species lose their leaves
  and/or
• the last herbaceous plants cease flowering and their leaves die back

Degree of Disturbance(s)

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.

Disturbed (Atypical Situations)

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

Mark data sheet “significantly disturbed” for soils, vegetation and hydrology
Both hydrology (due to pattern tiling) and vegetation (removed by cropping) are significantly disturbed. Are soils significantly disturbed? If “normal plowing” (8-9 inch depth) was done, in most cases the answer would be no. Exception, if the plowing removed or obscured hydric soil field indicators.

- 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

### Problem Areas

- Problem Areas
  - Seasonal Wetlands
  - Wetlands dominated by non-hydrophytic species like white pine, a facultative island species

### 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
Wetland Definition (1977)

- 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/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.

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.

Normal Circumstances Key

1. Soils, vegetation and hydrology are undisturbed…………….NC
2. Physical alteration(s) to soils, vegetation and/or hydrology has occurred…………….…………2
3. Physical alteration(s) to soils, vegetation and/or hydrology is minor, i.e., insufficient to remove or obscure field indicators………………………………………..Normal Circumstances
4. Physical alteration(s) to soils, vegetation and/or hydrology is more than minor ("significantly disturbed" is checked on datasheet)………………………………………..3
5. 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
6. Physical alteration(s) is due to:
   a. an unauthorized or illegal activity;
   b. done with intent of evading wetland regulations;
   c. total or partial clearing of vegetation, or selective removal of veg
   d. presence of a crop, tree farm, improved pasture, managed veg
   e. destruction of hydric soil field indicators by cultivation, deep ripping, etc.;
   f. irrigation or pumping of surface or groundwater for agriculture;
   g. a major natural event (e.g., a river changes course)…………….……..NOT Normal Circumstances
Relationship of Normal Circumstances and Recent Disturbance(s)

**Normal Circumstances**

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

**Extent and Relative Permanence Test**

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**Not Normal Circumstances**

- **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.

**Normal Circumstances – Hydrology**

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

**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 indicators (e.g., F8, some S indicators [waxy]) 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.

**Normal Circumstances**

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Normal Circumstances - Vegetation

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

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.

- Overgrazing to the extent that alteration of vegetation is more than minor = NOT Normal Circumstances

Problem Areas and Normal Circumstances

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

Normal Circumstances?

Not Normal Circumstances:
- removal of natural vegetation

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

Chapter 5 - Difficult Wetland Situations

General Procedure for Difficult Wetlands

Some wetlands can be difficult to delineate because wetland indicators may be missing due to natural processes or recent disturbances. Regional Supplements provide guidance in Chapter 5 on how to delineate regional examples of problem areas and atypical situations.

• Examples of difficult wetland situations:
  - Land use for agriculture and silviculture
  - Problematic hydrophytic vegetation
  - Problematic hydric soils
  - Wetlands that periodically lack hydrology indicators
  - Wetland/non-wetland mosaic areas

General Procedure:
1) Verify at least one hydric soil indicator and one primary or two secondary hydrology indicators are present
2) Consider landscape position concave, floodplain, toe slope, flat, fringes wetland, restrictive soil layers, groundwater discharge
3) Procedures outlined in Chapter 5 for type of situation
4) Long-term monitoring
Use of Reference sites, aerial photography, hydrology data, climatic data important!
Lands Used for Agriculture and Silviculture

Agriculture
- Lack natural plant communities
- Planted with crops or pasture species
- Altered by mowing, grazing, herbicide
- Soils altered by cultivation in surface horizons
- Hydrology often altered by drainage

Silviculture
- Lack natural plant communities
- Planted with managed community
- Soil surface horizons often disturbed (mixing and compaction) from equipment and roads
- Hydrology sometimes altered by drainage

Vegetation Determination on Agricultural Lands

• Goal is to determine native plant community under normal circumstances
- Look for volunteer vegetation between rows, plantings, etc.
- Examine vegetation in undisturbed reference sites
- Check NRCS soil survey reports for vegetation information
- Aerial photograph interpretation
- Allow for one of more normal seasons

Soils Determination on Agricultural Lands

• Tilling disturbs and mixes surface horizons and may cause compaction.
- Review soil survey maps for likely presence of hydric soils
- Use a reference area with similar landscape position and hydrology
- Note whether soil changes color upon exposure to air
- Monitor the hydrology on the site

