

Refresher Quiz

- Colors
- Textures





Contrast

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

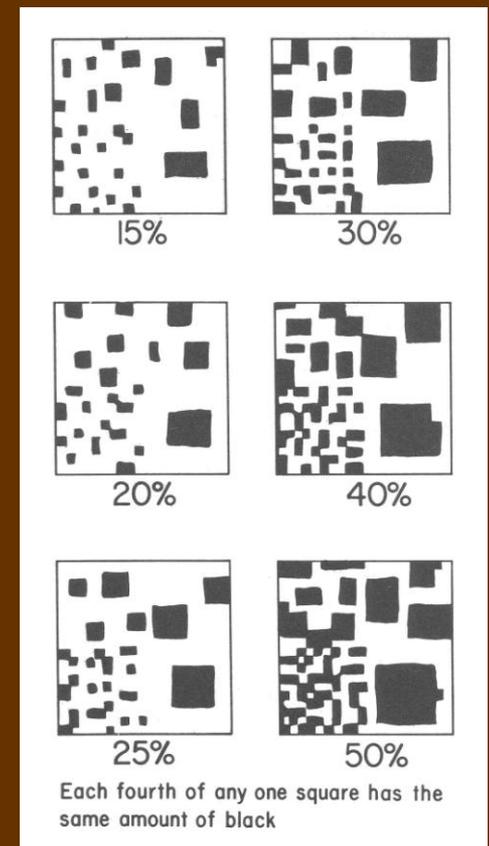
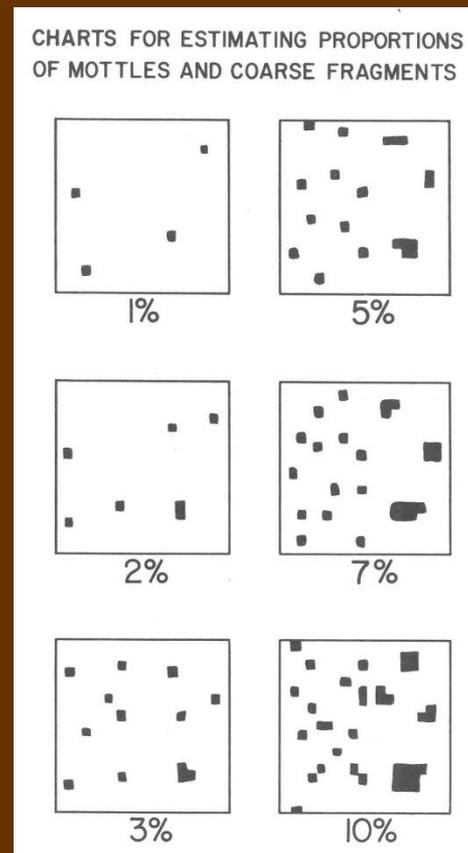
Several indicators require distinct or prominent contrast!

