



MN Wetland Professional Certification Program Basic Class- Day 2

m BOARD OF WATER
AND SOIL RESOURCES



1



m BOARD OF WATER
AND SOIL RESOURCES



2

Quiz

1) Sampling transects should be?

- Used when conducting a routine level 1 delineation
- Representative of wetland-upland transition areas
- Located systematically using an established grid
- Randomly located throughout the evaluation area



3

2) What is the maximum average water depth for a special aquatic site to be classified as a wetland?

- 1 foot below the surface
- 8.2 feet above the surface
- 1 foot above the surface
- 3 feet above the surface



4

3) Wetland boundaries must be delineated using:

- Only the US Army Corps of Engineers 1987 manual for identifying and delineating jurisdictional wetlands
- The hydrogeomorphic method
- The WCA Rulebook
- the US Army Corps of Engineers 1987 manual for identifying and delineating jurisdictional wetlands as well as the applicable Regional Supplement to the manual

4) A seasonally flooded wetland on agricultural land is normally plowed and planted in most years. For delineation purposes, which of the following conclusions is most likely true?

- This is not a jurisdictional wetland
- Normal circumstances are not present
- Normal circumstances exist
- A level 2 delineation is required

5

5) Explain the concept of a Problem area

- Indicators absent to seasonal, or annual variability; or permanent due to the nature of the soils or species
- Including seasonal wetlands, prairie soils, red parent material etc.





6

6) Explain the concept of an Atypical Situation

- One or more Indicators absent due to human activity or natural events (beavers, fire, river changing course)

7) Which of the following can be used for determining the start of the growing season?

- a) Soil temperature at 41 inches below the surface
- b) Soil temperature at the soil surface
- c) Soil temperature at 18 inches below the surface
- d) Soil temperature at 12 inches below the surface



7

8) What classification system uses Systems, Sub-systems and Classes?

- a) HGM
- b) Eggers and Reed
- c) Cowardin
- d) Circular 39

9) Which of the following plant communities would be characteristic of a Circular 39 type 6 wetland?

- a) Sedge meadow
- b) Bog
- c) Alder thicket
- d) Shallow marsh



8

10) Which of the follow is not a parameter of the Hydrogeomorphic Method classification system?:

- a) geomorphology
- b) plant community
- c) hydrology
- d) hydraulics

11) A natural process in a wetland that can be scientifically assessed can also be described as a:

- a) wetland value
- b) routine assessment method
- c) exemption
- d) wetland function



9

12) While most wetlands are non-navigable, they still may be considered the following and thus regulated under the Federal Clean Water Act:

- a) Incidental wetlands
- b) Perpetual Conservation Easement
- c) Upland
- d) Waters of the United States

13) Which regulatory program defines it's jurisdictional boundary by the ordinary high water level?

- a) Section 404 of Clean Water Act
- b) Wetland Conservation Act
- c) Section 401 of Clean Water Act
- d) Public Water Works Permitting Program


10

14) Which Federal regulatory program regulates the discharge of dredged or fill material:


- a) Food Security Act
- b) Rules of the Department of the Interior
- c) Section 401 of the Clean Water Act
- d) Section 404 of the Clean Water Act

15) The WCA regulates:

- a) Peat mining
- b) Normal farming practices
- c) Draining, filling of all wetland types
- d) Incidental wetlands



