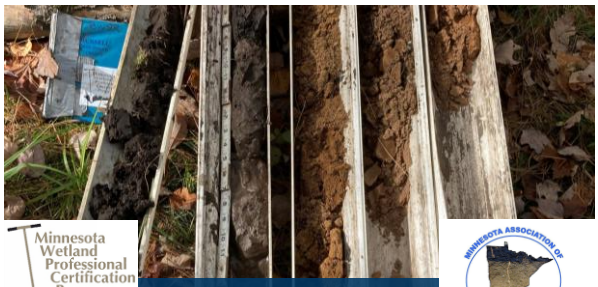


Soils on the Landscape

1

Introductions

- Ben Meyer- CMWP- MN Board of Water & Soil Resources
  - Co-Coordinator-MN Wetland Professional Certification Program
  - Wetland Specialist- North Metro Counties
- David Demmer- CMWP- MN Board of Water & Soil Resources
  - Co-Coordinator-MN Wetland Professional Certification Program
  - Wetland Specialist- NE MN Counties

MN Association of Professional Soil Scientists:

- Luke Lunde- Professional Soil Scientist- WSB LLC
- Steve Lawler- Professional Soil Scientist- Mower SWCD
- David Bauer- Professional Soil Scientist- CMWP- Alliant Engineering
- Wayne Cymbaluk- Professional Soil Scientist- Stearns SWCD

2

2025 MWPCP Training Courses

Technical Training

- **Soils on the Landscape**- Robert Ney Regional Park -April 29 & 30- Two one-day classes (6 CEC per day)
- **Wetland Delineation Methods w Field Practicum**- Cloquet Forestry Center- May 20-22 (18 CEC)
- **Plant ID**- Shoreview MNDOT Training Center (July 14) and Cloquet Forestry Center (July 16)-Two one-day classes (6 CEC per day)
- **MWPCP Regional Wetland Training- Northeast MN**- Hermantown City Hall- August 12-13 (6 CEC per day)
- **Hydrogeomorphic Method of Classifying Wetlands** - Hartley Nature Center, Duluth- October 28-29- Two one-day classes (6 CEC per day)
- **Wetland Banking & Monitoring for Consultants**- Shoreview MNDOT Training Center- November 12-13 (12 CEC)

3

2025 MWPCP Training Courses

Introduction to Wetland Delineation and Regulations

- **Introduction to Wetland Delineation and Regulations:** MNDOT Training Center, Shoreview- June 9-13
- **Introduction to Wetland Delineation and Regulations:** Northland Arboretum, Baxter - September 8-12
- **Introduction to Wetland Delineation and Regulations:** MNDOT Training Center, Shoreview - October 6-10

Professional Exams

MWPCP Exams will be offered at 1pm on: June 13 in Shoreview, September 12 in Baxter, October 10 in Shoreview

4

Upcoming MAPSS Events

MAPSS 2025 Summer Tour and Business Meeting
August 1, 2025
Artesols – The Urban/Built Environment Soils

MAPSS Winter Technical Event- December 5

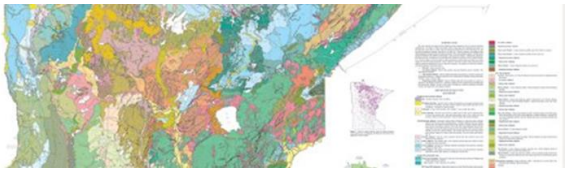
www.mnsoilscientist.org

5

Soils on the Landscape Course Agenda

- Des Moines Lobe to HGM: How Glaciers Shaped the Wetlands of Minnesota
- Soil Catenas along Landforms
- Hydric Soil Indicators
- Introduction to field sites via the Web Soil Survey
- Lunch (bag lunch on your own) then meet at field site after lunch
- Field stations

6



Des Moines Lobe to HGM: How Glacial Geology Shaped the Wetlands of Minnesota

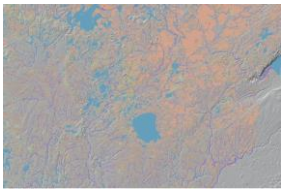
BOARD OF WATER AND SOIL RESOURCES

Minnesota Wetland Professional Certification Program

7

Objectives

- Understand how glacial activity shaped MN landscapes and deposited soil parent material.
- Geomorphology is used to classify wetlands based on the Hydrogeomorphic Method.
- 3 Parameters of HGM- Geomorphology, Hydrology and Hydraulics- contribute to soil development.



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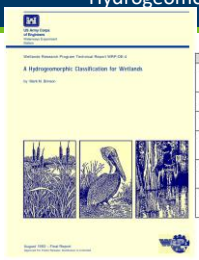
Hydrogeomorphic Method of Classifying Wetlands



Classification Name	Definition
Lacustrine	Wetland occurs within a topographic depression that has a closed elevation contour that allows the accumulation of surface water and is restricted to the margin of a depressional lake basin.
Riverine	Wetland occurs on a nearly level landform and lies along and is influenced by flooding from a stream, river or flow-through ditch.
Slope	Wetland occurs on a slope (generally >2%) with groundwater discharge as its primary source of hydrology.
Mineral Flat	Wetland occurs on a nearly level landform, is not significantly influenced by flooding from a stream, river or flow-through ditch and has predominately mineral soils.
Organic Flat	Wetland occurs on a nearly level landform, is not significantly influenced by flooding from a stream, river or flow-through ditch and has predominately organic soils.
Depression	Wetland occurs within a topographic depression that has a closed elevation contour that allows the accumulation of surface water and is not associated with the margin of a depressional lake basin.

Brinson, M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

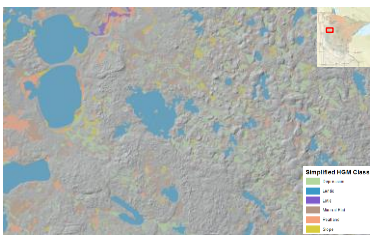
9

3 Parameters of HGM= Hydrology, Geomophology, Hydraulics

10

Parameters of HGM

- Geomorphology- landscape position
  - Where a wetland situated and the shape of the landscape
- Hydrology- water source and output
  - Why the wetland is there
- Hydraulics- hydrodynamics
  - What it does



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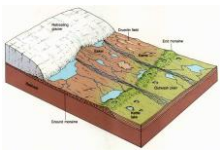
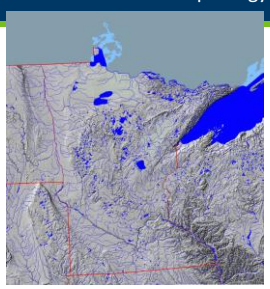
Geomorphology

Study of physical features on the surface of the earth and their relation to its geologic structures

- Landscape position
- Parent material
- Surface shape





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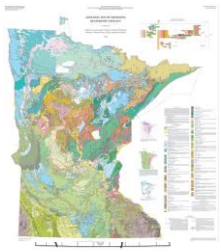
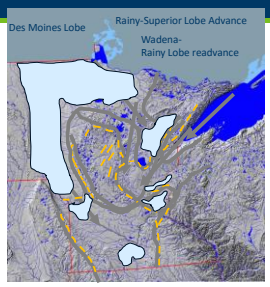
Glacial Geology of MN

