

Supplemental Hydric Soil Indicators for MDEQ



Adapted from 1998 NRCS Field Indicators of Hydric Soils in the United States

The following is a list of the field indicators that have been tested and approved in Michigan from the 1998 NRCS guidebook [Field Indicators of Hydric Soils in the United States](#). The listing is structured by alpha numeric listing, short name, applicable land resource regions (LRRs), description of the field indicator, and user notes. For example, A1 indicates the first indicator for all soils; the indicator is for use in all LRRs; Histosol is the short name; classifies as a Histosol, except Folists is the indicator description; helpful User Notes are added. For a map of land resource regions, photos of the soils described below, or for test indicators, please refer to [Field Indicators of Hydric Soils in the United States](#)

ALL SOILS:

All soils refers to soils with any USDA soil texture. Unless otherwise indicated, all mineral layers above any of the Indicators have dominant chroma 2 or less, or the layer(s) with dominant chroma of more than 2 is less than 15 cm (6 in.) thick. Also, unless otherwise indicated, nodules and concretions are not considered to be redox concentrations. Use the following Indicators regardless of texture.

A1. Histosol. For use in all LRRs. Classifies as a Histosol, except Folists.

Histosol User Notes: A Histosol has 40 cm (16 in.) or more of the upper 80 cm (32 in.) as organic soil material. Organic soil material has an organic carbon content (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), or peat (fibric soil material). See glossary for definition of muck, mucky peat, peat, and organic soil material. See Figure 32 (organic soil material) in the glossary for organic carbon requirements.

A2. Histic Epipedon. For use in all LRRs except W, X, and Y. A histic epipedon.

Histic Epipedon User Notes: Most histic epipedons are surface horizons 20 cm (8 in.) or more thick of organic soil material. Aquic conditions or artificial drainage are required. See Keys to Soil Taxonomy, page 3 (US Department of Agriculture, Soil Survey Staff, 1994). Slightly lower organic carbon contents are allowed in plowed soils (ibid., page 4). See glossary for definitions. See Figure 32

(organic soil material) in the glossary for organic carbon requirements.

A3. Black Histic. For use in all LRRs except W, X, and Y. A layer of peat, mucky peat, or muck 20 cm (8 in.) or more thick starting within the upper 15 cm (6 in.) of the soil surface having hue 10YR or yellower, value 3 or less, and chroma 1 or less.

Black Histic User Notes: Unlike indicator A2, this indicator does not require proof of aquic conditions or artificial drainage. See glossary for definitions of peat, mucky peat, and muck. See Figure 32 (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 in.) 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 sulfidic odor is only present when the soil is saturated and anaerobic.

A5. Stratified Layers. For use in LRRs F, K, L, M, N, O, P, R, S, T, and U. Several stratified layers starting within the upper 15 cm (6 in.) of the soil surface. One or more of the layers has value 3 or less with chroma 1 or less and/or it is muck, mucky peat, peat, or mucky modified mineral texture. The remaining layers have value 4 or more and chroma 2 or less.

Stratified Layers 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); at least 70 percent of soil material is covered, coated, or similarly masked with organic matter. An undisturbed sample must be observed. Individual strata are dominantly less than 2.5 cm (1 in.) thick. A hand lens is an excellent tool to aid in the identification of this indicator. Stratified layers in soils that fail NTCHS hydric soil criteria and fail anaerobic conditions are not indicative of hydric soils. Many alluvial soils have stratified layers at greater depths; these are not hydric soils. Many alluvial soils have stratified layers at the required depths but lack chroma 2 or less; these do not fit this indicator. Stratified Layers occur in any type soil material.

A10. 2 cm Muck. For use in LRR M and N. A layer of muck 2 cm (0.75 in.) or more thick with value 3 or less and chroma 1 or less starting within 15 cm (6 in.) of the soil surface.

2 cm Muck User Notes: This Indicator requires a minimum muck thickness of 2 cm. Normally this expression of anaerobiosis is at the

soil surface; however, it may occur at any depth within 15 cm (6 in.). Muck is sapric soil material with at least 12 to 18 percent organic carbon. Organic soil material is called muck (sapric soil material) 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. To determine if muck is present, first remove loose leaves, needles, bark, and other easily identified plant remains. This is sometimes called a leaf/root mat. Then examine for decomposed organic soil material. 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, Organic Bodies, or Histic Indicators. See the glossary for the definition of muck. See Figure 32 (organic soil material) in the glossary for organic carbon requirements.

SANDY SOILS:

“Sandy soils” refers to those soils with a USDA texture of loamy fine sand and coarser. Unless otherwise indicated, all mineral layers above any of the Indicators have dominant chroma 2 or less, or the layer(s) with dominant chroma of more than 2 is less than 15 cm (6 in.) thick. In addition, unless otherwise indicated, nodules and concretions are not considered to be redox concentrations. Use the following sandy Indicators for sandy mineral soil materials:

S1. Sandy Mucky Mineral. For use in all LRRs except W, X, and Y. A mucky modified mineral layer 5 cm (2 in.) or more thick starting within 15 cm (6 in.) of the soil surface.

Sandy Mucky Mineral User Notes: “Mucky” is a USDA texture modifier for mineral soils. The organic carbon content is at least 5 and ranges to as high as 14 percent for sandy soils. 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. See the glossary for the definition of mucky modified mineral texture. See Figure 32 (organic soil material) in the glossary for organic carbon requirements.