11

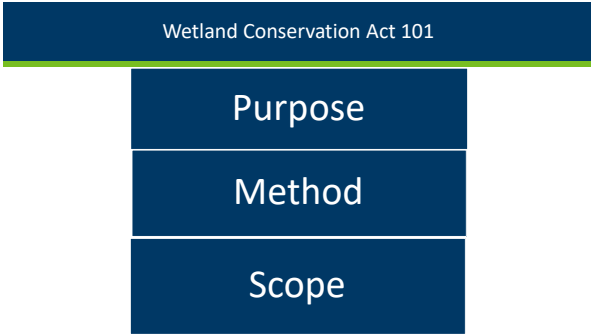


WCA 101

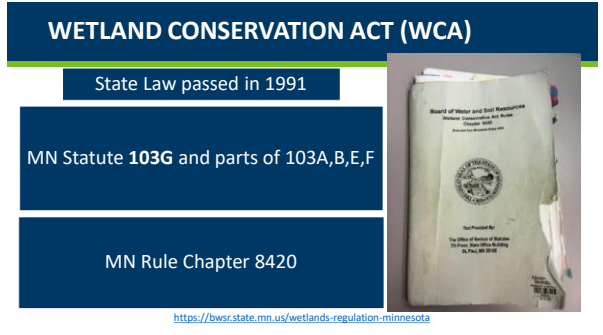


mi BOARD OF WATER AND SOIL RESOURCES

12



13



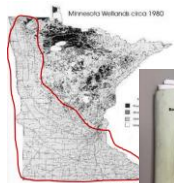

14

WETLAND CONSERVATION ACT (WCA) OF 1991

- Bipartisan Bill
- Passed in 1991
- Effective 1992

- MN Statute **103G** and parts of 103A,B,E,F
- BWSR has Rule-making authority

- MN Rule **8420**
 - Statute changes
 - Guidance Documents

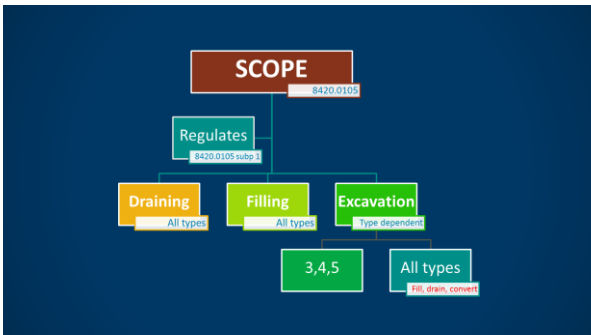



BWSR Wetland Section | www.bwsr.state.mn.us/wetlands

15



16



17



18

What Does WCA Regulate?

- Draining or filling of wetlands (wholly or partially)
- Excavation of wetlands (under certain conditions)



19

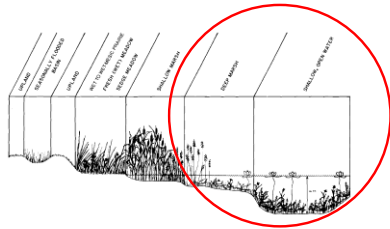
Excavation

WCA regulates excavation in *permanently* and *semi-permanently* flooded areas of *Type 3, 4, or 5* wetlands and in all wetland types if the excavation results in conversion to nonwetland (i.e. deepwater habitat which is defined as average water depth of 8.2 feet or greater).

20

Excavation

What is permanently and semi-permanently flooded?



21

What WCA Does NOT Regulate

- The use of wetlands for pasture or cropland
- Normal farming practices (plowing, seeding, timber harvesting, etc.)
- Control of noxious weeds
- Impacts to created (non-natural) wetlands (ditches, ponds, etc. created in upland areas)



22

WCA Does NOT regulate

- DNR Public Waters & PWW
 - DNR can waive to WCA for public water wetlands
- Peat Mining
 - Subject to DNR permit to mine under MN Statute 93.44-93.51
 - WCA applies if project does not require DNR permit to mine



WCA Wetland Section | www.beer.state.mn.us/wetlands

23

WCA Authority on Tribal Lands?

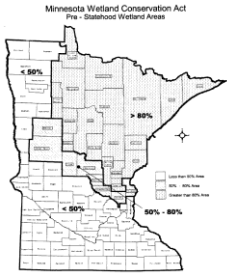
- Tribes have special legal status as sovereign nations
- Tribal lands are composed of Trust lands, allotted trust lands, fee lands
- Many tribes have enacted their own environmental regulations
- Federal regulatory environmental laws apply on Tribal Lands



- WCA does not have jurisdiction on Trust lands
- Fee lands are held by an owner (tribal member or not)
- Authority of state environmental laws on tribal land is limited to fee lands held by a non-tribal owner

24

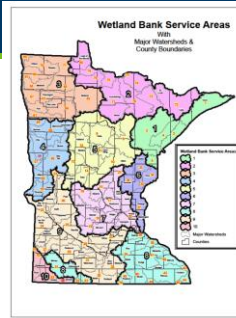
Pre-Statehood Areas



Different regulations apply depending on whether you are in a <50% area, 50 – 80% area, or >80% area.