- Glaciation of the Quaternary period (oldest to youngest):
  - Nebraskan
  - Kansan
  - Illinoian
  - Wisconsin
    - Wadena lobe
    - Rainy-Superior lobe
    - Des Moines lobe

13

In MN, geomorphology is result of glacial geology

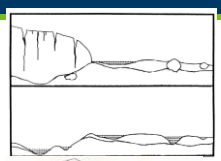


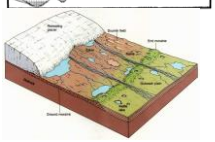


14

How Glaciers Shape Wetlands

- Kettle depressions
- Glacial lakes
- Surficial shape of landscape
- Fluvial-Lacustrine systems following glacial outwash
- Deposition of material with different properties

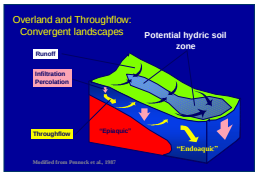


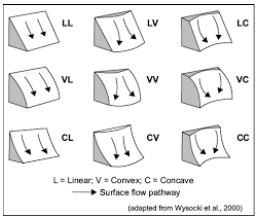


15

Landscape Position- surface shape

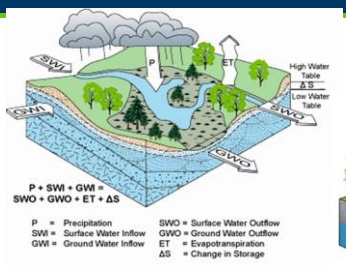
- Convex- surface curves outward
- Concave- surface curves inward
- Linear- flat, one dimensional surface

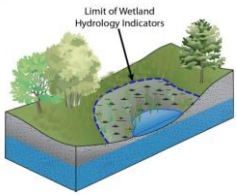




16

Wetland Hydrology and Indicators





17

Hydrology Indicator Groups

Group A – direct observation of *water*

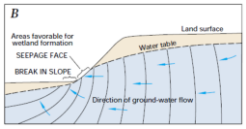
Group B – evidence of *flooding/ponding*

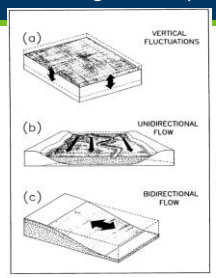
Group C – evidence of *current or recent saturation*.

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

18

Hydraulics- how water moves through landscape





- Uni-directional
  - Horizontal or Vertical
- Bi-directional
  - Estuarine and lacustrine fringe

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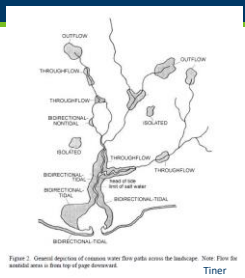
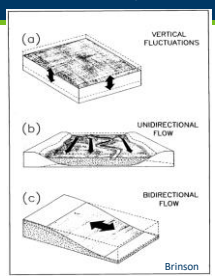
Wetland Hydraulics



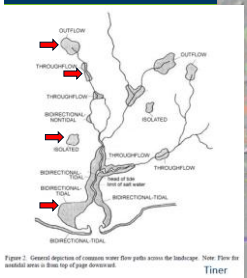
Tiner



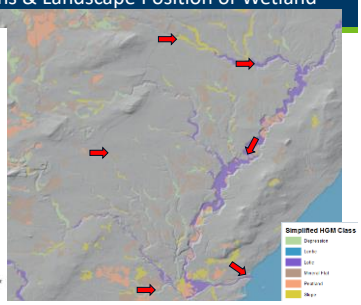
Brinson

20

Water Flow Paths & Landscape Position of Wetland



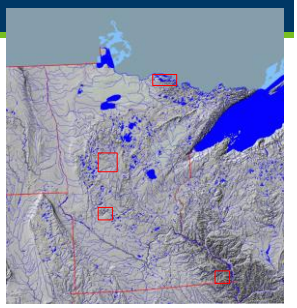
Tiner



21

Glaciers left different HGM classes of wetlands in MN

- Kettle depressions
  - Depression and lacustrine fringe
- Glacial lakes
  - Organic and mineral flat
- Surficial shape of landscape
  - Mineral flat and sloped
- Fluvial-Lacustrine systems following glacial outwash
  - Riverine, mineral flat, sloped, organic flat



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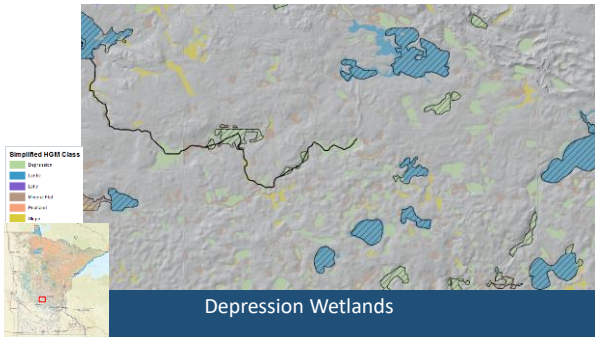
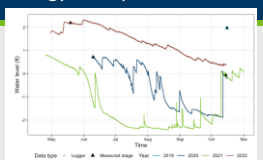
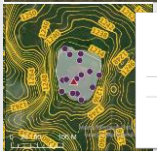


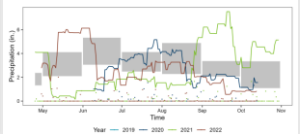
Depression Wetlands

23

Hydrology of Depression Wetlands



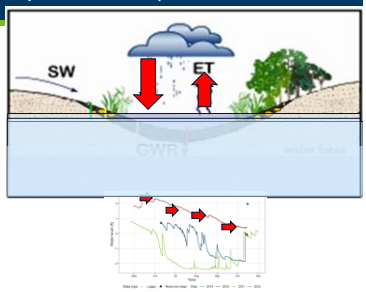




24

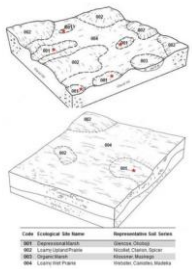
Hydraulics of Depression Wetlands

- Vertical uni-directional
- No surface outlet
- Evapotransporation
  - Increases and decreases with growing season
- Water table "bounces" with precipitation



25

Depression Marsh to Mineral Flat Wet Prairie



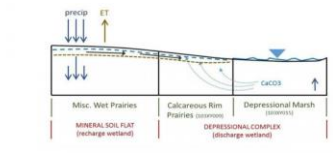
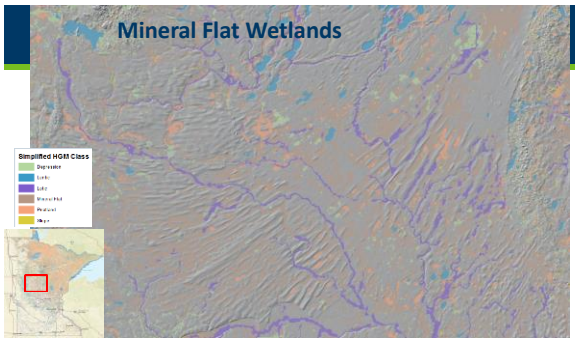


Figure 10. Hydrologic representation of a typical Des Moines Lobe (MLRA 103) Depressional Marsh and associated Ecological Sites.