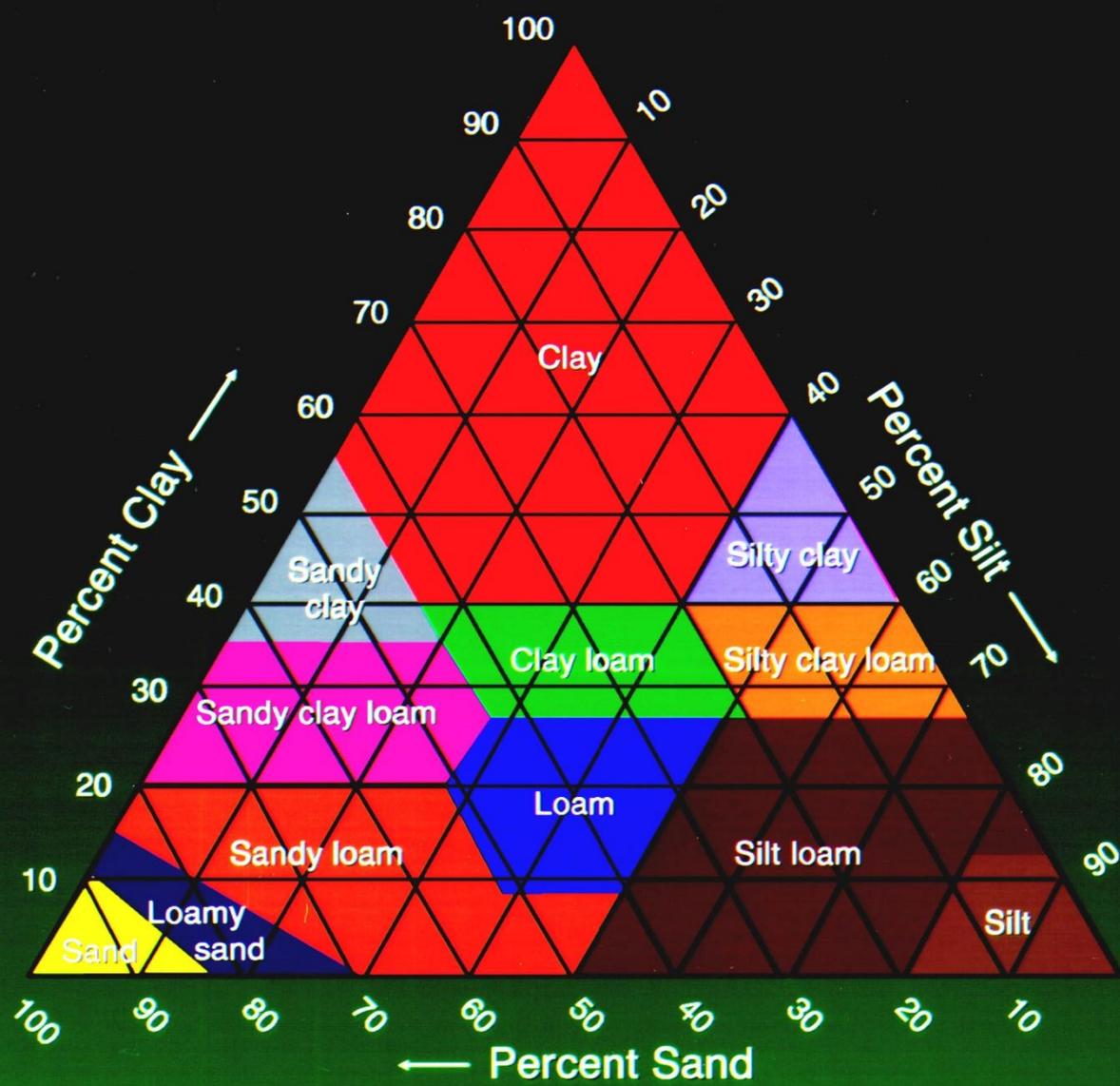
Abundance and Size of Redox

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

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

Several indicators require at least 2% abundance

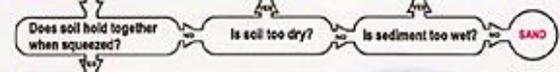




USDA SOIL TEXTURING FIELD FLOW CHART



Remove any material larger than 2 mm in size and start with approximately 25g of sediment in palm. Add water dropwise and knead the soil to break down all aggregates. Stop adding water when soil is plastic and moldable.



Place ball of soil between thumb and forefinger gently pushing the soil with the thumb, squeezing it upward into a ribbon. Form the ribbon with uniform thickness and width. Allow the ribbon to extend over the forefinger, breaking from its own weight.



Excessively wet a small pinch of soil in palm and rub with forefinger



TEXTURE MODIFIERS
Fragment Content, % by weight

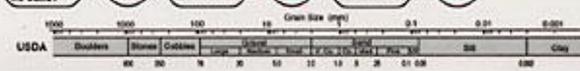
< 10%	No modifier
10% to < 20%	Add modifier
20% to < 30%	Add "very" with modifier
30% to < 40%	Add "extremely" with modifier
40% to < 50%	Add "super" with modifier
50% to < 60%	Add "extremely" with modifier
60% to < 70%	Add "super" with modifier
70% to < 80%	Add "extremely" with modifier
80% to < 90%	Add "super" with modifier
90% to < 100%	Add "extremely" with modifier

ROCK FRAGMENT MODIFIERS
Size Class & Quantity

Gravelly	> 15% but < 30%
Very Gravelly	> 15% but < 30%
Medium Gravelly	> 15% but < 30%
Large Gravelly	> 15% but < 30%
Very Coarse	> 15% but < 30%
Subsandy Gravelly	> 15% but < 30%
Coarse	> 15% but < 30%
Very Coarse	> 15% but < 30%
Extremely Coarse	> 15% but < 30%
Stony	> 15% but < 30%
Very Stony	> 15% but < 30%
Extremely Stony	> 15% but < 30%
Stoney	> 15% but < 30%
Very Stoney	> 15% but < 30%
Extremely Stoney	> 15% but < 30%
Stony	> 15% but < 30%
Very Stony	> 15% but < 30%
Extremely Stony	> 15% but < 30%

COMPOSITIONAL TEXTURE MODIFIERS

Organic Class	> 15% organic
Clayey	> 15% clayey
Siltaceous	> 15% siltaceous
Mucky	> 15% mucky
Mouldy	> 15% mouldy
Moist	> 15% moist



Hydric Soil Criteria & Field Indicators of Hydric Soils - Refresher



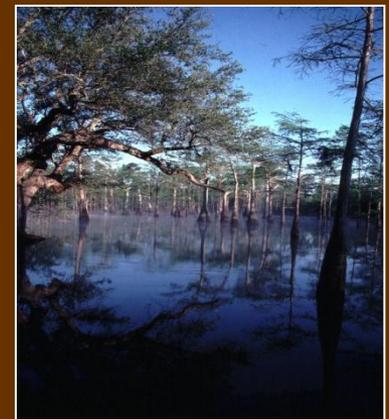
Dan Wheeler – University of Minnesota
Dept. Soil, Water & Climate *and* Water Resources Center

Hydric Soils

- The concept of a “hydric soil” was developed to help identify wetlands for inventory, regulation, restoration, etc.
- Hydric soil identification involves both policy and science
 - Hydric soils imply discrete boundaries in a natural continuum
 - ACOE 1987 manual hydric soil indicators are general

