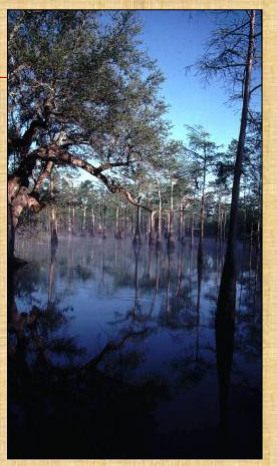
Guidelines for Using the NTCHS Indicators of Hydric Soils



Outline:

1. Glossary of Terms and Guides Used with Soil Descriptions
2. Soil Plug Extraction Procedure
3. Caveats for Using the Indicators

Ref: http://soils.usda.gov/use/hydric/

1.NTCHS Indicators of Hydric Soils (p1)

- A set of approved field indicators are published and updated by the Nat. Tech. Comm. For Hydric Soils (NTCHS) at http://soils.usda.gov/use/hydric/.
- Soils that have the required morphology have "field positive" proof that the soil meets the hydric soil definition. **A later lecture will go into more detail for each indicator.**
- They are now used as primary evidence now that the 87 Manual has been updated regionally. http://www.usace.army.mil/cecw/pages/reg_supp.aspx

1. NTCHS Indicators of Hydric Soils (p2)

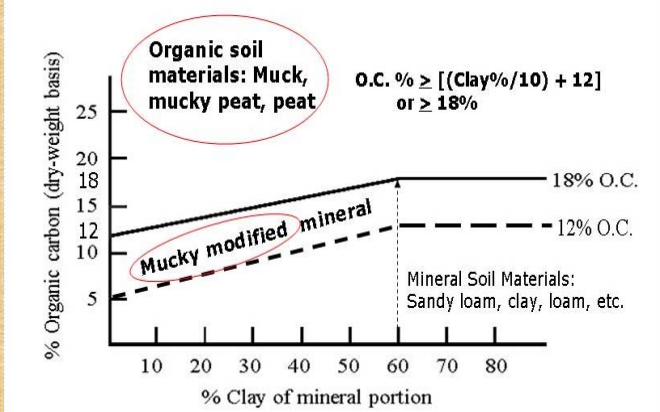
- Form in soils under the conditions described by the hydric soil definition.
- Are based on observable soil morphology (soil colors and textures) and provide immediate on-site validation without repeated measurements.
- Are updated periodically and backed by research data.
- Are specific to major physiographic regions (@ http://soils.usda.gov/survey/geography/mlra/index.html)
- Address problem soils and parent materials.
- Developed and updated by universities, private sector, federal, state, and local agencies.
- Multi-disciplinary approach by soil scientists, hydrologists, botanists for field delineation in support of the Clean Water Act.

1. Glossary of Terms and Guides Used With Soil Descriptions

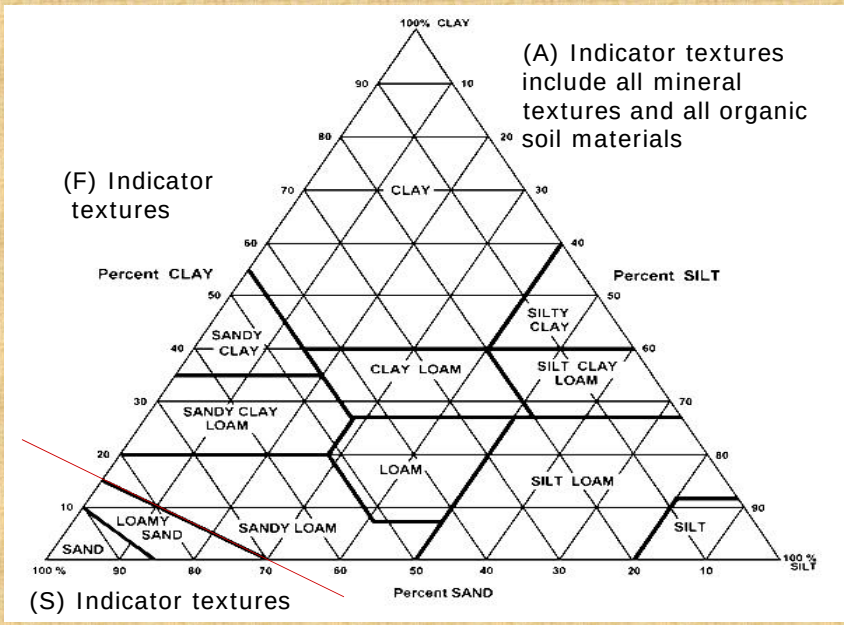
Textures:

- **Organic Soil Material:** An O horizon with > 18% OC, or OC ≥ (clay %/10) +12. Light brown to black in color, rotting organic matter smell, holds water like a sponge, with very low bulk density. High fiber content. Peat, mucky peat, and muck.
- **Muck:** The most highly decomposed organic soil material. Usually black (value 2.5 or 2), has 12% or more organic carbon, very greasy with few fibers. Mineral grains cannot be felt when texturing. Bulk density is very low (< 1/2 of normal subsoil clod of similar size). When saturated, dark water or soil may be squeezed out of a hand-held sample. Leaves a black stain on your hands. Evident organic matter smell.
- **Mucky-modified textures:** Must have between 5 and 12% organic carbon. Dark (value 3 or less), and feels a little slick or greasy when rubbed, but sand grains are easily felt. May be light in density (~1/2 of a subsoil clod of similar size). Slight organic matter smell, few if any fibers.

1. Organic, Mucky Modified Mineral, and Mineral Textures



Textures circled in red are proof-positive indicators of hydric soils



1. Munsell® Colors Indicating High OC Accumulation in Wetland Soils

1. Horizon Names

- **O horizon** – organic soil material
- **A horizon** – accumulated OC at the soil surface
- **E horizon** – depleted of Mn, Fe, OC, and clay by percolating water
- **B horizon** – better color or structure development compared to another soil horizon
- **C horizon** – has no vertical soil structure surfaces closer than 30 cm apart, or has thin layering in > ½ the volume
- ***Spodic horizon*** – in very sandy soils with fluctuating water tables, a dark B horizon under a very light-colored E horizon. The horizon is darkened by secondary OC-Al compounds, with or without Fe.

1. Landforms

- **Closed Depression:** Any area larger than a tree-tip pit where water may pond on the surface. F8, F13
- **Floodplain:** A low-lying level area periodically-exposed to water flowing above a channel. F12, F19
- **Swamp:** An area where water ponds and woody plants grow. Most A, S1, F1
- **Marsh:** An area dominated by herbaceous plants in association with shallow water or daily tides. Most A, S1, F1

1. Colors

- **Matrix:** The color or material in a horizon that makes up more volume than any other color or material.

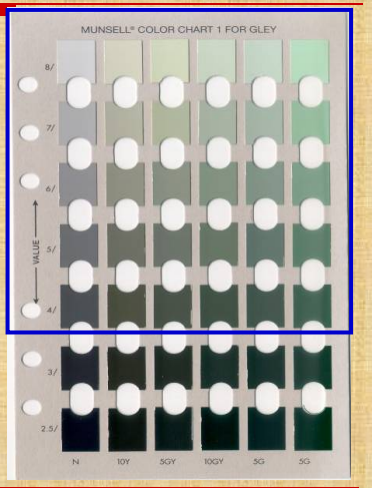
A. Gleyed Matrix:

B. Depleted Matrix:

C. Reduced Matrix:

A. Gleyed Matrix Colors

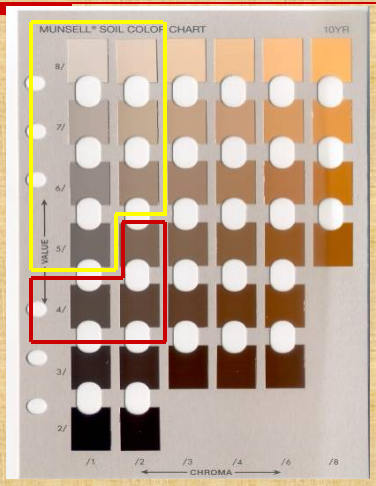
- Matrix value of ≥ 4 on any Munsell® Gley page.