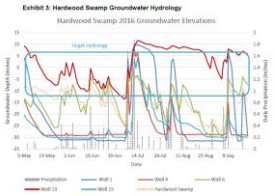
26

Mineral Flat Wetlands



27

Hydrology of Mineral Flats- Saturated Lacustrine Soils

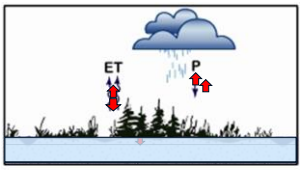


- Surface water input
- Responds to precipitation with little lag time otherwise hydrograph descending with season
- Saturated seepage flow
- Microtopography can be present
- Often intergrades into organic flats and sloped

28

Hydraulics of Mineral Flats

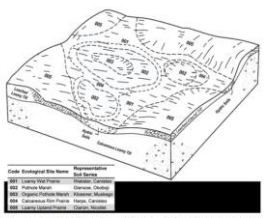
- Vertical uni-directional
- Winter Precipitation
  - overland "seepage flow"
- Evapotransporation
  - Increases and decreases with growing season
- Water table "bounces" with precipitation
- Can facilitate recharge



Surface Water - Extensive Flat

29

Mineral Flat Loamey Wet Prairie



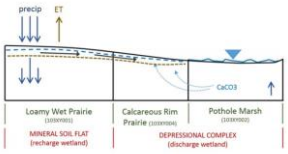
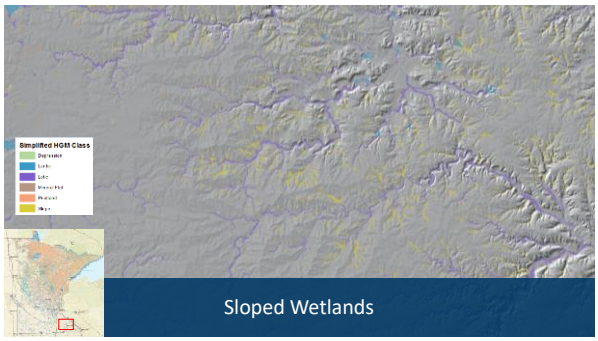


Figure 9. Hydrologic representation of a typical Des Moines

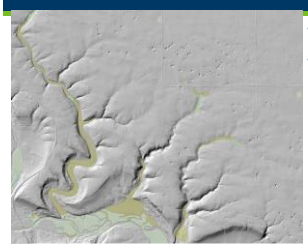
Figure 2. Block diagrams of the representative Wet Loamy Prairie and associated ecological sites.

30

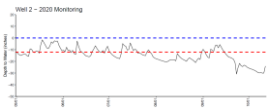


31

Hydrology of Sloped Wetlands



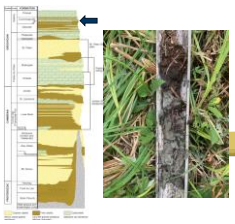
- Seasonally to continuosly saturated
- Decrease in groundwater input through growing season
  - Shorter duration
  - More abrupt bounce to precip. events

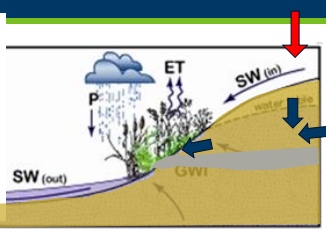


32

Hydraulics of Sloped Groundwater

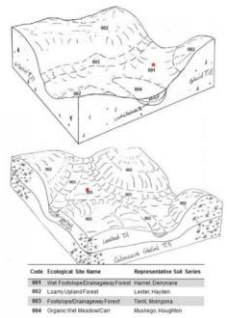
- Differences in permeability
  - Rock Stratigraphy and soil texture





33

Sloped Forested Wetland



Code	Ecological Site Name	Representative Soil Series
001	Wet Footslope/Drainageway Forest	Harnet, Dennane
002	Loamy Upland Forest	Lester, Hayden
003	Footslope/Drainageway Forest	Terril, Molngona
004	Organic Wet Meadow/Carr	Muskego, Houghton

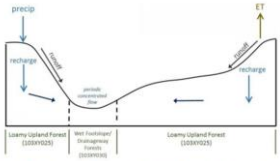


Figure 10. Hydrologic representation of a typical Des Moines Lobe (MLRA 103) Wet Footslope/ Drainageway Forest and associated Provisional Ecological Sites.

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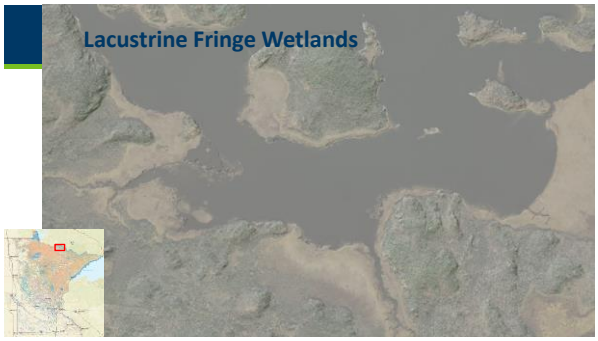
Lacustrine Fringe Wetlands



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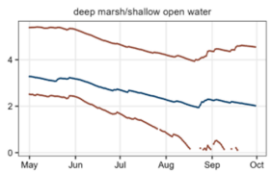
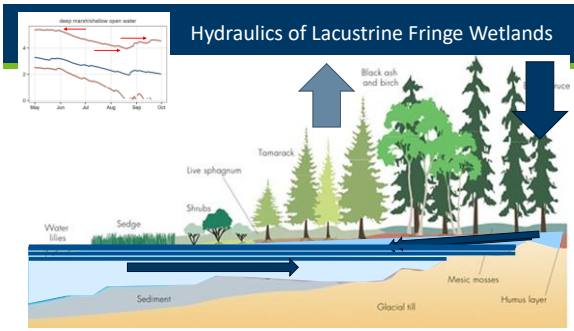
Hydrology of Lacustrine Fringe Wetlands



- Semi-permanently to permanently flooded
- Indundation levels vary with precipitation and evapotransporation
- Baseline flow and surface water input
- Lake levels can control local groundwater
- Surface flow out

36

Hydraulics of Lacustrine Fringe Wetlands



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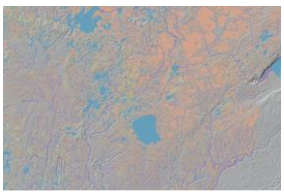
Key Concepts:

- Understand how glacial activity shaped MN landscapes and deposited soil parent material.
- Geomorphology is used to classify wetlands based on the Hydrogeomorphic Method.
- 3 Parameters of HGM- Geomorphology, Hydrology and Hydraulics- contribute to soil development.



38

Questions, comments, thoughts, ridicule…

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BOARD OF WATER AND SOIL RESOURCES

Minnesota Wetland Professional Certification Program

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What is Soil?