Definition of a Hydric Soil

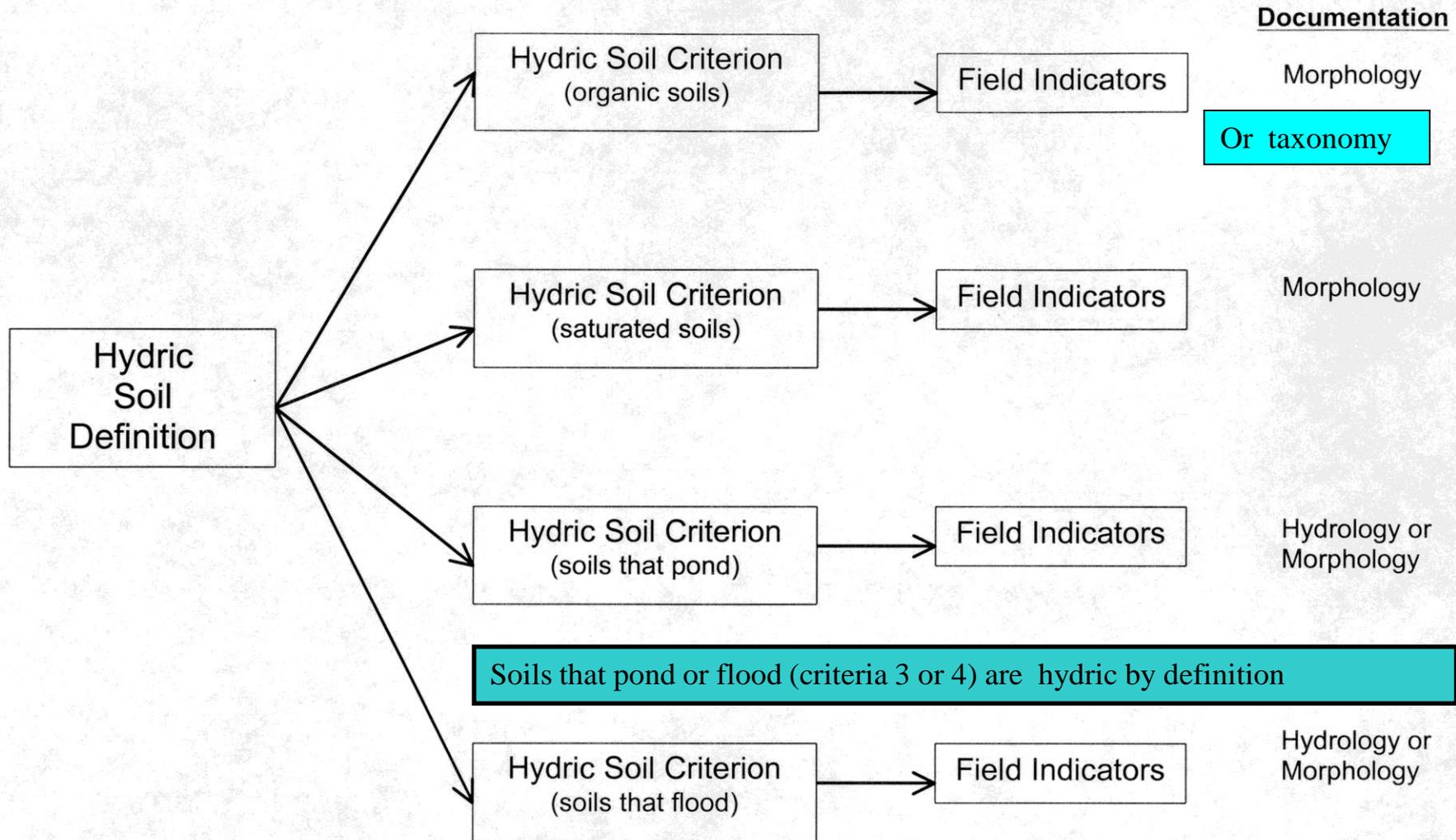
A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.



Hydric Soil Identification

- **Hydric Soil Criteria**
 - database search of estimated soil properties
 - designed to generate a list of soils that are likely to be hydric
- **Field Indicators**
 - the preferred method based on observable soil morphology (soil color, organic layers, etc.)
- **Monitoring Data**
 - used with technical standard for sites with no observable hydric morphology

Relationship Between Definition, Criterion and Indicators



Local Lists of Hydric Soils

- Local lists still have applicability for wetland delineation purposes, especially for screening
- Available on the WEB soil survey, or
- <http://soils.usda.gov/use/hydric/lists/state.html>
- <http://soildatamart.nrcs.usda.gov/>
- Download excel file with hydric soils for each county
- Supplements require less reliance on site-specific soil survey data (use of NRCS Field Indicators and a revised data form)

Map symbol and map unit name	Component	Percent of map unit	Landform	Hydric rating	Hydric criteria
86: Canisteo clay loam	Canisteo	85	Flats	Yes	2B3
113: Webster clay loam	Webster	85	Swales	Yes	2B3
114: Glencoe silty clay loam	Glencoe	85	Depressions	Yes	2B3, 3
134: Okoboji silty clay loam	Okoboji	85	Depressions	Yes	2B3, 3
227: Lemond loam	Lemond	85	Flats	Yes	2B3
241: Letri clay loam	Letri	85	Swales	Yes	2B3
255: Mayer loam	Mayer	85	Flats	Yes	2B3
269: Millington loam	Millington	85	Flood plains	Yes	2B3
282: Hanska fine sandy loam	Hanska	85	Flats	Yes	2B3
317: Oshawa silty clay loam	Oshawa	85	Flood plains	Yes	2B3, 4
321: Tilfer clay loam	Tilfer	85	Benches, Flats	Yes	2B3
392: Biscay loam	Biscay	85	Flats	Yes	2B3
399: Biscay loam, depressional	Biscay, depressional	85	Depressions	Yes	2B3, 3
562: Knoke silty clay loam	Knoke	85	Depressions	Yes	2B3, 3

Web Soil Survey

The screenshot shows the Web Soil Survey website in a Mozilla Firefox browser window. The browser's address bar displays the URL <http://websoilsurvey.nrcs.usda.gov/app/>. The website header features the USDA logo and the text "United States Department of Agriculture Natural Resources Conservation Service". The main heading is "Web Soil Survey". Below the header, there is a navigation menu with links for "Home", "About Soils", "Help", and "Contact Us". The main content area includes a search box with the text "Enter Keywords" and a "Go" button, and a "Browse by Subject" sidebar with various categories like "Soils Home", "National Cooperative Soil Survey (NCSS)", "Archived Soil Surveys", "Status Maps", "Official Soil Series Descriptions (OSD)", "Soil Series Extent Mapping Tool", "Soil Data Mart", "Geospatial Data Gateway", "eFOTG", "National Soil Characterization Data", "Soil Geochemistry Spatial Database", "Soil Quality", and "Soil Geography". The main content area also features a "START WSS" button and a "Welcome to Web Soil Survey (WSS)" section. The "Welcome" section includes a photograph of people in a field and text stating: "Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information." Below this, there is a "Three Basic Steps" section with a numbered list starting with "1 Define..." and a sub-section titled "Area of Interest (AOI)" with a "Use the Area of Interest tab to define your area of interest." sidebar. The sidebar also contains sections for "I Want To..." (listing "Start Web Soil Survey (WSS)", "Know the requirements for running Web Soil Survey", "Know whether my web browser works with Web Soil Survey", "Know the Web Soil Survey hours of operation", and "Find what areas of the U.S. have soil data"), "Announcements/Events" (listing "Web Soil Survey 2.0 has been released! View description of new features."), and "I Want Help With..." (listing "How to use Web Soil Survey", "Known problems and workarounds", "Frequently Asked Questions", and "Citing Web Soil Survey as a source of soils data"). The browser's taskbar at the bottom shows the Windows start button, open applications including "Microsoft PowerPoint ..." and "septic", and the current browser window "Web Soil Survey - Ho...". The system tray on the right shows the time as 9:49 PM.