Hydrology Determination on Agricultural Lands

• Goal is to determine whether wetland hydrology is present on a managed site under normal circumstances
Methods:
- Look for existing hydrology indicators. Discount indicators that were present prior to alterations (relic water marks)
- Offsite aerial review (5 or more normal years)
- Estimate scope and effect
- Use hydrologic models
- Monitoring the hydrology

Offsite Aerial Review on Agricultural Lands

Review of aerial imagery layered with soils and topography
Minimum of 5 normal years

Aerial photo review

Identify hydrology signatures (saturation, drown out, crop stress, etc)
Compile observations to make determination using decision matrix

Aerial photo 1: May 2015 - Normal
Aerial photo 2: Sep 2013 - Dry
Aerial photo 3: May 2016 - Normal
Hydrology Determination on Agricultural Lands

Lateral Effect - distance on either side of a drain which wetland hydrology is impacted

Use NRCS drainage setback table to determine how far a drain needs to be from wetland to prevent drainage

Setback table based on mapped soil unit

How to use tables:
1) Determine if hydrology indicators are present
2) Overlay drains on soil map
3) Determine average depth of drain per soil type
4) Determine setback distance for each soil type using NRCS table
5) Delineate setback corridor for drain
6) Identify wetlands within or adjacent to setback corridor
7) Consider all variables to determine potential wetland impact

Problematic Vegetation Situations

- Temporal Shifts in Vegetation
  - Seasonal shift in plant communities
  - Prolonged Dry to Drought Conditions
  - Long-term fluctuations in lake levels
  - Vernal pools
  - Areas affected by grazing
  - Managed plant communities
  - Areas affected by fires, floods, or other natural disturbances

Factors that can change the structure and composition of plant communities:
- Climatic variability
- Invasive species
- Land use - development, agricultural, silvicultural

Temporal Shifts in Vegetation

- Plant communities change in response to seasonal weather patterns
  - Coastal wetlands, vernal pools, interdunal swales, wet meadows, seeps
  - May lack hydrophytic vegetation in dry season

Vernal Pools

Sampling approach:
1) If inundated and emergent hydrophytic is not present, return to site under normal precipitation or soon after draw down
2) If hydrophytic prevalence cannot be determined under normal to wet conditions, make wetland determination based on hydrology and soil indicators

General Approaches to Problematic Vegetation

1) Verify at least one hydric soil indicator and one primary or two secondary hydrology indicators are present
2) Consider landscape position concave, floodplain, toe slope, flat, fringes wetland, restrictive soil layers, groundwater discharge
3) Use the follow approaches
4) Use undisturbed reference sites
5) Offsite review
6) If vegetation cannot be determined, make determination based on soil and hydrology indicators

Sampling approach:
1) If possible, return to site under normal precipitation
2) Identify all identifiable plant remains
3) Use off-site resources to determine plant community under normal to wet conditions
4) Use reference site
5) If vegetation under normal to wet conditions cannot be determined, make wetland determination based on hydrology and soil indicators
**Areas Affected by Grazing**

Sampling approach:
1) Use ungrazed reference site with similar soils, landscape position, and hydrology.
2) If feasible, remove livestock in a representative area to allow vegetation to recover.
3) If possible, use offsite methods to determine conditions prior to grazing.
4) If vegetation cannot be determined, make wetland determination based on hydrology and soil indicators.

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**Managed Plant Communities**

Sampling approach:
1) Use reference site with similar soils, landscape position, and hydrology.
2) If feasible, leave representative area unmanaged to allow vegetation to recover.
3) If possible, use offsite methods to determine prior conditions.
4) If unmanaged vegetation cannot be determined, make wetland determination based on hydrology and soil indicators.

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**Areas affected by natural disturbance**

Sampling approach:
1) Use reference site with similar soils, landscape position, and hydrology.
2) If possible, use offsite methods to determine prior conditions.
3) If undisturbed vegetation cannot be determined, make wetland determination based on hydrology and soil indicators.

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**Areas dominated by non-vascular plants**

For areas exclusively dominated by non-vascular plants, the vegetation should be considered hydrophytic if both soil and hydrology indicators are present, the site is in a landscape position able to concentrate or receive water and the hydrology has not been altered.

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**FACU species that dominate wetlands**

Sampling approach:
1) Drop any FACU species for each sampling point.
2) Compile the species list for remaining species.
3) Revaluate dominance test(s) using the compiled species list. If either is met, then vegetation is hydrophytic.