- Natural body that occurs on the land surface, occupies space, and is characterized by one or both of the following:
- Horizons or layers, or
- The ability to support rooted plants in a natural environment
  - Upper limit is air or shallow (>2.5 m) water
  - Lower limit is either bedrock or the limit of biological activity
  - Lower limit for classification set at an arbitrary 2 m

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Two Categories of Soil Material - Mineral Soil/Horizons

Mineral horizons

- Primarily sand, silt, and clay, with varying amounts of organic matter

Organic horizons

- consists of mostly decomposed organic material

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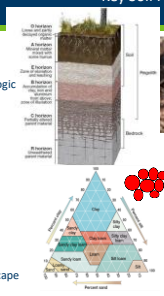
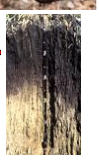
Key Soil Properties

Properties that are important to hydric soil development and recognition:

- Horizons- layer of soil with similar physical, chemical, and biologic properties
- Texture- relative proportion of soil particles (sand, silt, clay)
- Structure- arrangement of solid parts and of the pore spaces located between them
- Permeability- ability of water to move through a material
- Color- hue, value, chroma
- Organic matter- percent, thickness, and level of organic decomposition
- Drainage- presence of natural and human drainage on a landscape





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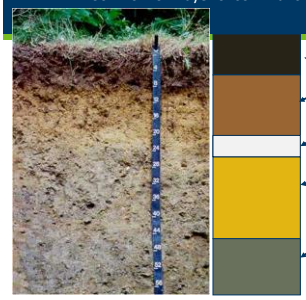
Soil Horizon- layer of soil with similar physical, chemical, and biologic properties



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

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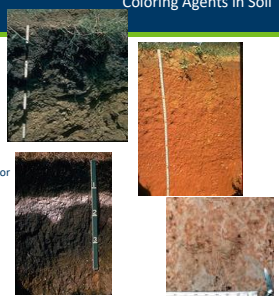
Coloring Agents in Soil

- Organic matter
  - OM will mask all other coloring agents.
- Iron
  - brown colors are the result of Fe oxide stains coating individual particles
- Manganese
  - resulting in a very dark black or purplish black color
- Calcium
  - Resulting in lighter colors, chemically unique
- Lack of coatings
  - Color of the mineral soil grains (stripped)



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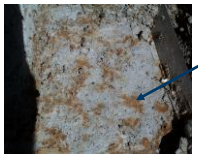
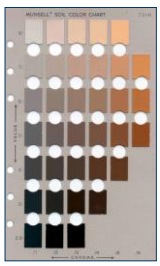
Color

- Matrix (predominant) color
- Color of redoximorphic features
  - Contrast, abundance, location, and size of redox features



What is the percent of redox?

30%



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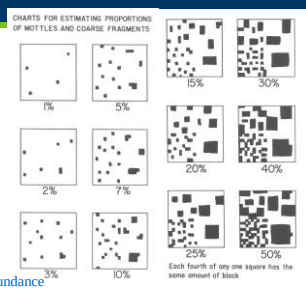
Abundance and Size of Redox

Abundance

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

Size

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



Several indicators require at least 2% abundance

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Contrast

- Contrast refers to the degree of visual distinction between associated colors
  - Faint -- evident only on close examination
  - Distinct -- readily seen at arms length
  - Prominent -- contrast strongly

Contrast Class	Code	Difference in Color Between Matrix and RMF (Δ means "difference between")				
		Hue (h)	Value (v)			*Chroma (c)*
Faint [1]	F	Δh = 0;	Δv ≤ 2	and		Δc ≤ 1
		Δh = 1;	Δv ≤ 1	and		Δc ≤ 1
		Δh = 2;	Δv = 0	and		Δc = 0
Distinct [1]	D	Δh = 0;	Δv ≤ 2	and		Δc > 1 to < 4
			or Δv > 2 to < 4	and		Δc < 4
		Δh = 1;	Δv ≤1	and		Δc > 1 to < 3
			or Δv > 1 to < 3	and		Δc < 3
		Δh = 2;	Δv = 0	and		Δc > 0 to < 2
			or Δv > 0 to < 2	and		Δc < 2
Prominent [1]	P	Δh = 0;	Δv ≥ 4	or		Δc ≥ 4
		Δh = 1;	Δv ≥ 3	or		Δc ≥ 3
		Δh = 2;	Δv ≥ 2	or		Δc ≥ 2
		Δh ≥ 3;				

[1] If compared colors have both a value ≤3 and a chroma of ≤2, the contrast is *Faint*, regardless of hue differences.

Several indicators require distinct or prominent contrast!

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Depleted Matrix

Iron removed or re-organized in profile leaving Grey matrix

- **Value 4 or More**
- **Chroma 2 or Less**

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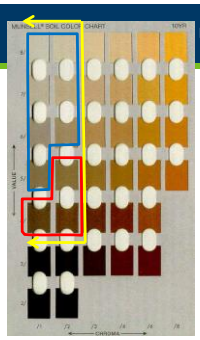
Depleted Matric Requirement



Do Not Need Concentrations

Need Concentrations (2%)

High Value (4 or more)

Low Chroma (2 or Less)

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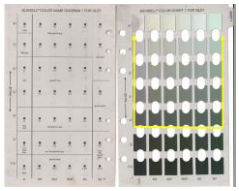
Gleyed Matrix Requirements

Gleyed Matrix

- **Iron Present, but in reduced state (Fe2+) Gleyed color with value > = 4**



50

Definition of a Hydric Soil

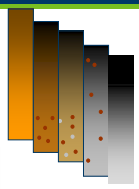
- A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding **long enough** during the **growing season** to develop anaerobic conditions in the **upper part**.

51

Hydric Soil Development

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

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



Foundation of the Field Indicator Manual.

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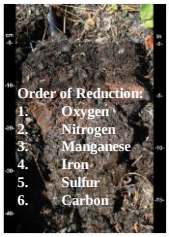
Hydric Soil Development

Soil microbes that drive reduction require:

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

In anaerobic conditions decomposition slows and leads to organic accumulation



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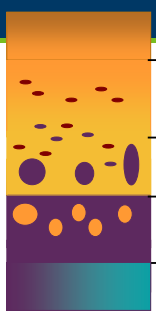
Anaerobic process



Never Saturated
Oxidized Matrix

Infrequently Saturated
Oxidized Matrix with few concentrations

Frequently Saturated
Oxidized Matrix with depletions And concentrations

Very Frequently Saturated
Depleted or Reduced Matrix With concentrations

Permanently Saturated - depleted Or reduced matrix

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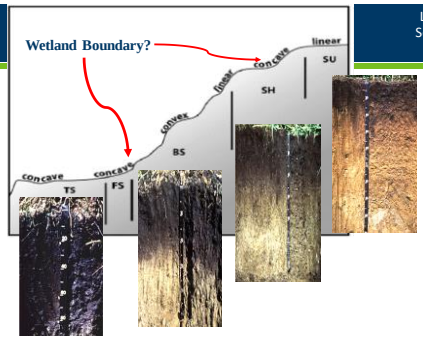
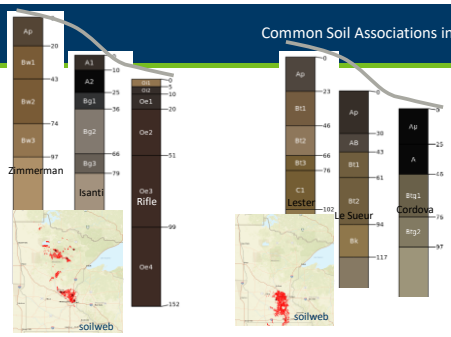
Landscape Soil Catena



