Field Indicators of Hydric Soils in the United States: For All Soils

- As revised

Field Indicators

- The publication *Field Indicators of Hydric Soils in the US* (Hurt, and Vasilas 2006) is the reference for this lecture. Any statement in this lecture such as “see glossary” refers to this publication.
- There are three divisions to the indicators:
  - Indicators with the letter A preceding a number are used for all soils, regardless of texture.
  - Indicators with the letter S preceding a number are used for all sandy soil material.
  - Indicators with the letter F preceding a number are used for all loamy and clayey soil material.

Indicators for all soils regardless of texture

- All mineral layers above any of the layers meeting an A Indicator(s), except for Indicator A16 have dominant chroma 2 or less, or the layer(s) with dominant chroma of more than 2 is less than 15 cm (6 inches) thick. In addition nodules and concretions are not redox concentrations. Use the following Indicators regardless of texture.
A1. Histosol

- **Histosols (For use in all LRRs)** or **Histels (For use in LRRs with permafrost).** Classifies as a Histosol (except Folist) or as a Histel (except Folistel).

- Histosol User Notes: In a Histosol, typically 40 cm (16 inches) or more of the upper 80 cm (32 inches) is organic soil material. 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 (2007 for complete definition. Histels are similar to Histosols except they are underlain by permafrost.

A2. Histic Epipedon

- For use in all LRRs except W, X, and Y; for testing in LRRs W, X, and Y. A histic epipedon (according to Soil Taxonomy) underlain by mineral soil material with a chroma of 2 or less.

  - Histic Epipedon User Notes: Most histic epipedons are surface horizons 20 cm (8 inches) or more thick of organic soil material. Aquic conditions or artificial drainage are required. See Keys to Soil Taxonomy (2007) for complete definition.
A2. Indicator A2 (Histic Epipedon).
Proof of aquic conditions is required.
Generally, Histosols have more than 16 inches of organic soil material and Histic epipedons have 8 to 16 inches of organic materials.

A3. Black Histic

- For use in all LRRs. A layer of peat, mucky peat, or muck 20 cm (8 inches) or more thick starting within the upper 15 cm (6 inches) of the soil surface having hue 10YR or yellower, value 3 or less, and chroma 1 or less underlain by mineral soil material with a chroma of 2 or less.
  
  Black Histic User Notes: Unlike indicator A2 this indicator does not require proof of aquic conditions or artificial drainage. It identifies a subset of Histic Epipedon that is always hydric. See glossary for definitions of peat, mucky peat, and muck. See Figure 2 (organic soil material) in the glossary for organic carbon requirements.
A4. Hydrogen Sulfide

- For use in all LRRs. A hydrogen sulfide odor within 30 cm (12 inches) of the soil surface.
  
  - Hydrogen Sulfide User Notes: This "rotten egg smell" indicates that sulfate-sulfur has been reduced and therefore the soil is anaerobic. In most hydric soils, the sulfide odor is only present when the soil is saturated and anaerobic. Most often this indicator occurs in wet marshes. Remember the reduction sequence (O - N - Mn - Fe - S). Sulfur is last which means that all the other have already been reduced. This indicator is often misidentified. There are other odors produced in soils (mercaptans); just because the soil smells, the smell does not have to be hydrogen sulfide.

Indicator A4 (Hydrogen Sulfide) would most likely occur here. Anaerobic conditions would probably occur in this salt marsh throughout the year.

A5. Stratified Layers

  
  Several stratified layers starting within the upper 15 cm (6 inches) of the soil surface. At least one of the layers has value 3 or less with chroma 1 or less, mucky peat, or mucky modified mineral texture. The remaining layers have chroma 2 or less. Any sandy material that constitutes the value 3 or less and chroma 1 or less layer using a 10X or 15X hand lens, must have at least 70 percent of the visible soil particles masked with organic material. Observation without a hand lens appears to be close to 100 percent masked.
  
  - User Notes: Use of this indicator may require assistance from a trained soil scientist with local experience. The minimum organic carbon content of at least one layer of this indicator is slightly less than required for indicator A7 (Mucky Modified Mineral Texture). An undisturbed sample must be observed. A hand lens is an excellent tool to aid in the identification of this indicator. Many alluvial soils have stratified layers at greater depths; these soils do not meet the requirements of this indicator. Stratified Layers occur in any soil texture.
A6. Organic Bodies.