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**Problematic Hydrophytic Soil**

Soils could meet the hydric soil definition but may not exhibit any indicator.

Examples:
- Sandy Soils
- Red Parent Material
- Dark Parent Material
- Fluvial deposits within floodplains
- Recently developed wetlands
- Seasonally ponded soils
- High Chroma Soils
- Iron enriched groundwater discharge areas
Procedure for Determining Problematic Soil

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

Wetlands that Periodically Lack Wetland Hydrology

- During the dry season and drought cycles, wetland areas that are typically inundated or ponded during normal precipitation may dry out completely and not exhibit wetland hydrology indicators.
- Every wetland delineation should consider the timing of the site visit and antecedent precipitation.

Wetland Hydrology Procedure

1) Confirm whether hydrophytic vegetation and hydric soil are present or absent due to atypical or problem area
2) Determine whether site is in a landscape position capable of concentrating or collecting water

3) Use one of the following methods:
   Site visits during the dry season:
   a) Look for secondary hydrology indicators. If found
   b) No hydrology indicators but has hydric soils and hydrophytic veg and not within influence of drainage- consider wetland

   Periods with below normal rainfall:
   a) determine whether precipitation 2-3 months prior were below normal, normal, above normal
   b) if precipitation is below normal, site meets vegetation and hydrology, and is not within influence of drain- consider wetland

Wetland Non-Wetland Mosaics

- “...a landscape where wetland and nonwetland components are too closely associated to be easily delineated or mapped separately.” – page 142 Corps NCNE Regional Supplement
- Areas of complex microtopography- “ridges” and “troughs”
Wetland Mosaic Procedures

Length Distance method
- Measure length of transect
- Lay measuring tape and keep
- Multiple transects should be parallel
- Other arrangements of transects can be used for odd shapes
- Transect spacing is based on mosaic area

Point Intercept Method
Number of wetland points along transect
- Select transect line(s)
- At fixed number of paces determine and record wetland status
- Compile data points
- Estimate the wetland % with formula

Wetland Mosaic Procedures

Regulatory implications of Mosaic Wetlands

Calculating wetland impacts:
- Area determined to be 50% wetland
- Driveway proposes to cross 750 ft² of mosaic wetland
- Total wetland impact equals 375 ft²

Review of Chapter 5

- Examples of difficult wetland situations:
  - Land use for agriculture and silviculture
  - Problematic Hydrophytic Vegetation
  - Problematic hydric soils
  - Wetlands that periodically lack hydrology indicators
  - Wetland/Non-wetland mosaic areas
- Reference sites, aerial photography, hydrology data, climatic data

General Procedure:
1) Verify at least one hydric soil indicator and one primary or two secondary hydrology indicators are present
2) Consider landscape position
   - concave, floodplain, toe slope, flat, fringes wetland, restrictive soil layers, groundwater discharge
3) Procedures outlined in Chapter 5
4) Long-term monitoring

Reading Wetland Hydroscapes

The correlation of geomorphology, hydrology, wetlands, and biodiversity
What is a hydroscape?

How hydrology interacts with the landscape.

Ability to interpret the landscape position and hydrology is much of what a wetland delineator does.

Abiotic and biotic influences upon and interactions within wetlands

- Wetland soils, Hydrology, and geomorphology
  - Jackson, Thompsons, Kolka, US Forest Service, 2014

Key factors

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

3 Parameters of a Wetland

- Climate- long term weather pattern of an area
  - 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

3 Parameters of a wetland
Climate affects wetland water budgets

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

Ecology
- Relationship of organisms to one another and their physical surroundings
- Relationships to the physical environment that influence ecology:
  - Water
  - Wind
  - Fire
  - Soil
  - Climate

Ecological Land Classification

Geomorphology
- Study of physical features on the surface of the earth and their relation to its geologic structures
  - Glacial geology of MN
Examples of landscapes in MN
- Whitewater River valley
- Lutsen
- Blue Mounds
- Thief River Falls
- Wadena
- Drumlins

Reading a landscape
What do we mean “reading” the landscape?
Landscape position:
- Summit
- Shoulder
- Backslope
- Foot slope
- Toe slope

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

Geomorphology to Hydrology
Key factors
- Climate
- Ecology
- Hydrology
- Geomorphology
- Soil
- Plant Communities
- Wetlands

Modified from Pennock et al., 1987
Hydrology - movement of water in relation to land

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

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.