55

Common Soil Associations in MN



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Field Indicators of Hydric Soils

Natural Resources Conservation Service

- National Technical Committee for Hydric Soils

Used for **on-site verification** of hydric soils

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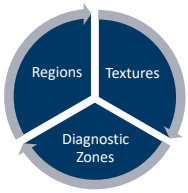
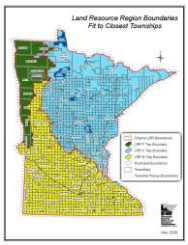
Field Indicator Organization- Regions





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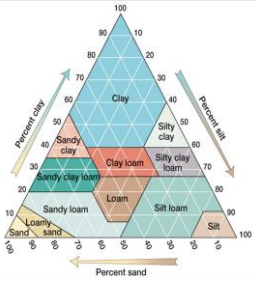
Field Indicator Organization- Texture

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



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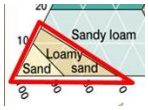
Soil Indicator Groups- Texture

Sandy Soil Indicators (S):

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



Fine Grained Soil Indicators (F):

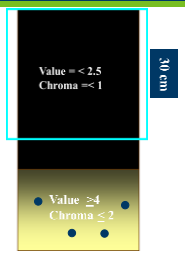
- Use when texture is:
  - Loamy Very Fine Sand or finer

A group- all textures

60

Diagnostic Zones

- Layers with :
  - Certain **Colors**
    - high value and low chroma
    - redoximorphic features
    - organic matter accumulations
  - Specific **Depths** from Surface
  - **Thickness** requirements



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Diagnostic Zones for S and F indicator groups

Sandy (S)

Upper 15 cm (6")

Loamy / Clayey (F)

Upper 30 cm (12")

62

A1- Histosol

- **A1. Histosol:** Classifies as a Histosol. A Histosol has a layer of organic matter accumulation of ≥ 16 inches in the upper 32 inches of soil material.
- Use in all LRRs

A1.—Histosol *(for use in all LRRs)* or **Histel** *(for use in LRRs with permafrost)*. Classifies as a Histosol (except Folist) or as a Histel (except Folistel).

User Notes: In a Histosol, typically 40 cm (16 inches) or more of the upper 80 cm (32 inches) is organic soil material (fig. 7). Organic soil materials have organic carbon contents (by weight) of 12 to 18 percent or more, depending on the clay content of the soil. These materials include muck (sapric soil material), mucky peat (hemic soil material), and peat (fibric soil material). See *Keys to Soil Taxonomy* (Soil Survey Staff, 2014) for a complete definition.

Figure 7.—Indicator A1 (Histosol or Histel). This soil has more than 40 cm (16 inches) of organic material, starting at the soil surface.

63

A11- Depleted Below Dark Surface

- Applicable land resource regions (LRR)
  - Use in all MN LRRs

A11.—Depleted Below Dark Surface. *For use in all LRRs, except for W, X, and Y; for testing in LRRs W, X, and Y.* A layer with a depleted or gleyed matrix that has 60 percent or more chroma of 2 or less, starting at a depth ≤30 cm (12 inches) from the soil surface, and having a minimum thickness of either:

a. 15 cm (6 inches), or
b. 5 cm (2 inches) if the 5 cm consists of fragmental soil material.

Organic, loamy, or clayey layer(s) above the depleted or gleyed matrix must have value of 3 or less and chroma of 2 or less starting at a depth <15 cm (6 inches) from the soil surface and extend to the depleted or gleyed matrix. Any sandy material above the depleted or gleyed matrix must have value of 3 or less and chroma of 1 or less starting at a depth ≤15 cm (6 inches) from the soil surface and extend to the depleted or gleyed matrix. Viewed through a 10x or 15x hand lens, at least 70 percent of the visible sand particles must be masked with organic material. Observed without a hand lens, the sand particles appear to be close to 100 percent masked.

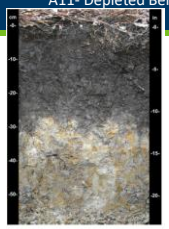

Figure 16.—Indicator A11 (Depleted Below Dark Surface). This soil has a thick dark surface horizon that meets the requirements of indicator A11. Unlike the matrix in figure 15, the depleted matrix below the dark surface horizon in this soil starts at a depth of about 25 cm, which is too deep to meet the requirements of indicator F3 (Depleted Matrix). Indicator A11 allows a deeper depleted matrix than indicator F3.

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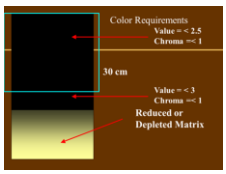
A12- Thick Dark Surface

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

Figure 17.—Indicator A12 (Thick Dark Surface). Deep observation is needed to determine whether a soil meets the requirements of this indicator. In this soil, depth to the depleted matrix is about 65 cm.

A12.—Thick Dark Surface. *For use in all LRRs.* A layer at least 15 cm (6 inches) thick with a depleted or gleyed matrix that has 60 percent or more chroma of 2 or less starting below 30 cm (12 inches) of the surface. The layer(s) above the depleted or gleyed matrix and starting at a depth <15 cm (6 inches) from the soil surface must have value of 2.5 or less and



chroma of 1 or less to a depth of at least 30 cm (12 inches) and value of 3 or less and chroma of 1 or less in any remaining layers above the depleted or gleyed matrix. In any sandy material above the depleted or gleyed matrix, at least 70 percent of the visible soil particles must be masked with organic material, viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100 percent masked.

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F6- Redox Dark Surface

- Applicable land resource regions (LRR)
  - Use in all LRRs

F6.—Redox Dark Surface. *For use in all LRRs, except W, X, and Y; for testing in LRRs W, X, and Y.* A layer that is at least 10 cm (4 inches) thick, starting at a depth ≤20 cm (8 inches) from the mineral soil surface, and has:

a. Matrix value of 3 or less and chroma of 1 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings, or
b. Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

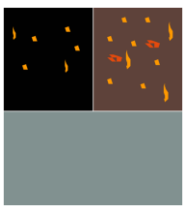

Figure 31.—Indicators F6 (Redox Dark Surface) and F7 (Depleted Dark Surface). A soil that meets the requirements of indicator F7 commonly also meets the requirements of indicator F6. If the dark surface layer has depletions, it most likely also has concentrations.