B. Depleted Matrix Colors

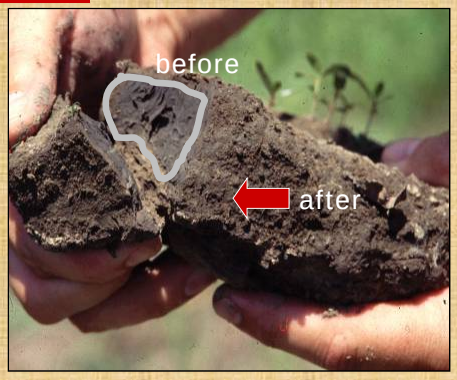
For any Color Book Hue:

- For A and E horizons, matrix colors inside both red and yellow areas need ≥ 2% distinct or prominent redox concentrations.
- For B and C horizons, only matrix colors inside the red box need ≥ 2% distinct or prominent redox concentrations.



C. Reduced Matrix Colors

- When soils have high value, low chroma in-situ but the color changes rapidly when first exposed to gaseous O_2, proving that reduced Fe is present. These matrices are usually found in soil layers that are extracted from beneath the water table.



70% Coated Grains Required in Surface of most Sandy Indicators

70% of grains coated, covered, or masked by organic material

50% of grains coated, covered, or masked by organic material

Estimating Percent by Volume

Stoops, G. 2003. *Guidelines for Analysis and Description of Soil and Regolith Thin Sections.* Soil Sci. Soc. Am. Madison, WI. 184pp.

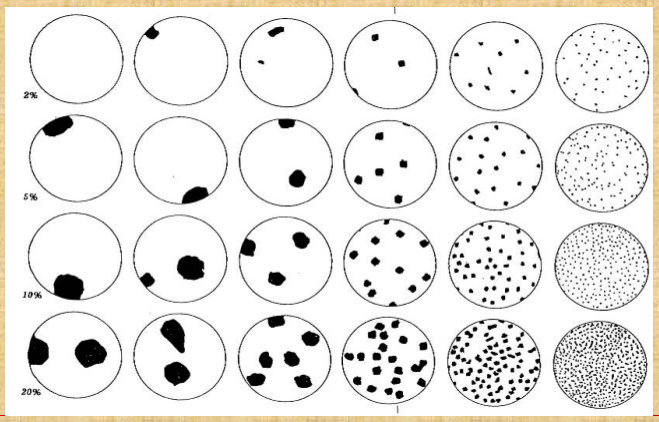


Fig. 1 - Difference in Hue

To determine the "difference in hue" between two colors, record the color of the matrix and the redox features, then count the number of intervals difference in hue on the wheel.

For example hues of 5Y and 5YR differ by four intervals, and so their difference in hue is counted as "4."

Hue of N is zero hues different than any other hue.

Use Table 1 (next) to determine the contrast class.