25

Bank Service Areas



• Used in wetland mitigation siting

26

Basic Soil Concepts

m BOARD OF WATER AND SOIL RESOURCES

Minnesota Wetland Professional Certification Program

27

Overview

- Basics of Soil
 - Soil formation
 - Landscape position
- Soil Properties
 - Texture
 - Color
- Hydric soil development
- Web Soil Survey
 - Interpreting soil reports
- Hydric soil indicators
 - All
 - Fine
 - Sandy
- Common soil indicators



28

What is Soil?

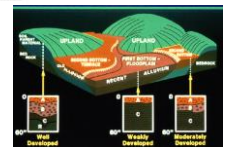
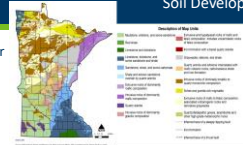
- Natural body that occurs on the land surface, occupies space, and is characterized by one or both of the following:
 - Horizons or layers, or
 - The ability to support rooted plants in a natural environment
 - Upper limit is air or shallow (>2.5 m) water
 - Lower limit is either bedrock or the limit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



29

Factors That Influence Soil Development

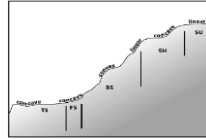
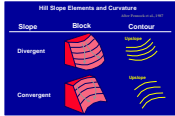
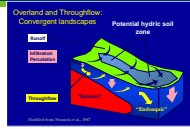
- Climate- weather conditions prevailing over long period of time
- Parent material- geologic material from which soils form
- Topography- landscape position and slope processes
- Organisms- essential role of microbes in the soil, includes humans
- Time- soil doesn't "age", it develops. vegetation, organisms and climate "act on" parent material and topography to develop soil.



30

Landscape Position

- Location relative to other landforms
- Critically influences water flow and soil formation
- Most wetlands, even groundwater seeps, are on some sort of concave surface



31

Soil Taxonomy

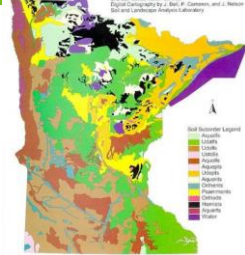
- 12 orders of soil taxonomy
- Which ones are common in MN



- **Alfisols:** wide range of climate, forest soils, clay in subsoil
- **Andisols:** volcanic, high nutrient
- **Aridisols:** desert soils
- **Entisols:** recent deposition, dunes, slopes, floodplains, sandy
- **Gelisols:** permafrost, high latitudes and/or elevation
- **Histosols:** high organic, most saturated year round
- **Inceptisols:** wide range of climate, moderate weathering
- **Mollisols:** "prairie soils", dark colored, high organic
- **Oxisols:** highly weathered tropical, stable, low fertility
- **Spodosols:** coarse-textured, acidic, conifer forests
- **Ultisols:** humid climate, weathered, clay-rich
- **Vertisols:** high content of expanding clays, Red River Valley

32

Soil Suborders of Minnesota



- What orders are based upon?

Soil forming factors: **CLORPT**

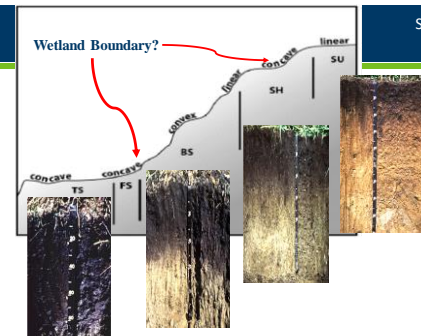
Climate, organisms, relief (landform), parent material, time

Climate and organisms (all orders)

Parent Material (Vertisol, Andisol, Histisol)

33

Soil Catena



34

Two Categories of Soil Material - Mineral Soil/Horizons

Mineral horizons

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



Organic horizon

- consists of mostly decomposed organic material



35

Organic Matter Decomposition

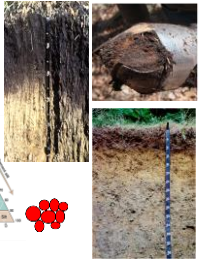
- **Fibric (peat)**
 - Least decomposed
 - Plant fibers identifiable
 - After rub - >40% of fibers still visible (2/3)
- **Hemic (mucky peat)**
 - Intermediate decomposition
- **Sapric (muck)**
 - Most decomposed, <1/3 ID of plant fibers
 - <1/6 of fibers visible after rubbing



