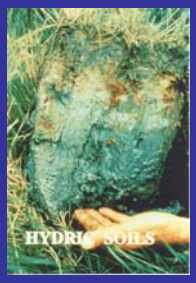
ACT PRESENTATION 5 AN INTRODUCTION TO HYDRIC SOILS AND HYDRIC SOIL TERMINOLOGY OCTOBER 2011

FLORIDA DEPARTMENT OF HEALTH

DIVISION OF Environmental Health

An Introduction to Hydric Soils and Hydric Soil Terminology

- by: Wade Hurt, USDA, NRCS, NSSC/ University of Florida, Gainesville, Florida
- and based on deliberations of: The National Technical Committee for Hydric Soils (NTCHS).



Hydric Soil Indicators

- *Field Indicators of Hydric Soils in the US* (Hurt, et al. 2002) has been approved as the sole source document for hydric soil identification and delineation by the NRCS and US Fish and Wildlife Service. It has not been approved as the sole source document for hydric soil identification and delineation by the US Army COE and EPA.
- COE and EPA has approved the document as a source of additional information for hydric soil identification and delineation that can be used as a sole source.
  - Semantics; COE and EPA cannot and will not give the impression they are adding or deleting areas of wetlands even though many of the hydric soil indicators listed in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory. 1987) are unusable and the others ill defined.

The beauty of the hydric soil indicators is that they provide us a method to prove or disproved the presence of a hydric soil based on something felt, seen, or smelled and not estimated or guessed.

Indicators are based on biogeochemical processes that occur when a soil is saturated or inundated.

Biogeochemical Processes

- Biogeochemical processes are processes that alter soil due to the interaction of its chemical composition and the animal and plant life it supports.
- Hydric soil indicators are based on several biogeochemical processes (Vepraskas. 1994) that occur when soils are saturated or inundated (this subject will be covered thoroughly in the lecture of redoximorphic features).
  - Iron
  - Carbon
  - Carbon and Iron
  - Carbon and/or Iron
  - Carbon and Iron/Manganese
  - Iron/Manganese
  - Sulfur
  - Algae
- The processes and the hydric soil indicator that result from the processes are reviewed in the next few slides. The indicators will be covered in depth during a later lecture. Ignore their being referenced for now; you may need to refer back after the next lecture.

Iron

- Nine indicators are based on iron reduction, transformation, and differential accumulation:
  - S4, S5, S10, F2, F3, F8, F9, F14, and F15.

Carbon

- Seventeen indicators are based on carbon accumulation and differential decomposition:
  - A1, A2, A3, A5, A6, A7, A8, A9, A10, S1, S2, S3, S7, S8, S9, F1, F11, and F13.

Carbon and Iron

- Four indicators are based on carbon accumulation and differential decomposition and iron reduction, translocation, and differential accumulation:
  - F4, F5, F6, and F7.

Carbon and/or Iron

- **One indicator is based on carbon accumulation and differential decomposition and/or iron reduction, translocation, and differential accumulation:**
  - **S6.**

Carbon and Iron/Manganese

- One indicator is based on carbon accumulation and differential decomposition and iron/manganese reduction, translocation, and differential accumulation:
  - F16.

Iron/Manganese

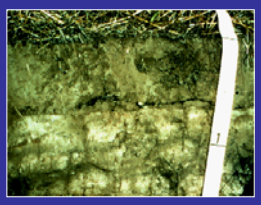
- One indicator is based on iron/manganese reduction, transformation, and differential accumulation: F12.

Sulfur

- One indicator is based on sulfur reduction:
  - A4.

Algae

- One indicator is based on precipitation of calcium carbonate by algae:
  - F10.



Where do we begin our observations?

- To determine whether an indicator is present or not it is critical to know where to begin looking. To determine whether a hydric soil indicator is present we would begin our observation of the soil in the photo to the right beneath the knife blade (below the fibric and hemic material) in most LRRs but where we begin our observations varies from region to region (next slide).

Where to look for an Indicator by LRR (see slide 36)

- The soil surface is the very top of the material upon which standing
  - **nationwide when applying indicators A1, A2 and A3**
  - in LRRs F, G, H, and M if the material beneath any mucky peat and/or peat is sandy.
- In LRR R the soil surface is the top of the mineral surface (underneath any and all fibric, hemic, and/or sapric material) except for application of A1 and A2.
- **In the remaining LRRs and in LRRs F, G, H, and M if the material beneath any mucky peat and/or peat is not sandy the soil surface is the top of the muck or mineral surface (underneath any fibric and/or hemic material) except for application of A1, A2 and A3.**

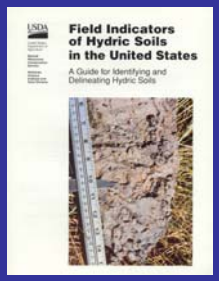
Where do we begin our observations?