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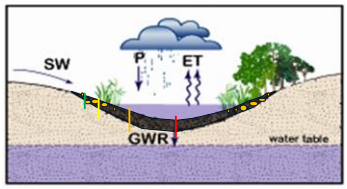
Cross Section of Hydric Soils in Depression Wetlands

- Histosol A1
- Thick dark surface A12
- Depleted below dark surface A11
- Redox dark surface F6

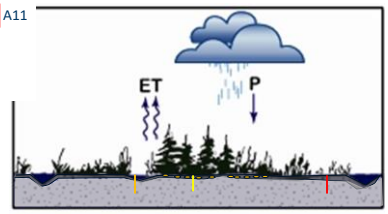


Surface Water - Depression

67

Cross Section of Hydric Soil in Mineral Flat Wetlands

- Depleted Below dark Surface A11
- Loamy mucky mineral F1
- Redox Dark Surface F6

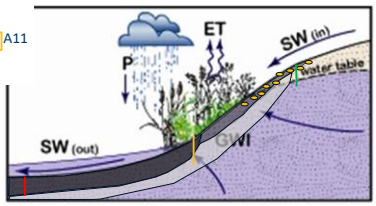


Surface Water - Extensive Flat

68

Cross Section of Hydric Soils in Sloped Wetlands

- Histosol A1
- Depleted below dark surface A11
- Redox Dark Surface F6

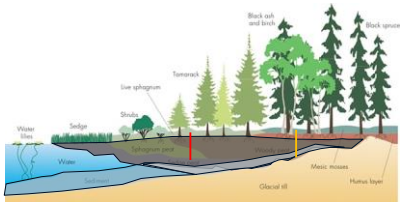


Ground Water - Slope

69

Cross Section of Hydric Soils in Lacustrine Fringe

- Histosol A1
- Thick Dark Surface A12



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USE OF WEB SOIL SURVEY TO DETERMINE SITE INFORMATION

wsb

BOARD OF WATER AND SOIL RESOURCES

MNBWSR CEU Training: Soils on the Landscape – Robert Nye Regional Park

April 29th and April 30th 2025

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HOW CAN I USE THE SOIL SURVEY TO DETERMINE SITE SPECIFIC INFORMATION PRIOR TO STEPPING FOOT ONSITE ?

- Soil Series within project limits
- Soil Map Unit Descriptions
- Geomorphic Landscape Position
- Parent Material
- Drainage Class
- Depth of Water Table
- Depth of Bedrock
- Soil Physical Properties
- Soil Textures
- Soil Erosion Factors
- Flood Frequency
- Hydrologic Soil Group
- Ecological Sites
- Water Management

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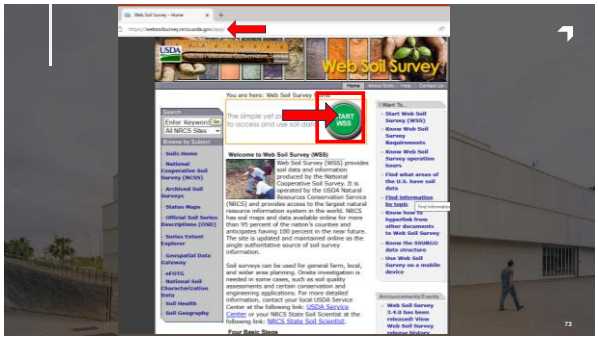
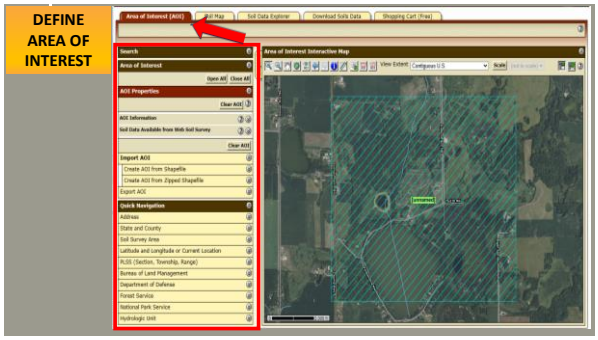
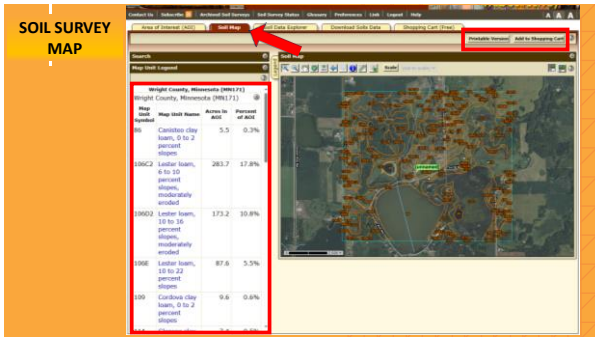

Web Soil Survey
TAB: WSS

73

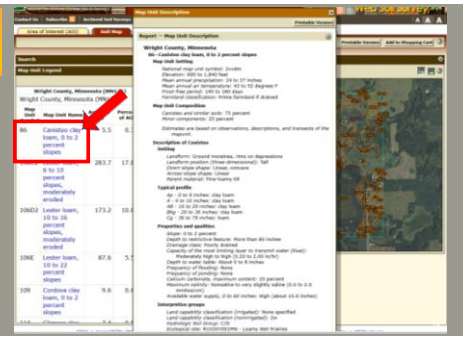

DEFINE AREA OF INTEREST

74


SOIL SURVEY MAP

75

SOIL MAP UNIT DESCRIPTION



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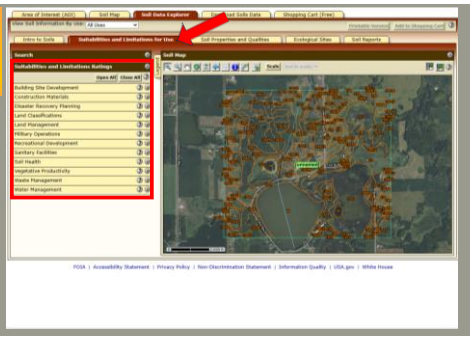
SUITABILITY AND LIMITATIONS RATINGS



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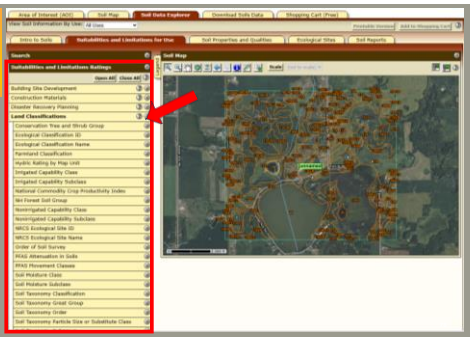
SUITABILITY AND LIMITATIONS RATINGS