36

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



37

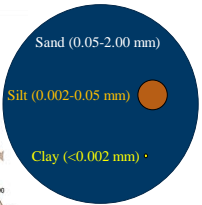
Soil Horizon- layer of soil with similar physical, chemical, and biologic properties



- O horizon- Organic horizon, thickness varies
- A Horizon- Organic accumulation (typically ~10%), ideally 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

38

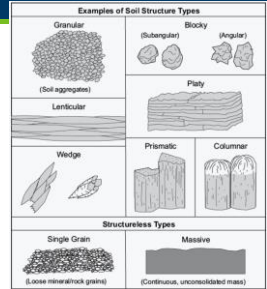
Soil Texture- Relative proportion of soil particles



39

Soil Structure

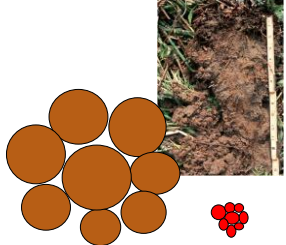
- Soil Structure- arrangement of solid parts and of the pore spaces located between them
- Aggregation- interaction and arrangement of soil particles
- Precipitation of oxides, carbonates and silicates
 - Cementation
- Can decline under cultivation & irrigation



40

Permeability- ability of water or air to move through the soil profile

- Variables in permeability:
 - Structure- arrangement of soil characterized by size, shape (blocky, columnar, platy, etc.) and grade (weak, strong)
 - Texture- pore space of different particle sizes
- Permeability is "measured" in inches per hour
 - Permeability is an estimated property
- Larger grain sizes= higher permeability



41

Capillary Fringe

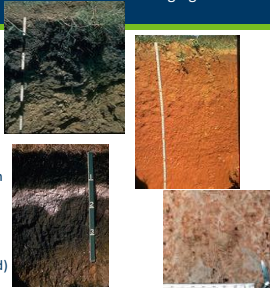
- Based upon permeability
- The zone above the free water table that is effectively saturated
 - Water held at tension
 - Theoretical values much higher than "real life"
 - Difficult to measure



42

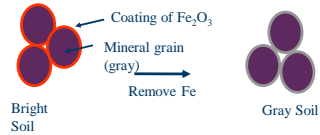
Coloring Agents in Soil

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



43

Soil Color

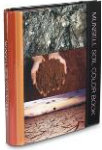


“Bright-colored” soil is bright because the gray-colored mineral grains are coated with a thin layer of “paint” formed by Fe oxides. Stripping the paint off the particles leaves the mineral grains exposed.

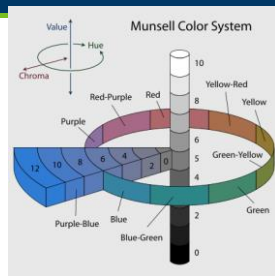
44

Color

- Hue- the spectrum color
- Value- lightness or darkness
- Chroma- “purity” or grayness of color



Hue Value Chroma
10YR 2/1



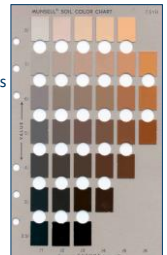
45

Color

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



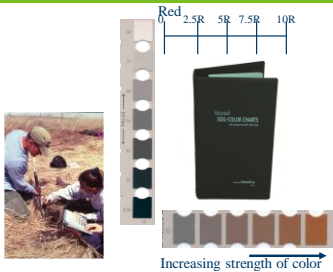
What is the percent of redox?
30%



46

Reading Soil Color

- Optimum conditions
 - Natural light
 - Clear, sunny day
 - Midday
 - Light at right angles
 - Soil moist



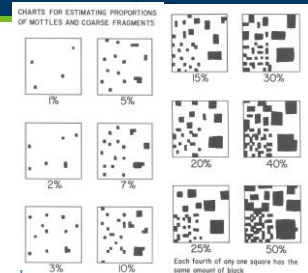
47

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



Each fourth of any one square has the same amount of black.