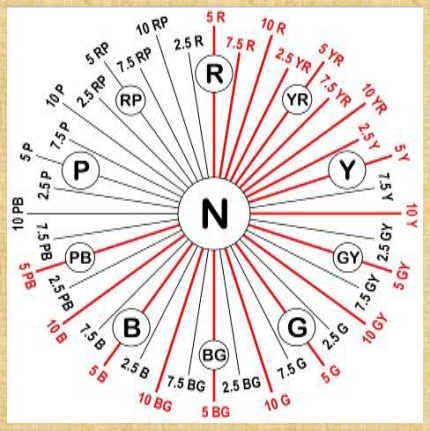
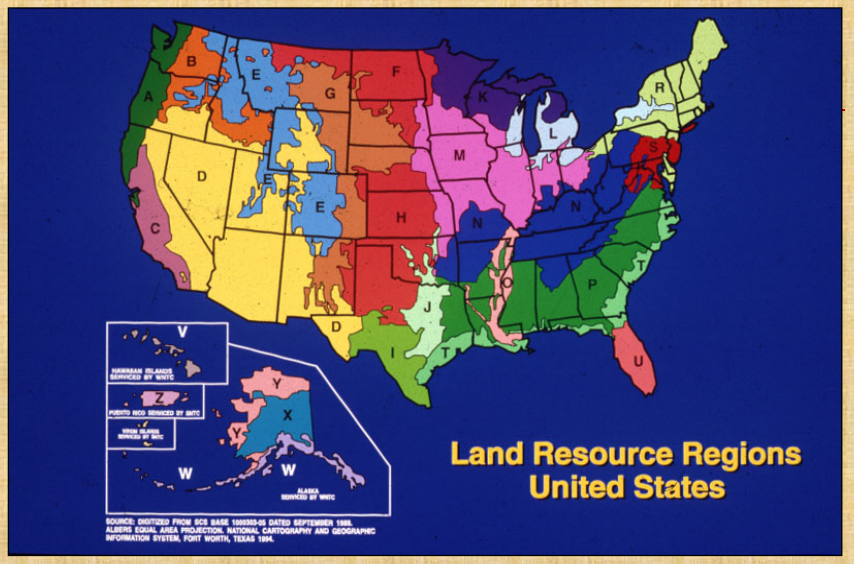


Table 1 - Distinct and Prominent Contrast (fail “Faint” below)

Hue difference (see Fig. 1)	Value Difference		Chroma Difference
0	> 2	or	> 1
1	> 1	or	> 1
2	> 0	or	> 0

The value of one of the compared colors must be > 3 or the chroma > 2



Source: http://soils.usda.gov/survey/geography/mlra/index.html

2. Soil Slice Extraction (p1)

- Remove duff (loose leaves and needles other than those deposited under water) by gently raking them away. Do not pull up firmly held layers or layers held down by roots and hyphae.
- Dig a hole to at least 30-cm. If still in an O or A horizon, continue to dig 10 cm past the bottom of the deepest O or A horizon. A peat auger may be needed to auger to 80 cm in Histosols.

2. Soil Slice Extraction (p2)

- Tile-spade extraction of soil is better than augering, because it does not mix the soil or smear the color patterns as much. Use pruners to cut through roots rather than pulling the soil out of a heavily-rooted soil.
- Clear off any loose soil that smears across the slice. Lay a cm-ruler next to the extracted soil slice, and take pictures of the soil and site.
- Read colors of subaqueous horizons immediately, then identify and record a full soil description. Re-read the colors a second time to see if they have changed.

3. Caveats for Using the Field Indicators (p1)

- The thickness and color of "fill" or other recent sediment allowed on top of the indicators varies. Ref: http://soils.usda.gov/use/hydric/
- Depth measurement begins at the mineral soil surface for most soils, but if the indicator requires an organic surface layer, measurement begins at the top of the organic surface material.
- The indicators often have more than one part. For example, indicator A11 requires both a depleted matrix and dark colors above.
- Some indicators allow two different sets of morphologic properties. A2, S9 and F3 are examples where the thickness of the indicator varies by what depth it is found in the soil.

3. Caveats for Using the Field Indicators (p2)

- Genetic soil horizons have names such as A, E, Btg. The indicators refer to "layers" that may be made up of any vertical slice of the soil: one genetic horizon, two or more adjacent genetic soil horizons, or as a subdivision of one or more genetic soil horizons (e.g., S7).
- Fe/Mn nodules and concretions are not considered hydric soil indicators, nor are redoximorphic features that are considered "relict" from former climates and processes.
- Tree-tip pits (pits formed when trees fall) are not large enough to be considered as closed depressions, Carolina Bays, or vernal pools.