- For use in LRRs P (except MLRA 136), T, U, and Z. Presence of 2% or more organic bodies of muck or a mucky modified mineral texture, approximately 1 to 3 cm (0.5 to 1 inches) in diameter, starting within 15 cm (6 inches) of the soil surface.

- Organic Bodies User Notes: Organic bodies are typically found at the tips of fine roots. The content of organic carbon in organic bodies is the same as in the Muck or Mucky Texture Indicators. The Organic Bodies indicator includes the indicator previously named “accretions” (Florida Soil Survey Staff, 1992). The size of the organic body is not critical, however the organic carbon content is. The bodies are commonly 1 to 3 cm (0.5 to 1 inch) in diameter, and the organic carbon requirement in the organic bodies must meet those of muck or mucky modified. Many organic bodies lack the required amount of organic carbon and are not indicative of this indicator. Organic bodies of hemic material (mucky peat) and/or fibric material (peat) do not meet the requirements of this indicator, nor does material consisting of partially decomposed root tissue.
A6. Organic Bodies. The mucky organic bodies layer occurs between 0 and 10 cm (left) Indicator S7 (Dark Surface) is also present. The individual organic bodies are 1 - 3 cm in size (right) from the soil on the left. Scale is inches (top) and cm (bottom).

Indicator A6 states that the size of organic bodies are about 1-3 cm. Sometimes they are smaller. Scale is inches. This indicator is easy to identify. Bodies that adhere to roots and qualify for A6 feel greasy; bodies that adhere to roots and fail to qualify for A6 feel gritty.

A7. 5 cm Mucky Mineral

- For use in LRRs P (except MLRA 136), T, U, and Z. A mucky modified mineral surface layer 5 cm (2 inches) or more thick starting within 15 cm (6 inches) of the soil surface.

  - 5 cm Mucky Mineral Use Notes: "Mucky" is a USDA texture modifier for mineral soils. The organic carbon content is at least 5 and ranges to as high as 18 percent. The percentage requirement is dependent upon the clay content of the soil; the higher the clay content, the higher the organic carbon requirement. An example is mucky fine sand, which has at least 5 percent organic carbon but not more than about 12 percent organic carbon. Another example is mucky sandy loam, which has at least 7 percent organic carbon but not more than about 14 percent organic carbon.

  When soils with this indicator are saturated or nearly saturated individual soil particles are not visible or can be feebly discerned after 2 rubs with slightly firm pressure and within 5 rubs individual soil particles can be felt.
Indicator A7 (5 cm Mucky Mineral) about 10 cm thick. Indicator S7 (Dark Surface) is also present. Scale is inches (R) and cm (L).

A8 (Muck Presence), A9 (1 cm Muck), and A10 (2 cm Muck)

- Because the only differences are the required thickness of muck, these three indicators are presented together (note LRRs).
- A8. Muck Presence. *For use in LRRs U, V and Z.* A layer of muck with value 3 or less and chroma 1 or less starting within 15 cm (6 inches) of the soil surface.
- A9. 1 cm Muck. *For use in LRRs D, F, G, H, P, and T; for testing in LRRs I, J, and O.* A layer of muck 1 cm (0.5 inches) or more thick with value 3 or less and chroma 1 or less starting within 15 cm (6 inches) of the soil surface.
- A10. 2 cm Muck. *For use in LRR M and N; for testing in LRRs A, B, C, E, K, L, S, W, X, Y, and Z.* A layer of muck 2 cm (0.75 inches) or more thick with value 3 or less and chroma 1 or less starting within 15 cm (6 inches) of the soil surface.

User Notes for the Muck Indicators

- These Indicators require a minimum muck thickness of mere presence (A8), 1 cm (A9), or 2 cm (A10). Normally this expression of anaerobiosis is at the soil surface; however, it may occur at any depth within 15 cm (6 inches). Muck is sapric soil material with at least 12 to 18 percent organic carbon. Organic soil material is called muck (sapric soil materials) if virtually all of the material has undergone sufficient decomposition to limit recognition of the plant parts. Hemic (mucky peat) and fibric (peat) soil materials do not qualify. Generally muck is black and has a "greasy" feel; sand grains should not be evident. Hydric soil indicator determinations are made below the leaf or root mat; however, root mats that meet the definition of hemic or fibric soil material are included in the decision making process for Mucky Peat, Peat, or the 2 Histic Indicators. See the glossary for the definition of muck. See Figure 2 (organic soil material) in the glossary for organic carbon requirements.
This could be Indicator A8, A9, or A10. This soil also has Indicator S7 (Dark Surface). Muck is about 3 cm thick and the dark surface is 18 cm thick. Scale is inches (R) and cm (L).