48

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	g C	Difference in Color Between Matrix and RMF (A means "difference between")		
		Hue (h)	Value (v)	Chroma (c)
Faint †	F	$\Delta h = 0$; $\Delta v \leq 2$ and $\Delta c \leq 1$		
		$\Delta h = 1$; $\Delta v \leq 1$ and $\Delta c \leq 2$		
		$\Delta h = 2$; $\Delta v = 0$ and $\Delta c = 0$		
Distinct †	D	$\Delta h = 0$; $\Delta v \leq 2$ and $\Delta c > 1$ to < 4		
		or $\Delta v > 2$ to < 4 and $\Delta c < 4$		
		$\Delta h = 1$; or $\Delta v > 1$ to < 3 and $\Delta c > 1$ to < 3		
Prominent †	P	$\Delta h = 0$; $\Delta v \geq 4$ or $\Delta c \geq 4$		
		$\Delta h = 1$; $\Delta v \geq 3$ or $\Delta c \geq 3$		
		$\Delta h = 2$; $\Delta v \geq 2$ or $\Delta c \geq 2$		

† 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!

49

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**.



50

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

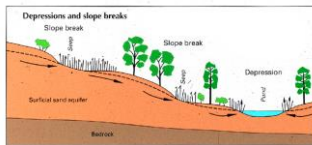


Figure 81. Precipitation analysis for a growing season showing daily precipitation, monthly precipitation, the 30-day rolling sum, and the range of normal conditions.

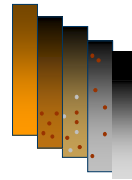
51

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.

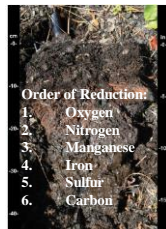


52

Hydric Soil Development

- Soil microbes that drive reduction require:
1. Anaerobic conditions i.e. (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



53

Conceptual overview of aquic conditions

- Here's what happens when water moves into a soil profile:
 - Downward movement
 - Lateral movement
 - Lose some things
 - Changes in chemical state in others

Think old car left in the elements- chemical reactions leave "rust in the soil"



54

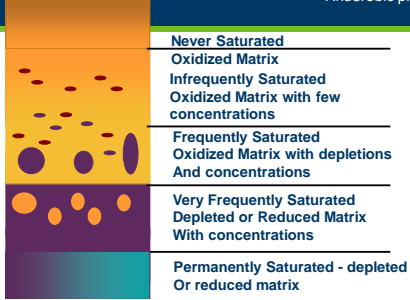
Change in the state of iron

- Available O₂, NO₃, and Mn depleted
- Fe³⁺ → Fe²⁺ (Mobile)
- **Bluish Grey** when **reduced**
- **Grey** when **depleted** from soil
- **Orange or Red** when **oxidized**



55

Anaerobic process



56

Depleted Matrix

Iron removed or re-organized in profile leaving Grey matrix

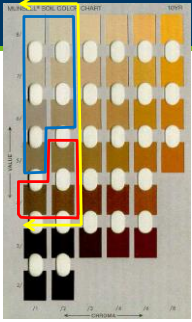
- Value 4 or More
- Chroma 2 or Less



57

Depleted Matrix Requirement

Do Not Need Concentrations
Need Concentrations (2%)



High Value (4 or more)
Low Chroma (2 or Less)

58

Gleyed Matrix Requirements

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



59



Hydric Soil Indicators

mi BOARD OF WATER AND SOIL RESOURCES

Minnesota Wetland Professional Certification Program

60

Field Indicators of Hydric Soils

Natural Resources Conservation Service

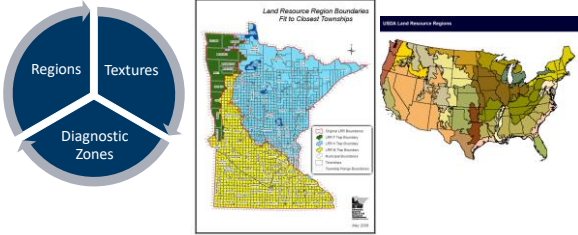
- National Technical Committee for Hydric Soils