[Websoilsurvey.nrcs.usda.gov](http://websoilsurvey.nrcs.usda.gov)



View Soils

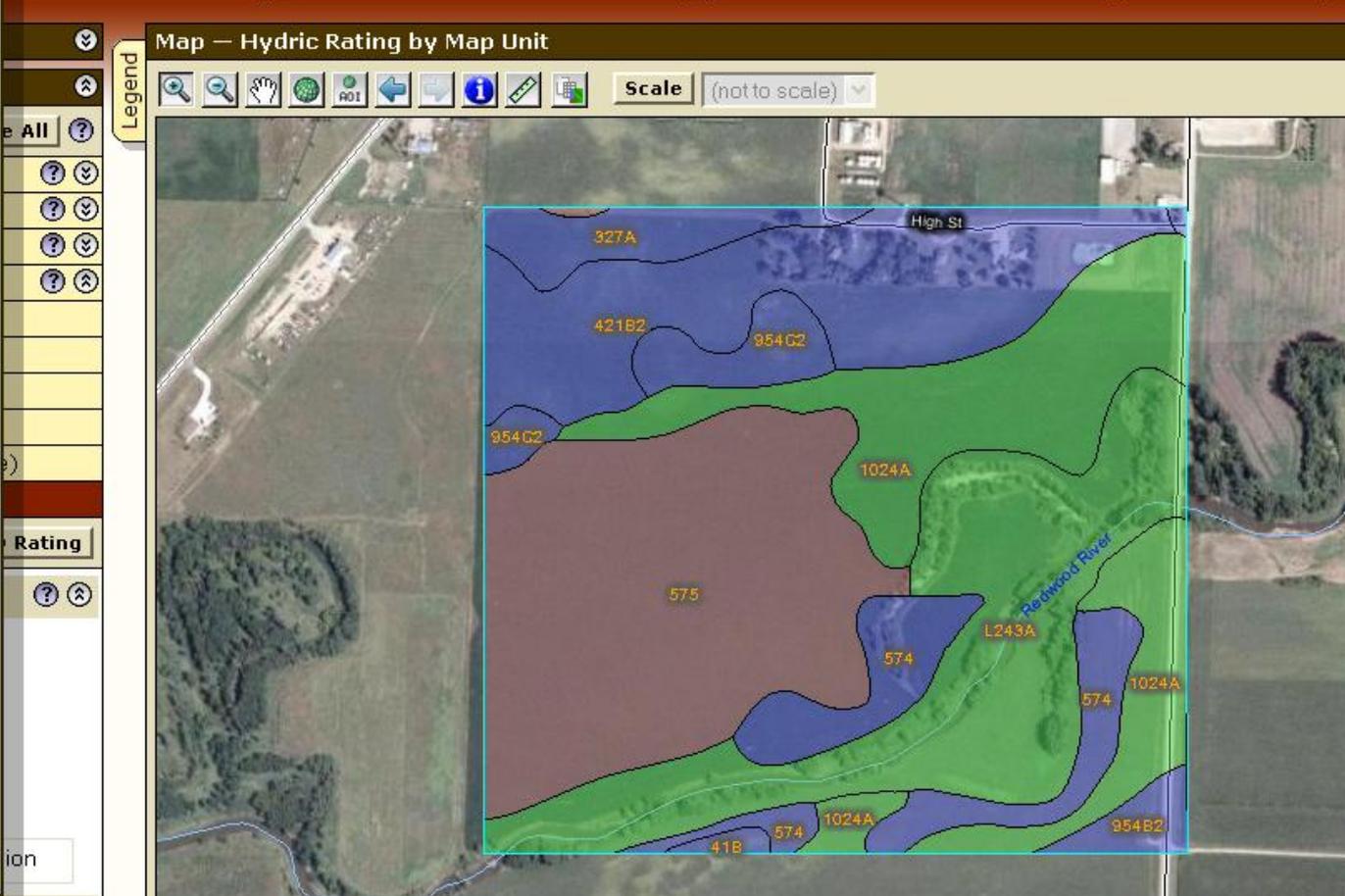
Map Legend

Map Legend

- Area of Interest (AOI)
 - Area of Interest (AOI)
- Soils
 - Soil Survey Areas
 - Soil Map Units
 - Soil Ratings
 - All Hydric
 - Partially Hydric
 - Not Hydric
 - Unknown Hydric
 - Not rated or not available
 - Special Point Features
 - Special Line Features
- Political Features
 - States
 - Counties
 - Urban Areas
 - Cities
 - Postal Code
 - PLSS Township and Range
 - PLSS Section
- Federal Land
 - Bureau of Land Management
 - Bureau of Reclamation

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Limitations for Use Soil Properties and Qualities Ecological Site Assessment Soil Reports