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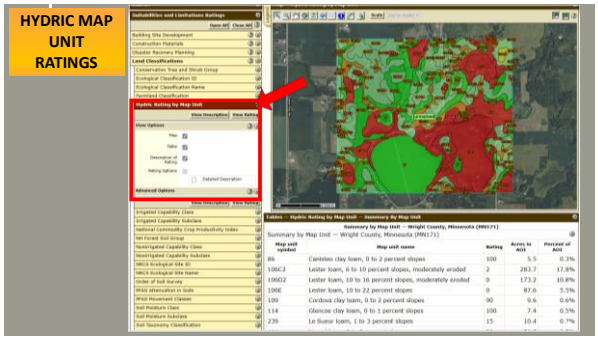
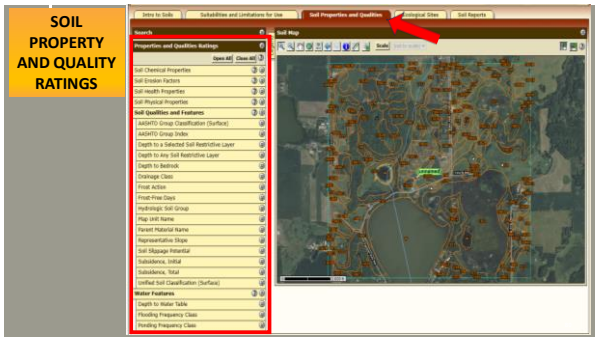
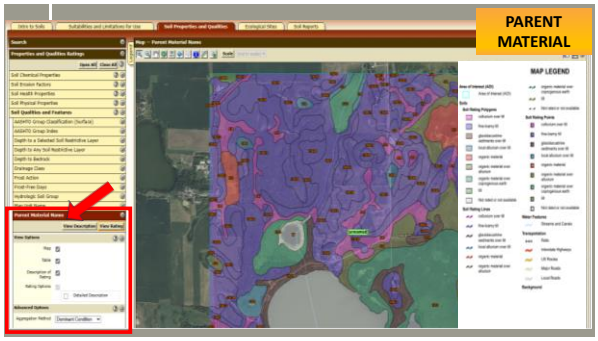

HYDRIC MAP UNIT RATINGS

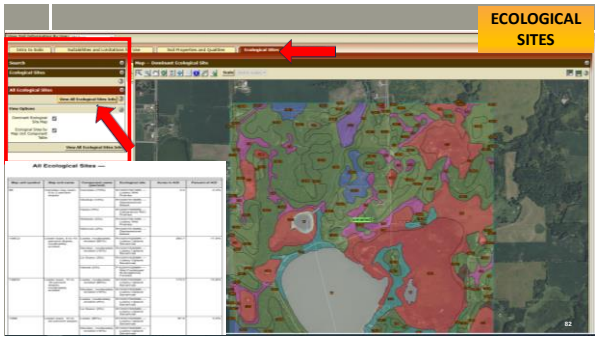
79


SOIL PROPERTY AND QUALITY RATINGS

80


PARENT MATERIAL

81



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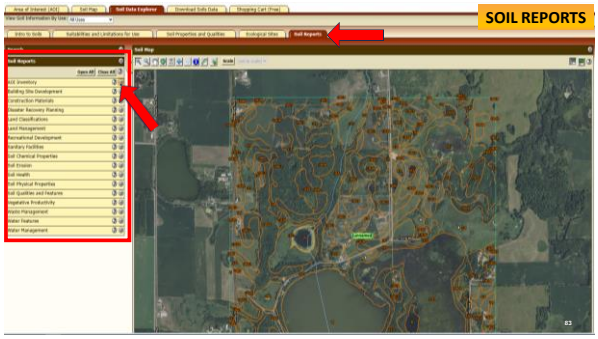

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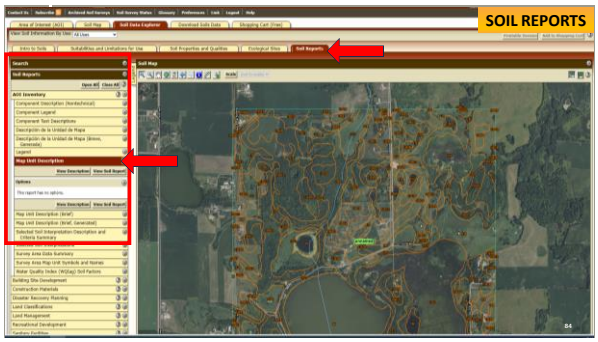

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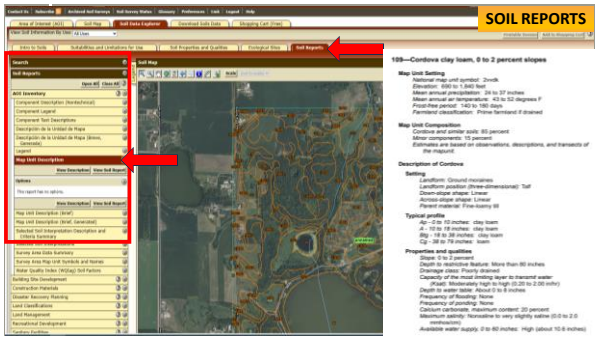