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



61

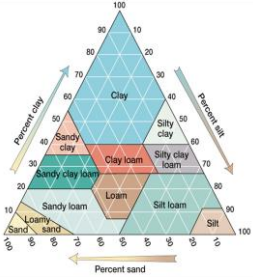
Field Indicator Organization- Regions



62

Field Indicator Organization- Texture

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



63

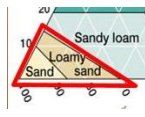
Soil Indicator Groups- Texture

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

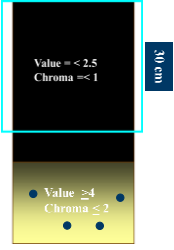


A group- all textures

64

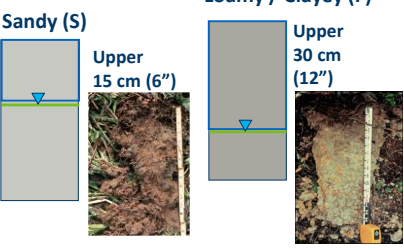
Diagnostic Zones

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



65

Diagnostic Zones for S and F indicator groups



66

Key terms to help interpret indicators:

- Aquic- moisture regime, reducing regime virtually free of dissolved oxygen
- Histic- saturated organic horizon
- Epipedon-horizon near the surface
- Depletions- areas of low chroma where oxides have been stripped away
- Concentrations-zones where oxides have accumulated

LRR01: UNDA & PAUS 1st growing period

67

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

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.

Format of Indicator Descriptions

- Alpha-numeric designation
 - A1
- Short name
 - Histosol
- Applicable land resource regions (LRR)
 - Use in all LRRs
- Description of the indicator
 - User notes
 - Additional information, explanation and guidance
- Supplement adds regional likelihood, locations

68

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

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

69

A2- Histic Epipedon

- Histic epipedon- saturated, organic horizons 8 inches or more thick in the upper part
- Applicable land resource regions (LRR)
 - Use in all LRRs

Figure 8.—Indicator A2 (Histic Epipedon) and A3 (Black Histic). This soil meets the depth criteria of A2 and the color and depth criteria of A3. The black color, a requirement of A3, results from the accumulation of organic matter when the soil is saturated and anaerobic.

70

A3- Black Histic

- A layer of peat, mucky peat, or muck 8 in or more thick that starts at a depth of ≤ 6 in from the soil surface; has hue of 10YR or yellower, value of 3 or less, and chroma of 1 or less; and is underlain by mineral soil material with chroma of 2 or less.
- Applicable land resource regions (LRR)
 - Use in all LRRs

Figure 8.—Indicator A2 (Histic Epipedon) and A3 (Black Histic). This soil meets the depth criteria of A2 and the color and depth criteria of A3. The black color, a requirement of A3, results from the accumulation of organic matter when the soil is saturated and anaerobic.

71

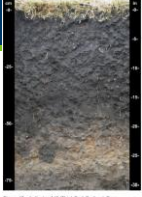
A11- Depleted Below Dark Surface

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

Figure 10.—Indicator A11 (Depleted Below Dark Surface). This soil has thick dark surface horizons that meet the requirements of indicator A1. Unlike the matrix in figure 9, the depleted layer below the dark surface horizon, in this soil starts at a depth of about 20 cm, which is too deep to meet the requirements of indicator P3 (Depleted Matrix). Indicator A11 shows a deeper depleted matrix than indicator P3.

72

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.

Color Requirements
Value = < 2.5
Chroma = < 1

Value = < 3
Chroma = < 1
Reduced or Depleted Matrix

30 cm

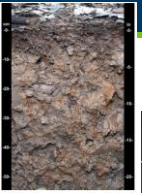
Figure 17.—Indicator A12 (Thick Dark Surface). Deep observations are made to determine whether a soil meets the requirements of the indicator to the full depth to the bottom of the A horizon.

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 5 or less starting below 30 cm (12 inches) of the surface. This layer is 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, at least 70 percent of the visible soil particles must be masked with organic materials. Viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100 percent masked.

73

F3- Depleted Matrix



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

Depleted Matrix

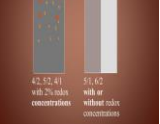


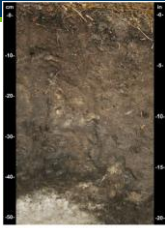
Figure 20.—Indicator F3 (Depleted Matrix). This soil has a value of 3 or more for chroma of the M1 horizon, the color requirements apply to a depth of 30 cm from the soil surface. The minimum thickness requirement is 6 cm.

F3.—Depleted Matrix. For use in all LRRs, except W, X, and Y; for testing in LRRs W, X, and Y, a layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

- a. 5 cm (2 inches) if the 5 cm starts at a depth ≤10 cm (4 inches) from the soil surface, or
- b. 15 cm (6 inches), starting at a depth >25 cm (10 inches) from the soil surface.