Tables – Hydric Rating by Map Unit – Summary By Map Unit

Summary by Map Unit – St. Louis County, Minnesota, Meadowlands Part

Map unit symbol	Map unit name	Rating	Acres in AOI
1020A	Bowstring muck and Fluvaquents, loamy, 0 to 1 percent slopes, frequently flooded	All Hydric	21.9
B81A	Cathro muck, depressional, duluth catena, 0 to 1 percent slopes	All Hydric	11.3
B104A	Ellsburg-Baden complex, 0 to 2 percent slopes	Partially Hydric	67.3
B107A	Baden muck, depressional, 0 to 1 percent slopes	All Hydric	56.9
B118A	Rifle soils, duluth catena, 0 to 1 percent slopes	All Hydric	104.1
B121A	Merwin peat, duluth catena, 0 to 1 percent slopes	All Hydric	16.5
B122A	Tacoosh mucky peat, duluth catena, 0 to 1 percent slopes	All Hydric	198.8
B123A	Blackhoof-Cathro-Baden complex, depressional, 0 to 1 percent slopes	All Hydric	4.7
B124A	Dusler-Ellsburg complex, 0 to 3 percent slopes	Partially Hydric	103.7
B125B	Culver silt loam, 3 to 8 percent slopes	Not Hydric	20.2
B126D	Duluth-Culver complex, 3 to 18 percent slopes	Not Hydric	141.9
B126E	Duluth silt loam, 18 to 45 percent slopes	Not Hydric	100.5
B127B	Culver-Dusler-Ellsburg complex, 0 to 8 percent slopes	Partially Hydric	858.1
B128D	Duluth-Culver-Cathro, depressional, complex, 0 to 18 percent slopes	Partially Hydric	199.3
B130D	Duluth-Duluth, coarse substratum-Ellsburg complex, 0 to 18 percent slopes	Partially Hydric	9.6
B148A	Greenwood soils, duluth catena, 0 to 1 percent slopes	All Hydric	282.2
W	Water	Unknown Hydric	6.3
Totals for Area of Interest			2,203.5

	Blackfoot, depressional	70	Depressions on moraines, depressions on till plains	2B3, 3
	Baden, depressional	15	Depressions on moraines, depressions on till plains, drainageways on moraines, drainageways on till plains	2B3, 3
	Cathro, depressional	15	Depressions on moraines, depressions on till plains	1, 3
B124A—Dusler-Ellsburg complex, 0 to 3 percent slopes				
	Ellsburg	35	Flats on moraines, drainageways on moraines	2B3
	Baden, depressional	10	Drainageways on moraines, depressions on moraines	2B3, 3
B127B—Culver-Dusler-Ellsburg complex, 0 to 8 percent slopes				
	Ellsburg	16	Moraines	2B3
	Baden, depressional	3	Depressions on moraines, drainageways on moraines	2B3, 3
	Cathro, depressional	2	Depressions on moraines	1, 3
B128D—Duluth-Culver-Cathro, depressional, complex, 0 to 18 percent slopes				
	Cathro, depressional	10	Depressions on moraines	1, 3
	Baden, depressional	7	Depressions on moraines, drainageways on moraines	2B3, 3
	Ellsburg	6	Moraines	2B3
B130D—Duluth-Duluth, coarse substratum-Ellsburg complex, 0 to 18 percent slopes				
	Ellsburg	18	Moraines	2B3
B148A—Greenwood soils, duluth catena, 0 to 1 percent slopes				
	Greenwood	45	Bogs on till plains, bogs on moraines	1
	Greenwood, depressional	45	Bogs on till plains, bogs on moraines	1, 3
	Merwin	10	Bogs on till plains, bogs on moraines	1, 3

Where/when to use soil survey?

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region **(DRAFT)**

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

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

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

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

Slope (%): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

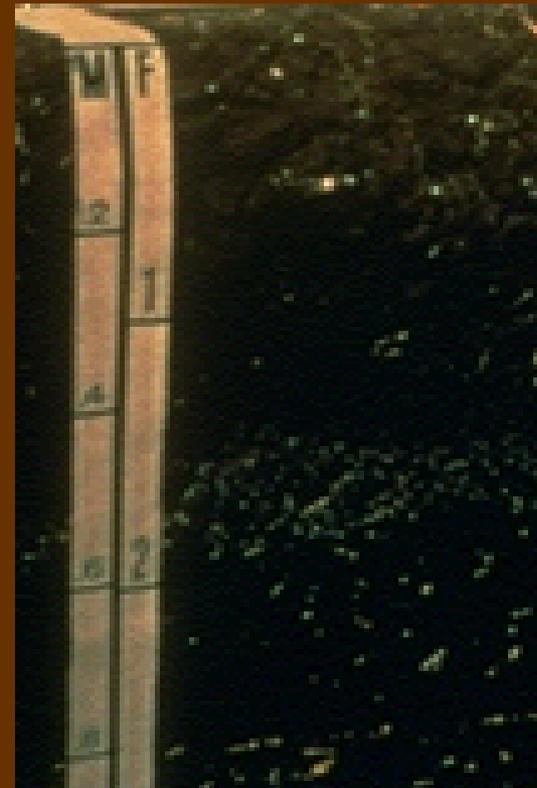
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes _____ No _____	Is the Sampled Area within a Wetland? Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	
Remarks: (Explain alternative procedures here or in a separate report.)		If yes, optional Wetland Site ID: _____

Determine if surface horizon is mineral or organic



It's Organic...

- High amount of decomposed plant material
- Saturated soil materials (except in bedrock)
- >12-18% organic carbon
- Histosol (A1)
 - >50% organic soil (by depth) in upper 80cm
- Histic epipedon (A2)
 - 20-60cm of organic soil that is saturated (at or near surface)
 - Proof of drainage status required
- Black histic (A3)



Organic Decomposition

- Fibric (peat)
 - Least decomposed
 - Plant fibers identifiable
 - After rub – $>40\%$ of fibers still visible (2/3)
- Hemic (mucky peat)
 - Intermediate decomposition
- Sapric (muck)
 - Most decomposed, $<1/3$ ID of plant fibers
 - $<1/6$ of fibers visible after rubbing

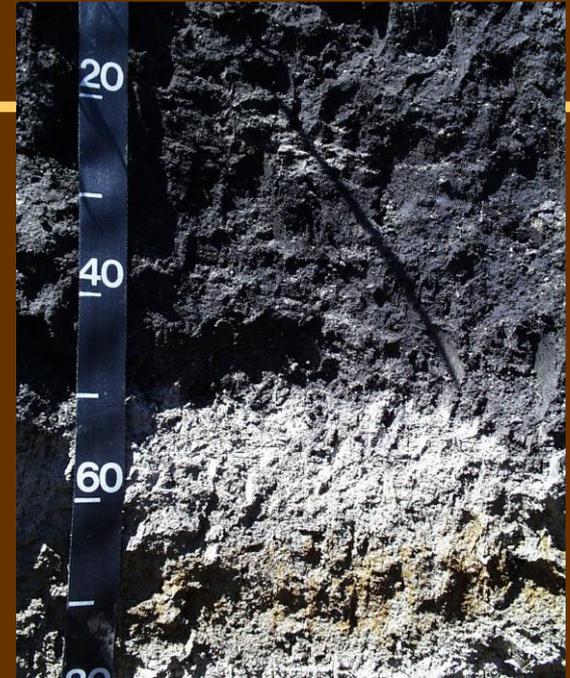


So what about Mucky Modified?