Storage Capacity and Evapotranspiration

- Relationship between landscape and climate
- Influences hydroperiod of wetland

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

Parameters of HGM

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

HGM Classes

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

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

Factors That Influence Soil Development

- Climate-weather conditions prevailing over long period of time
- Parent material- geologic material from which soils form
- Topography- landscape position and slope processes
- Organisms- essential role of microbes in the soil, includes humans
- Time- soil doesn’t “age”, it develops

Landscape and formation of hydric soils

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

Wetland Indicator Status

- 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

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

Hydrophytes

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

- Ecological Sections & Areas of high or outstanding biodiversity

Mapping geomorphology, ecology, and wetlands

- Sequence of maps to illustrate correlation of geomorphology, wetlands, and areas of ecologic significance
- Offsite method to study field site
- Information that can be used to inform an efficient approach to field work

Online resources

- MN Geospatial Commons
- MN Topo
- NRCS Web Soil Survey
- MN NWI
- MN DNR Ecological Classification System
- MN DNR Native Plant Community List

Nemadji

LIDAR

Bedrock Geology

Other Resource Values:
- Biodiversity
- Plant Community
- Ecological Sections
- Wetlands
- Soils
- Topography
- Geomorphology
Questions?

What are we going to cover?

- Plant ID basics
- Plant ID resources
- Plant comparison

Basic Plant ID

Species Identification

- Grasses
- Sedges
- Rushes
- Ferns & Allies
- Vines
- Shrubs
- Trees
- Forbs

Forbs

- A broad-leaved, non-woody flowering plant
Grasses (Poaceae Family)

- Round, hollow, jointed stems
- Sheaths usually open in front
- Leaves 2-ranked
- Floret wrapped in 2 bracts/scales
- One seed per flower (grain)

Sedges (Cyperaceae Family)

- Stems round or triangular, solid, no joints
- Sheaths usually closed
- Leaves usually closed
- Leaves usually 3-ranked
- Flowers subtended by a single scale/bract
- One seed per flower

Rushes (Juncaceae Family)

- Stems round or compressed, solid, no joints
- Leaves few, round or flat in cross-section
- Sheaths open, often with auricles
- Flowers with 6 tepals
- Capsules with 3 or many seeds

Ferns & Allies

- Flowerless, seedless vascular plants having roots, stems, and reproducing by spores
Vines

• A plant with the stem not self-supporting but trailing or climbing on some type of support

Shrubs

• A woody plant, typically shorter than 5 meters at maturity.

Trees

• A large woody plant, usually with one to a few main stems or trunks

Apps and Online Resources

- PlantNet
- Minnesota Wildflowers
- Google Lens
- PlantSnap

...and many more

Tips for Apps

VS

Ag Land Crops

- Corn – Zea mays
- Soybean – Glycine max
- Wheat – Triticum aestivum
- Oats – Avena sativa
- Barley – Hordeum vulgare
- Sugar Beets – Beta vulgaris
- Sorghum – Sorghum bicolor

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Green Ash and Black Ash

Alder and Hazelnut

Silver and Sugar Maple

White and Black Spruce

Speckled alder (alnus incana) FACW (NENC)

- Tough veg transitions
- Think about prevalence
Vegetation Component Focus is on plant communities and not individual plants.

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.

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

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

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

Vegetation Strata (layers of vegetation):

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

Vegetation Sampling Adjustments

Circular plot overlaps two different plant communities?

Then use rectangular plot of same square footage.

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

Typical Vegetation Sampling
Determining Dominance - Sampling

Sample vegetation plots along transects
Set up sample plots at a representative point for each plant community

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.

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Determining Dominance - Sampling

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

Determining Dominance - Sampling

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

Determining Dominance - Sampling

Estimates of Percent Cover

- Aspen, birch
- Balsam fir
- White and black spruce
- White cedar
- Green ash vs black ash
- Maples- silver vs sugar vs red
- Cottonwood and box elder

Determining Dominance - Sampling

- Alder and willow
- Hazelnut
<table>
<thead>
<tr>
<th>Herbaceous Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferns - sensitive, bracken, lady, cinnamon</td>
</tr>
<tr>
<td>Raspberry</td>
</tr>
<tr>
<td>Large leaf aster</td>
</tr>
<tr>
<td>Bluejoint</td>
</tr>
<tr>
<td>Sedges - Pennsylvania, lake sedge</td>
</tr>
</tbody>
</table>

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