74

F6- Redox Dark Surface



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





Figure 18.—Indicator F6 (Redox Dark Surface) and F7 (Depleted Dark Surface). A soil that meets the requirements of indicator F7 (generally) also meets the requirements of indicator F6 if the dark surface layer has depletions. A small black spot has concentrations.

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 15 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.

75

F7- Depleted Dark Surface



- Applicable land resource regions (LRR)
- Use in all LRRs
- User notes
 - Careful to not mistake an E horizon for depletions!



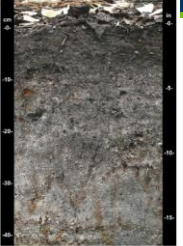
Figure 19.—Indicator F7 (Depleted Dark Surface). (2) Depleted Dark Surface. A soil that meets the requirements of indicator F7 (generally) also meets the requirements of indicator F6 if the dark surface layer has depletions. A small black spot has concentrations.

F7.—Depleted Dark Surface. For use in all LRRs, except W, X, and Y; for testing in LRRs W, X, and Y, a layer that has a depleted matrix with 60 percent or more chroma of 2 or less in 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 10 percent or more redox depletions, or
- b. Matrix value of 3 or less and chroma of 2 or less and 20 percent or more redox depletions.

76

S5- Sandy Redox



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

Figure 22.—Indicator S5 (Sandy Redox). This soil meets the requirements of indicator S5, having matrix chroma of 3 or less and at least 2 percent redox concentrations starting at a depth of about 10 cm.

S5.—Sandy Redox. For use in all LRRs, except for Q, V, W, X, and Y. A layer starting at a depth ≤15 cm (6 inches) thick and has a matrix with 60 percent or more chroma of 2 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings.

77

Data Sheet

S O I L									S a m p l i n g P o i n t				
Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)													
Depth (meters)	Moisture	Color (moist)	%	Color (moist)	%	Type*	LOE	Texture	Remarks				
Type	C	Concentration	O	Depletion	RM	Reduced Matrix	CO	Covered or Coated Sand Grains	Location	PL	Pore Linings	M	Matrix
Hydroic Soil Indicators:			<input type="checkbox"/> Sandy Gleyed Matrix (S4)			Indicators for Problematic Hydroic Soils:							
<input type="checkbox"/> Mistic Epipedon (A3)			<input type="checkbox"/> Sandy Redox (S5)			<input type="checkbox"/> Coarse Prairie Holo (A6)							
<input type="checkbox"/> Dark Muck (A3)			<input type="checkbox"/> Shaggy Matrix (S8)			<input type="checkbox"/> Iron-Manganese Masses (P12)							
<input type="checkbox"/> Hydrogen Sulphide (A4)			<input type="checkbox"/> Loamy Mucky Mineral (P1)			Other (Explain in Remarks)							
<input type="checkbox"/> Stratified Layers (A5)			<input type="checkbox"/> Loamy Gleyed Matrix (P2)										
<input type="checkbox"/> 1-cm Muck (A10)			<input type="checkbox"/> Depleted Matrix (F3)										
<input type="checkbox"/> Depleted Below Dark Surface (A11)			<input type="checkbox"/> Redox Dark Surface (F6)										
<input type="checkbox"/> Thick Dark Surface (A12)			<input type="checkbox"/> Depleted Dark Surface (F7)										
<input type="checkbox"/> Sandy Mucky Mineral (S1)			<input type="checkbox"/> Redox Depressions (F8)										
<input type="checkbox"/> 1-cm Mucky Peat or Peat (S3)													
Redox Layer (F) (observed):										Indicators of hydrophytic vegetators and wetland hydrology must be present, unless disturbed or problematic:			
Type:										Hydroic Soil Present? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Depth (inches):													
Remarks:													

78

Problematic Hydric Soils

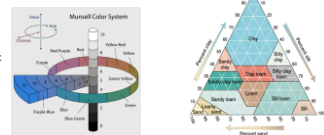
- Covered in Chapter 5 of the regional supplements
- Problematic hydric soils are the norm in some landscapes
- **Red Parent Material** (*inhibited, or difficult to see redox features*)
- Active floodplains (*deposition of new material*)
- Drained systems (*relict hydric indicators*)
- **High Value** (*bright*) / **Low Chroma** (*grey*),
- Thick prairie soils
- Sandy soils