- Highly decomposed organic material
- Lower percentage
 - 5-18% organic carbon
- Modifies the mineral textural class
 - E.g. Mucky loamy sand

Procedures (pg 9 of FI flip chart)

- Rub soil 1-2 times
 - If gritty, mineral
- Rub additional 2-3 times
 - If gritty or sticky, mucky mineral
 - If greasy, organic
- If organic – level of decomposition
 - Hand lens
 - Rub 10 times
 - Does not include live roots



Additional organic determinations (unofficial)

- Weight
 - Known mineral > questionable soil
- Squeeze moisture from sample
- Rubbed soil loses significant (>30%) volume
- Ground surface is spongy

Gleyed Matrix

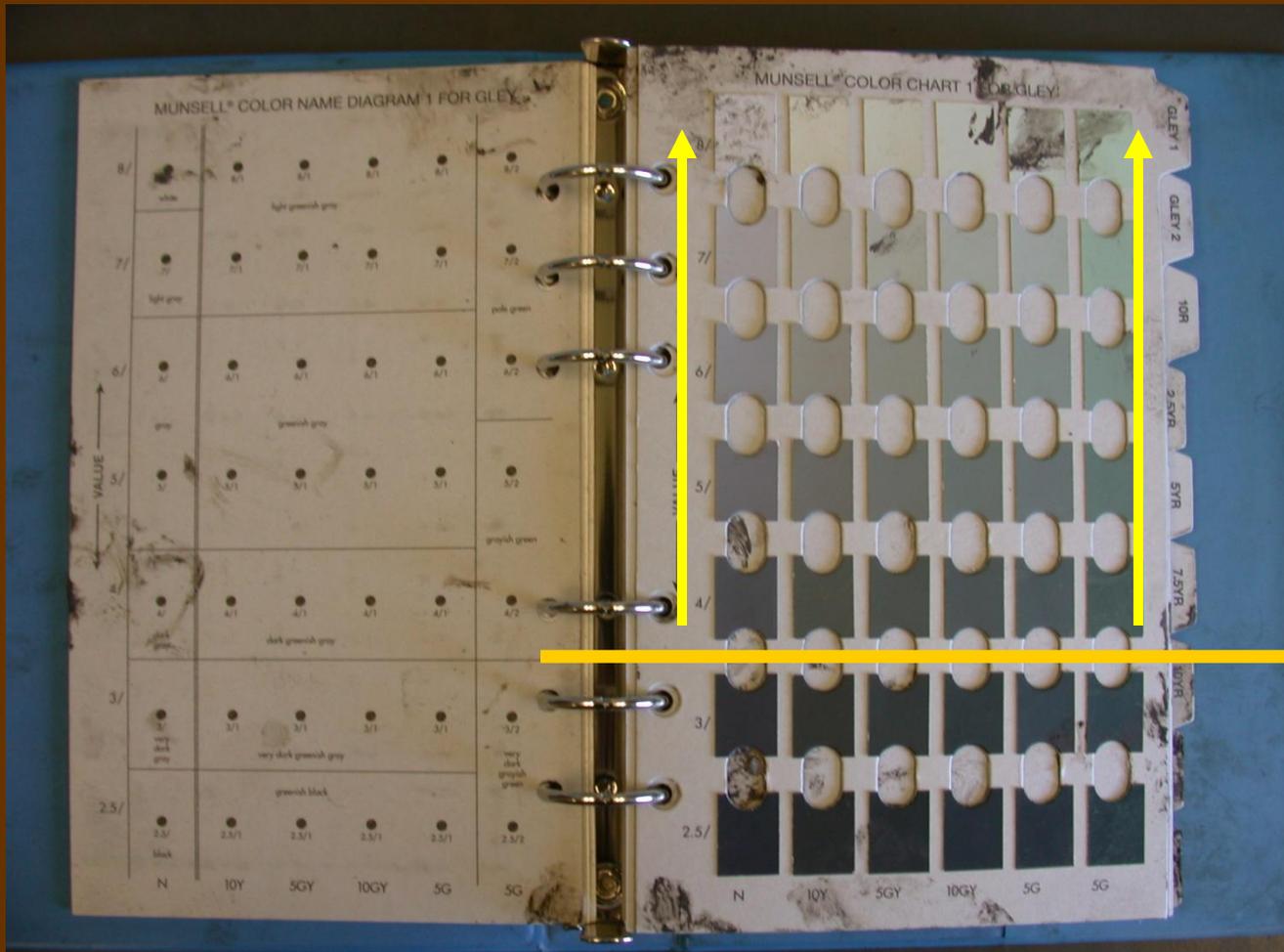


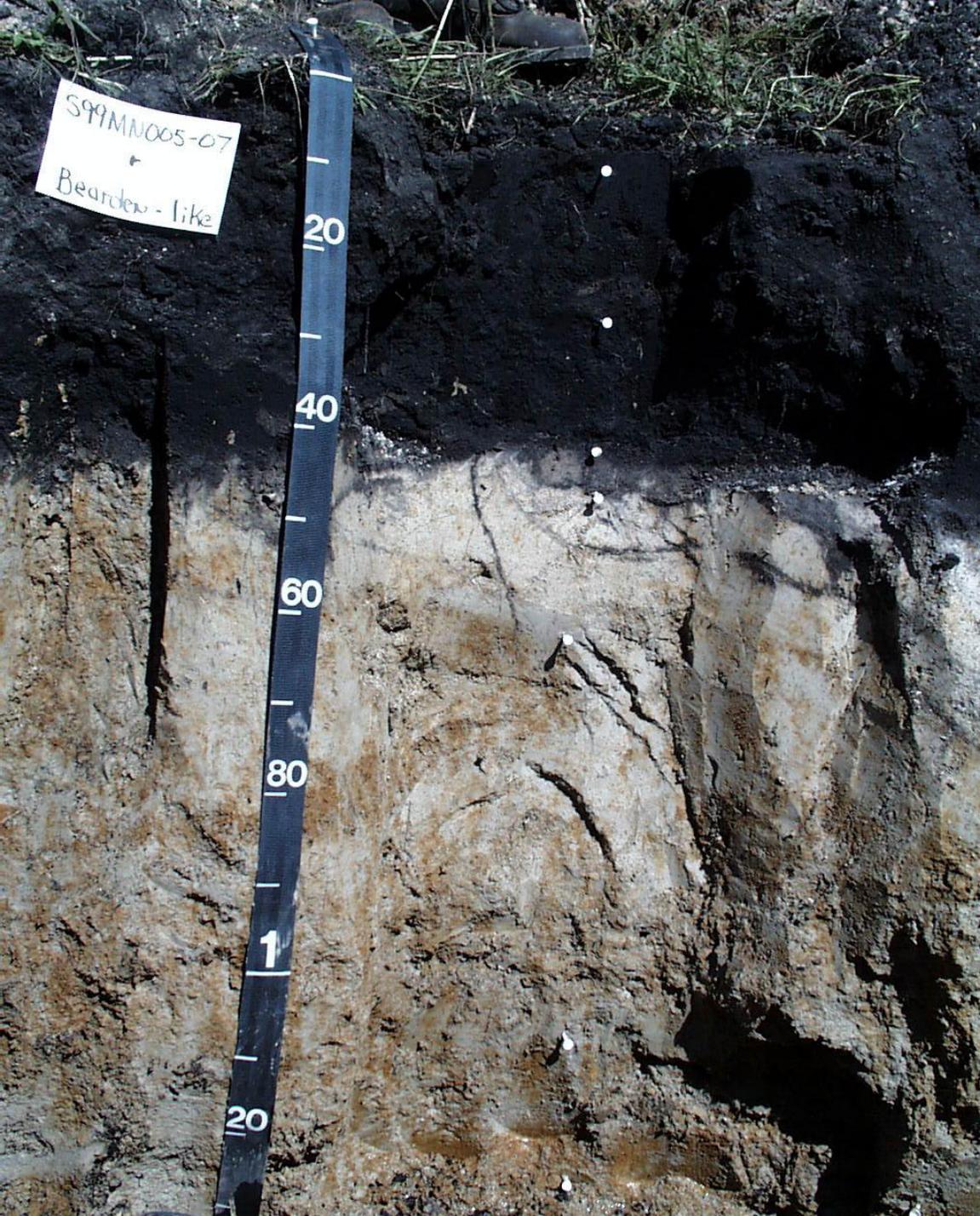
FI Requirements - Gleyed Matrix

- Gleyed Matrix
 - All gleyed colors with value ≥ 4



FI Requirements - Gleyed Matrix





Depleted Matrix

FI Requirements - Redox Feature Morphology

- Depleted Matrix
 - Value ≥ 5 , chroma ≤ 1
 - Value ≥ 6 , chroma ≤ 2
 - Value 4, chroma 1 or 2 with $\geq 2\%$ distinct redox concentrations
 - Value 5, chroma 2 with $\geq 2\%$ distinct redox concentrations

FI Requirements - Depleted Matrix Colors