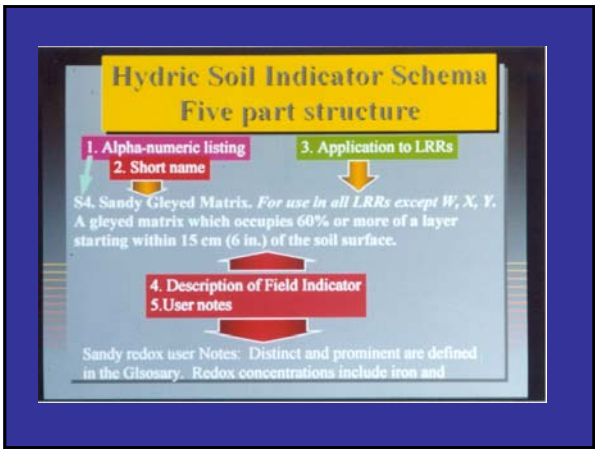
- Three indicators used in Florida can start with peat, mucky peat or peat, but there is a thickness requirement.
- These indicators are A1, A2 and A3.
- (THIS MATERIAL ADDED BY DAVID HAMMONDS AS OF SEPTEMBER 2011.

Field Indicators of Hydric Soils in the US

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

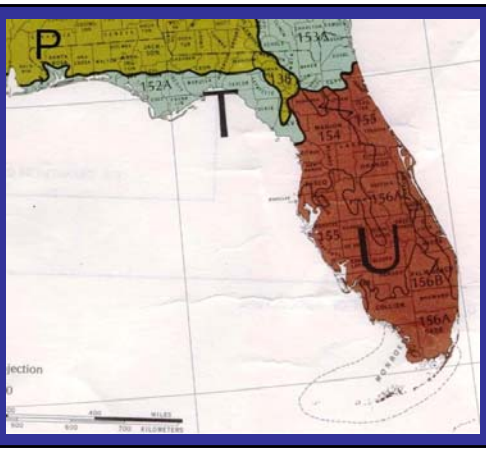
- The remain portion of this lecture pertains to the publication *Field Indicators of Hydric Soils in the US* .
- The current version is Version 7.0, 2010. The picture to the right is of the cover to Version 3.2 (Hurt, et al. 1996)





Regionalization of Hydric Soil Indicators

- The NTCHS has approved each of the indicators for use in specific regions of the US (USDA, SCS. 1981). Most are based on Land Resource Regions (LRRs, next slide). Some are based on the smaller Major Land Resource Areas (MLRAs).
- Table 1 in *Field Indicators of Hydric Soils in the US* is a listing of the indicators approved for use in each LRR.
- A prime example of regionalization: Only the "presence" of muck is required in south Florida, as one goes North thicker layers are required. In New England (and other areas) muck (sapric material) occurs on upland soils so this indicator is not used in LRR R.



Basic Terms

- There are some basic terms used throughout that need explaining. These terms are defined here because they are used in the definitions of many of the indicators.
  - Depleted Matrix
  - Gleyed Matrix
  - Reduced Matrix

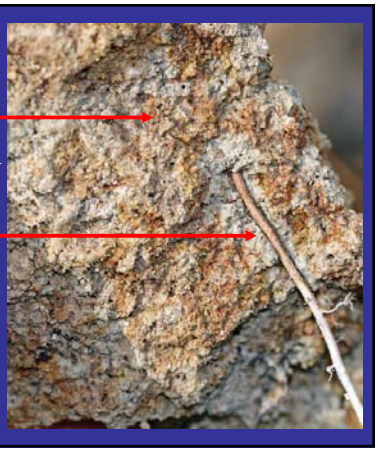
Depleted Matrix

- A depleted matrix refers to the volume of a soil horizon or subhorizon from which iron has been removed or transformed by processes of reduction and translocation to create colors of low chroma and high value. A, E and calcic horizons may have low chromas and high values and may therefore be mistaken for a depleted matrix; however, they are excluded from the concept of depleted matrix unless common or many, distinct or prominent redox concentrations as soft masses or pore linings are present. In some places the depleted matrix may change color upon exposure to air (Reduced Matrix), this phenomena is included in the concept of depleted matrix.

Soft Masses

- Noncemented redox concentrations, frequently within the soil matrix, that are of various shapes and cannot be removed as discrete units.
- Next slide for example.

Soft masses (red areas) and Redox Depletion along root channel



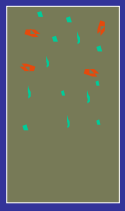
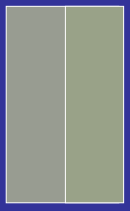
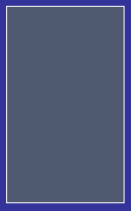
Soft Iron Masses

Depleted Matrix

- The following combinations of value and chroma identify a depleted matrix:
  - 1. Matrix value 5 or more and chroma 1 with or without redox concentrations as soft masses and/or pore linings; or
  - 2. Matrix value 6 or more and chroma 1 or 2 with or without redox concentrations as soft masses and/or pore linings; or
  - 3. Matrix value 4 or 5 and chroma 2 and has 2 percent or more distinct or prominent redox concentrations as soft masses and/or pore linings; or
  - 4. Matrix value 4 and chroma 1 and has 2 percent or more distinct or prominent redox concentrations as soft masses and/or pore linings.