79

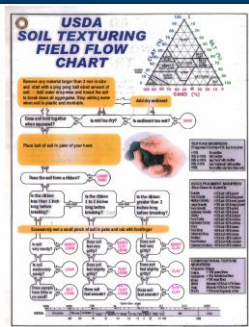
Review

- Soil formation
 - Parent material, landscape position, horizons
- Soil Properties
 - Texture
 - Sand, silt, clay
 - Color
 - Hue, value, chroma
- Hydric soil development
 - Anaerobic conditions, reduction, organic accumulation
- Web Soil Survey
 - Interpreting soil reports
- Hydric soil indicators
 - All, Fine, Sandy
 - Common soil indicators
 - Organic Indicators (A1, A2, A3)
 - Depleted Matrix (F3, F7)
 - Redoximorphic features (F6, S3)



80

Texture by Feel



81

82

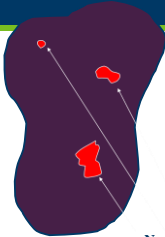
Map Unit	Map Unit Name	Acreage of ACP	Percent of ACP
1007	Udumtschits, sandstone (secondary basaltic)	36.6	3.2%
D49D	Gravelly loamy sand, 12 to 25 percent slopes	124.7	11.1%
D53B	Louger-Barber-Gudde complex, 0 to 6 percent slopes	66.8	5.9%
D62A	Zimmerman loamy fine sand, 0 to 2 percent slopes	156.3	14.7%
D62B	Zimmerman loamy fine sand, 1 to 6 percent slopes	98.7	8.7%

83

- 100% Hydric (Red)
- 66-99% Hydric (Light Green)
- 33-66% Hydric (Medium Green)
- 1-32% Hydric (Dark Green)
- Non-Hydric (Lightest Green)

84

Predominately Hydric

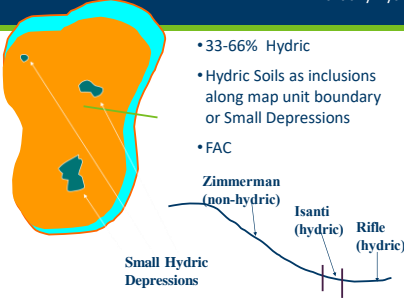


- 66-99% Hydric
- Small areas of non-hydric components on higher or convex landscape positions
- FACW

Non-Hydric Inclusions

85

Partially Hydric Soils




- 33-66% Hydric
- Hydric Soils as inclusions along map unit boundary or Small Depressions
- FAC

Small Hydric Depressions

86

Web Soil Survey



The screenshot shows the USDA Web Soil Survey homepage. It features a search bar, a 'START WSS' button, and a 'Welcome to Web Soil Survey (WSS)' message. The page includes navigation links for 'Home', 'About Soils', 'Help', and 'Contact Us'. A sidebar on the left offers options to 'Browse by Subject' and 'All NRCS Sites'. The main content area provides a brief introduction to the service and a 'I Want To...' section with links for starting a survey, knowing requirements, and finding areas of interest.

87

Attributes from Soil Survey to help understand Functions

<ul style="list-style-type: none"> • Geomorphic description <ul style="list-style-type: none"> • Landform • Slope shape • Parent material • Typical profile <ul style="list-style-type: none"> • Textures • Depths • Properties and qualities <ul style="list-style-type: none"> • Slope • Restrictive layer • Drainage class • Depth to water table • Frequency of flooding/ponding 	<p>Description of Normanna</p> <p>Setting Landform: Moraines Landform position (two-dimensional): Summit, backslope Down-slope shape: Linear Across-slope shape: Linear Parent material: Loamy material over dense loamy till</p> <p>Typical profile A: 0 to 4 inches: loam Bw: 4 to 45 inches: gravelly sandy loam 2Bw, BC, 2BC: 45 to 48 inches: gravelly sandy loam 2BtC: 48 to 80 inches: gravelly sandy loam</p> <p>Properties and qualities Depth to restrictive feature: 30 to 60 inches to dense material Natural drainage class: Moderately well drained Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.05 to 0.56 inch/hr) Depth to water table: About 18 inches Frequency of flooding: None Frequency of ponding: None Available water storage in profile: Low (about 5.2 inches)</p>
--	---

88