FI Requirements - Depleted Matrix





E Horizon

Calcic Horizon



FI Requirements - Cautions About a Depleted Matrix

- Read the user notes in the official publication
- A,E and calcic horizons may have high value/low chroma colors
- To be considered a “depleted matrix”, these layers must have common or many distinct or prominent redox concentrations occurring as soft masses or pore linings!!

Field Indicators of Hydric Soils

Natural Resources Conservation Service
in cooperation with the
National Technical Committee for Hydric Soils

ftp://ftp-fc.sc.egov.usda.gov/NSSC/Hydric_Soils/FieldIndicators_v7.pdf



Introduction

- Field indicators are soil morphological features used to identify hydric soils
- The features result from soil genesis in the presence of “anaerobic conditions”
- They are used for **on-site verification** of hydric soils
- The list of indicators is dynamic and are subject to revision with new research and field testing
- FI Version 7.0 not in Regional Supplements

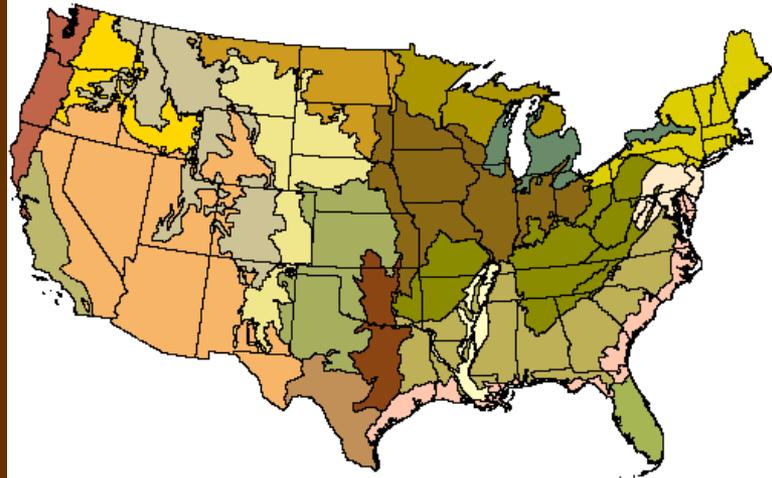
Field Indicators

- Provide a method to prove or disprove the presence of a hydric soil, based on--
- Feel
- Sight
- Smell