A11 Depleted Below Dark Surface

- A11. Depleted Below Dark Surface. For use in all LRRs except W, X, and Y; for testing in LRRs W, X, and Y. A layer with a depleted or gleyed matrix that has 60% or more chroma 2 or less starting within 30 cm (12 inches) of the soil surface that has a minimum thickness of either:
  - a. 15 cm (6 inches) or
  - b. 5 cm (2 inches) if the 5 cm (2 inches) consists of fragmental soil material.
- Sandy layer(s) with value of 3 or less and chroma 1 or less and, viewed through a 10x or 15x hand lens, at least 70 percent of the visible soil particles must be masked with organic material or dark loamy or clayey layer(s) with value 3 or less and chroma 2 or less must occur immediately above the depleted or gleyey matrix and within 15 cm (6 inches) of the soil surface. Observed without a hand lens sandy materials appear to be close to 100 percent masked.

Indicator A11 (Depleted Below Dark Surface). This indicator is similar to F3 (Depleted Matrix). Because darker colored surface horizons imply more wetness, A11 indicates hydric conditions if the depleted matrix occurs within 30 cm whereas F3 indicates hydric conditions if the depleted matrix occurs within 25 cm.
A12 Thick Dark Surface

- *For use in all LRRs.* A layer at least 15cm (6 inches) thick with a depleted or gleyed matrix that has 60% or more chroma 2 or less starting below 30cm (12 inches) of the surface. A layer(s) starting within 15cm (6 inches) and above the depleted or gleyed matrix must have value 2.5 or less and chroma 1 or less to a depth of at least 30cm (12 inches) and value 3 or less and chroma 1 or less in any remaining layers above the depleted or gleyed matrix. Any sandy material above the depleted or gleyed matrix using a 10X or 15X hand lens, must have at least 70 percent of the visible soil particles masked with organic material. Observation without a hand lens appears to be close to 100 percent masked.

Indicator A12 (Thick Dark Surface). A depleted matrix is below the mollic epipedon (left photo). Deep observation is often necessary (right photo).

A13 Alaska Gleyed

- *For use in LRRs W, X, and Y.* A mineral layer with a dominant hue of N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5PB, with value 4 or more in more than 50 percent of the matrix. The layer starts within 30cm (12 in) of the mineral surface, and is underlain within 1.5m (60 inches) by soil material with hue 5Y or redder in the same type of parent material.
• Indicator A13 (Alaska Gleyed). Bluish band at approximately 20 cm (8 inches) indicates the presence of reduced soil material. The underlying material below 20 cm reflects both the color of the parent material and soil weathering under aerobic conditions.

A14 Alaska Redox

• For use in LRRs W, X, and Y. A mineral layer that has dominant hue 5Y with chroma of 3 or less, or a gleyed matrix, with 10 percent or more distinct or prominent redox concentrations as pore linings with value and chroma 4 or more. The layer occurs within 30 cm (12 inches) of the soil surface.

• Indicator A14 (Alaska Redox). The matrix color meets the requirements of a gleyed matrix. Reddish orange redox concentrations occur along pores and channels of living roots.
**A15 Alaska Gleyed Pores**

- For use in LRRs W, X, and Y. A mineral layer that has 10 percent or more hue N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5PB with value 4 or more along root channels or other pores starting within 30cm (12 inches) of the soil surface. The matrix has dominant hue of 5Y or redder.

- A15 (Alaska Gleyed Pores). Reduction occurs first along root channels where organic carbon is concentrated. Note gleyed colors along root channels.

**A16 Coast Prairie Redox**

- For use in MLRA 150A of LRR T; for testing in LRR S (except MLRA 149B). A layer starting within 15 cm (6 inches) of the soil surface that is at least 10 cm (4 inches) thick and has a matrix chroma 3 or less with 2% or more distinct or prominent redox concentrations as soft masses and/or pore linings.
Summary of the “A” indicators

• Many of the “A” indicators require exacting amounts of organic carbon. It may be best to obtain samples of soils with known amounts of organic carbon for calibration or work with a local wetland scientist familiar with your region. Over estimating the amount of organic carbon in a soil is the norm.