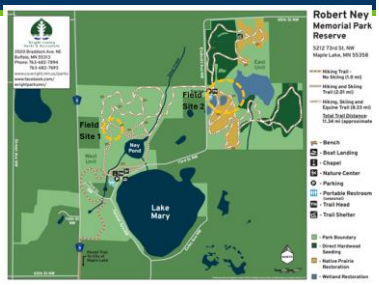
85

wsb

THANK YOU

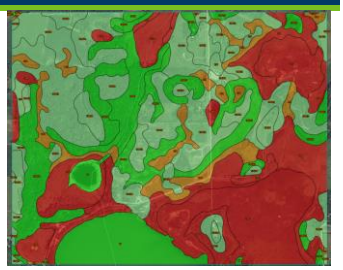
86

Field Sites



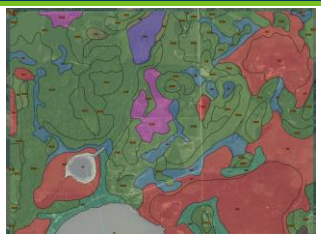
87

Hydric Soil Rating



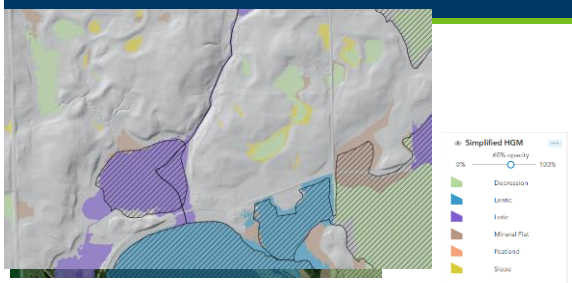
88

Ecological Sites



89

HGM



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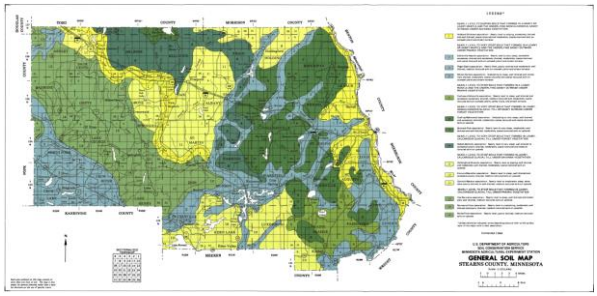
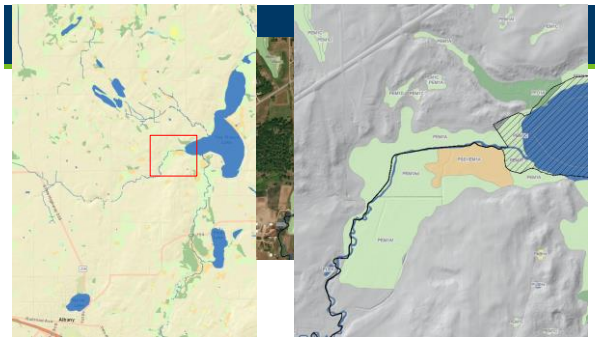
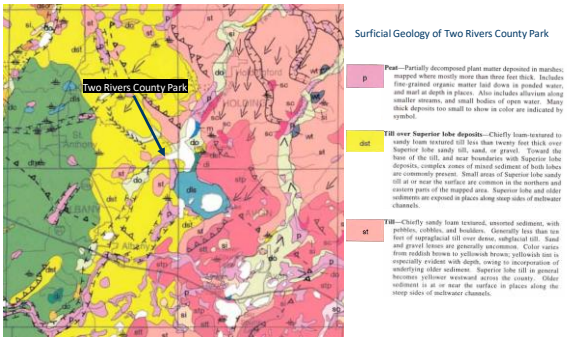

GENERAL SOIL MAP
STEARNS COUNTY, MINNESOTA

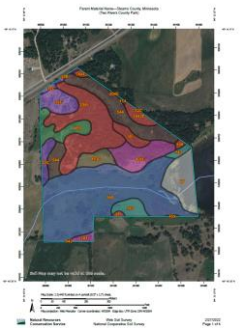
91



92


Two Rivers County Park
Surficial Geology of Two Rivers County Park
p
Peat—Partially decomposed plant matter deposited in marshes; mapped where mostly more than three feet thick. Includes fine-grained organic matter laid down in ponded water, and marl at depth in places. Also includes alluvium along smaller streams, and small bodies of open water. Many thick deposits too small to show in color are indicated by symbol.
dst
Till over Superior lobe deposits—Chiefly loam-textured to sandy loam textured till less than twenty feet thick over Superior lobe sandy till, sand, or gravel. Toward the base of the till, and near boundaries with Superior lobe deposits, complex zones of mixed sediment of both lobes are commonly present. Small areas of Superior lobe sandy till at or near the surface are common in the northern and eastern parts of the mapped area. Superior lobe and older sediments are exposed in places along steep sides of meltwater channels.
st
Till—Chiefly sandy loam textured, unsorted sediment, with pebbles, cobbles, and boulders. Generally less than ten feet of supraglacial till over dense, subglacial till. Sand and gravel lenses are generally uncommon. Color varies from reddish brown to yellowish brown; yellowish tint is especially evident with depth, owing to incorporation of underlying older sediment. Superior lobe till in general becomes yellower westward across the county. Older sediment is at or near the surface in places along the steep sides of meltwater channels.

93



Parent Material Name

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
320	Nelson loam, 0 to 1% percent slopes	flow-loamy till	2.0	2.2%
322	Nelson loam, 2 to 3% percent slopes	flow-loamy till	4.0	4.3%
327	Nelson sandy loam, 2% to 4% percent slopes	till	1.8	2.0%
100	Cordova loam	till	6.0	6.4%
114	Quam silty clay loam, occasionally ponded, 0 to 1 percent slopes	local alluvium over till	0.1	0.1%
1344	Gudding sandy loam, 15 to 25 percent slopes	till	15.2	16.5%
281	Dalfon cuyler sandy loam	outwash	1.0	1.1%
440E	Dorset sandy loam, 15 to 25 percent slopes	outwash	6.0	6.5%
455C	Dalfonville loamy sand, 6 to 15 percent slopes	outwash over till	2.5	2.7%
453	Corcoma loam	water-worked sediments over till	3.9	4.1%
540	Seelyeville-Greenwille complex, 0 to 1 percent slopes	herbaceous organic material	55.9	56.9%
543	Markey muck, occasionally ponded, 0 to 1 percent slopes	herbaceous organic material over sandy outwash	3.1	3.4%
544	Cathro muck, occasionally ponded, 0 to 1 percent slopes	herbaceous organic material over till	10.3	11.2%
194ZP	Cushing and Flak sandy loams, steep	till	1.6	1.7%
W	Water		6.7	7.3%
Totals for Area of Interest			91.9	100.0%

94

Stearns County, Minnesota

544—Cathro muck, occasionally ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2w0lr
Elevation: 590 to 2,030 feet
Mean annual precipitation: 24 to 33 inches
Mean annual air temperature: 37 to 48 degrees F
Frost-free period: 110 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Cathro, occasionally ponded, and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cathro, Occasionally Ponded

Setting

Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material over till

Typical profile

Oa - 0 to 26 inches: muck
Cg - 26 to 79 inches: loam

95

Stearns County, Minnesota

543—Markey muck, occasionally ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t4td
Elevation: 590 to 2,030 feet
Mean annual precipitation: 23 to 33 inches
Mean annual air temperature: 36 to 48 degrees F
Frost-free period: 90 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Markey, occasionally ponded, and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Markey, Occasionally Ponded

Setting

Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material over sandy outwash

Typical profile

Oa - 0 to 28 inches: muck
Cg - 28 to 79 inches: sand

96

Stearns County, Minnesota

540—Seelyeville-Seelyeville, ponded, complex, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2vsd
Elevation: 590 to 2,030 feet
Mean annual precipitation: 24 to 33 inches
Mean annual air temperature: 37 to 48 degrees F
Frost-free period: 110 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Seelyeville and similar soils: 55 percent
Seelyeville, ponded, and similar soils: 45 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Seelyeville

Setting

Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material

Typical profile

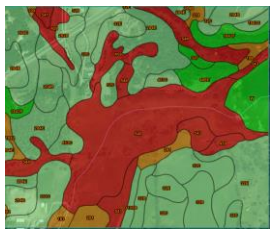
Oa1 - 0 to 10 inches: muck
Oa2 - 10 to 79 inches: muck

97

544—Cathro muck, occasionally ponded, 0 to 1 percent slopes
Map Unit Setting

543—Markey muck, occasionally ponded, 0 to 1 percent slopes
Map Unit Setting

540—Seelyeville-Seelyeville, ponded, complex, 0 to 1 percent slopes
Map Unit Setting



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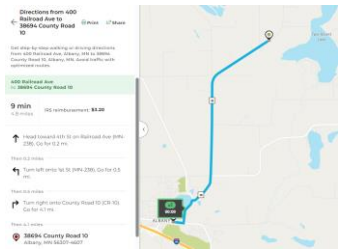
Directions from 400 Railroad Ave to 38694 County Road 10
Print
Share
400 Railroad Ave
to 38694 County Road 10
9 min
IRS reimbursement: $5.20
Head toward 4th St on Railroad Ave (MN-238). Go for 0.2 mi.
Turn left onto 1st St (MN-238). Go for 0.5 mi.
Turn right onto County Road 10 (CR-10). Go for 4.1 mi.
38694 County Road 10
Albany, MN 56307-4607

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