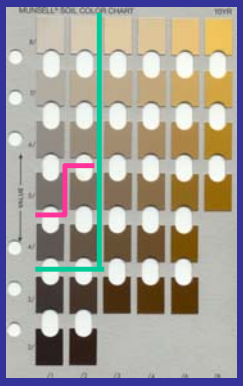
Gleyed Matrix

- Soils with a gleyed matrix have the following combinations of hue, value, and chroma and the soils are not glauconitic:
  - 1. 10Y, 5GY, 10GY, 10G, 5BG, 10BG, 5B, 10B, or 5PB with value 4 or more and chroma is 1; or
  - 2. 5G with value 4 or more and chroma is 1 or 2; or
  - 3. N with value 4 or more; or
  - 4. (for testing only) 5Y, value 4 or more, and chroma 1.
  - In some places the gleyed matrix may change color upon exposure to air (reduced matrix). This phenomena is included in the concept of gleyed matrix.

Depleted	Depleted	Gleyed
		
4/2, 5/2, 4/1 with 2% or more redox concentrations	≥5/1, ≥6/2 with or without redox concentrations	value ≥ 4, gley pages of color charts

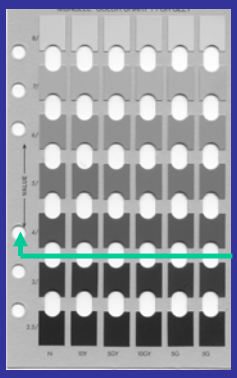
Depleted Matrix

- The range of colors for the depleted matrix is value 4 or more and chroma 1 or 2; however, colors of value 4 and chroma 1 or 2 and value 5 and chroma 2 must have redox concentrations.



Gleyed Matrix

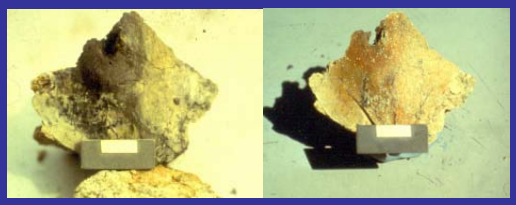
- The range of colors for the gleyed matrix is value 4 or more on either of the two gley color charts.



Reduced Matrix

- A reduced matrix is a matrix that upon initial exposure fits the color requirements of either a depleted matrix or a gleyed matrix but changes color (redder hue) when exposed to air for about 30 minutes (Vepraskas. 1994).
- In the next slide a soil (left photo) with a depleted/gleyed matrix upon initial exposure was air dried for 7 days (right photo). This is a classic example of a "reduced matrix." The most reduced areas turned the reddest after exposure. Some hue changes occurred after 30 minutes but the change was more dramatic after 7 days. The white bar in both photos is 1 cm long.

Reduced Matrix

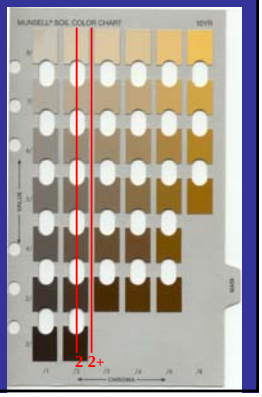


Moist Color

- All color requirements (hue, value, and chroma) are for moist color. If dry, moisten to record color; if wet, allow to dry to moist state. This picture shows moist soil (L) and dry soil (R). Features are usually more readily identifiable in moist state; they may be missing if soil is too wet (let dry).

Chroma

- Soil colors specified in the Indicators do not have decimal points listed; however, colors do occur between Munsell (Gretag/Macbeth. 2000) chips. Soil colors should not be rounded to qualify as meeting an indicator. For example: a soil matrix with a chroma between 2 and 3 should be listed as having a chroma of 2+. This soil material does not have a chroma 2 and would not meet any indicator that requires a chroma 2 or less.



Summary

- Hydric soil indicators are based on several biogeochemical processes that occur when soils are saturated or inundated: Iron, Carbon, Carbon and Iron, Carbon and/or Iron, Carbon and Iron/Manganese, Iron/Manganese, Sulfur, and Algae.
- Field Indicators of Hydric Soils in the US (Hurt, et.al) provides the structure of the regionalization of hydric soil indicators and defines the terms depleted matrix, gleyed matrix, and reduced matrix.
- Moist colors should be recorded and, although colors do occur between Munsell chips, soil colors should not be rounded to qualify as meeting an indicator.

QUESTIONS???

End of Presentation