Regional

- Lists of indicators by Land Resource Region (LRR)
- Addresses “problem” soils
 - Mollisols and Vertisols
 - Sandy soils
 - Flooded and ponded soils

USDA Land Resource Regions

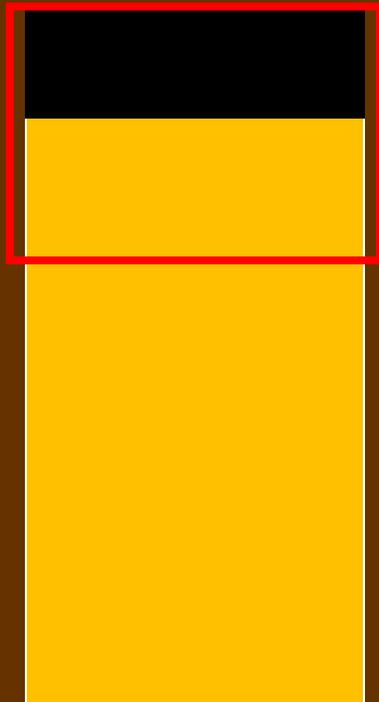


Three Major Divisions

- All soils
 - Use regardless of soil texture
 - Mostly surface layers of organic matter accumulations
 - A11 and A12 (common in Minnesota)
- Sandy soils
- Loamy and clayey soils
 - Use sandy indicators in sandy layers, loamy indicators in loamy layers

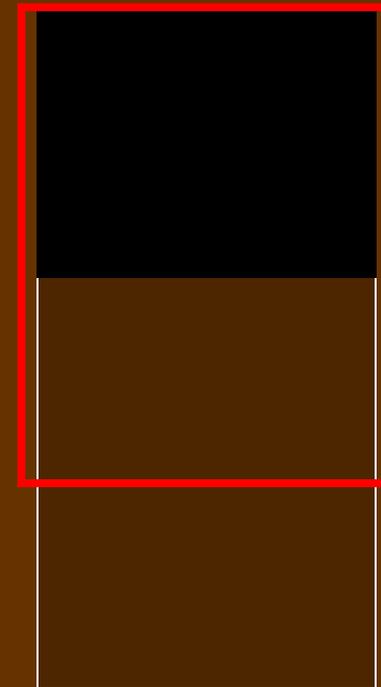
Determine Diagnostic Zone

Sandy



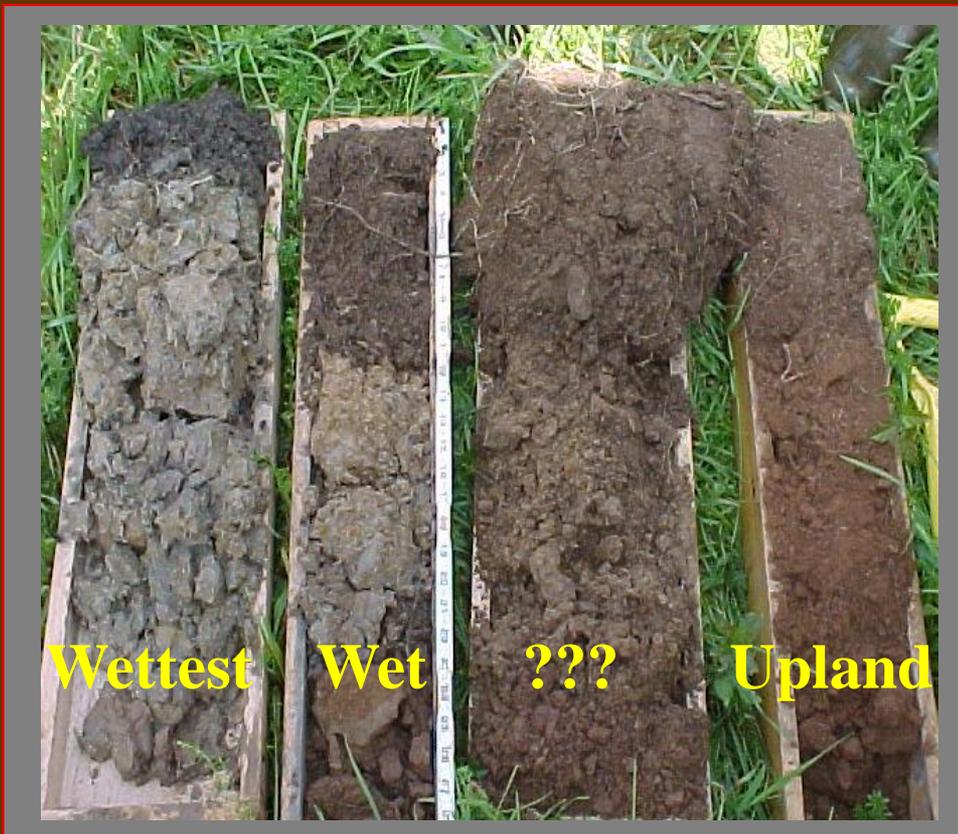
Upper
15 cm (6 inches)

Loamy / Clayey



Upper
30 cm
(12 inches)

Landscape Transect Approach



- Soils occur as a continuum on the landscape
- Describe a known “wet” soil
- Describe a known “upland” soil
- Use judgment to discern the boundary

Still Not Sure?

- Look at the entire soil profile
 - top to bottom, not just immediately below the A
- Indicators of wetland hydrology and a hydrophytic plant community
 - herbaceous layer is often more diagnostic than trees
- When all else fails....the last resort.....

Monitor

-Apply the NTCHS Hydric
Soil Technical Standard
(HSTN #11)





Steve D. Eggers Photo

The Three Parameter Approach:

- 1. Hydrology**
- 2. Soils**
- 3. Vegetation**

But Also:

- 4. Topography**
- 5. Professional Judgment**