S3. 5 cm Mucky Peat or Peat. For use in LRRs F and M. A layer of mucky peat or peat 5 cm (2 in.) or more thick with value 3 or less and chroma 2 or less starting within 15 cm (6 in.) of the soil surface.

5 cm Mucky Peat and Peat User Notes: Mucky peat (hemic soil material) and peat (fibric soil material) have at least 12 to 18 percent

organic carbon. Organic soil material is called peat if virtually all of the plant remains are sufficiently intact to permit identification of plant remains. Mucky peat is an intermediate stage of decomposition between peat and highly decomposed muck. To determine if mucky peat and/or peat are present, first remove loose leaves, needles, bark, and other easily identified plant remains. This is sometimes called a leaf/root mat. Next examine for undecomposed to partly decomposed organic soil material. See the glossary for the definitions of mucky peat and peat.

S4. Sandy Gleyed Matrix. For use in all LRRs except W, X, and Y. A gleyed matrix which occupies 60% or more of a layer starting within 15 cm (6 in.) of the soil surface.

Sandy Gleyed Matrix User Notes: Gley colors are not synonymous with gray colors. Gley colors are those colors that are found on the gley page (Kollmorgen Instruments Corporation, 1994). They have hue N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5PB with value 4 or more. The gleyed matrix only has to be present within 15 cm (6 in.) of the surface. Soils with gleyed matrices are saturated for a significant duration; this is why no thickness of the layer is required. See the glossary for the definition of gleyed matrix.

S5. Sandy Redox. For use in all LRRs except V, W, X, and Y. A layer starting within 15 cm (6 in.) of the soil surface that is at least 10 cm (4 in.) thick, and has a matrix with 60% or more chroma 2 or less with 2% or more distinct or prominent redox concentrations as soft masses and/or pore linings.

Sandy Redox User Notes: Distinct and prominent are defined in the Glossary. Redox concentrations include iron and manganese masses (reddish mottles) and pore linings (Vepraskas, 1994). Included within this concept of redox concentrations are iron/manganese bodies as soft masses with diffuse boundaries. The iron/manganese masses are 2 to 5 mm in size and have a value 3 or less and a chroma 3 or less; most commonly they are black. Iron/manganese masses should not be confused with concretions and nodules (US Department of Agriculture, Soil Survey Staff, 1993) associated with plinthitic soils or relict concretions. Common to many redox concentrations (US Department of Agriculture, Soil Survey Division Staff, 1993) are required.

S6. Stripped Matrix. For use in all LRRs except V, W, X, and Y. A layer starting within 15 cm (6 in.) of the soil surface in which iron/manganese oxides and/or organic matter have been stripped from the matrix exposing the primary base color of soil materials. The stripped areas and translocated oxides and/or organic matter form a diffuse splotchy pattern of two or more

colors. The stripped zones are 10% or more of the volume; they are rounded and approximately 1 to 3 cm (0.5 to 1 in.) in diameter.

Stripped Matrix User Notes: This indicator includes the indicator previously named polychromatic matrix (Florida Soil Survey Staff, 1992) as well as the term streaking (Environmental Laboratory, 1987). Common to many (US Department of Agriculture, Soil Survey Division Staff, 1993) areas of stripped (uncoated) soil materials 1 to 3 cm (0.5 to 1 in.) in size is a requirement. Commonly the splotches of color have value 5 or more and chroma 1 and/or 2 (stripped) and chroma 3 and/or 4 (unstripped). The matrix may lack the 3 and/or 4 chroma material. The mobilization and translocation of the oxides and/or organic matter is the important process and should result in splotchy coated and uncoated soil areas.

LOAMY AND CLAYEY SOILS:

Loamy and clayey soils refers to those soils with USDA textures of loamy very fine sand and finer. Unless otherwise indicated, all mineral layers above any of the Indicators have dominant chroma 2 or less, or the layer(s) with dominant chroma of more than 2 is less than 15 cm (6 in.) thick. In addition, unless otherwise indicated, nodules and concretions are not considered to be redox concentrations. Use the following loamy and clayey Indicators for loamy or clayey mineral soil materials:

F1. Loamy Mucky Mineral. For use in all LRRs except N, R, S, V, W, X, Y, those using A7, and MLRA 1 of LRR A. A mucky modified mineral layer 10 cm (4 in.) or more thick starting within 15 cm (6 in.) of the soil surface.

Loamy Mucky Mineral User Notes: “Mucky” is a USDA texture modifier for mineral soils. The organic carbon is at least 8 percent but can range 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 sandy loam, which has at least 8 percent organic carbon but not more than about 14 percent organic carbon. See the glossary for the definition of mucky modified mineral texture. See Figure 32 (organic soil material) in the glossary for organic carbon requirements.

F2. Loamy Gleyed Matrix. For use in all LRRs except W, X, and Y. A gleyed matrix that occupies 60% or more of a layer starting within 30 cm (12 in.) of the soil surface.

Loamy Gleyed Matrix User Notes: Gley colors are not synonymous with gray colors. Gley colors are those colors that are found on the

gley pages (Kollmorgen Instruments Corporation, 1994). They have hue N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5PB, with value 4 or more. The gleyed matrix only has to be present within 30 cm (12 in.) of the surface. Although no minimum thickness is required, it is (generally) at least 1 cm thick to be observable. Soils with gleyed matrices are saturated for a significant duration, this is why no thickness of the layer is required. See glossary for the definition of gleyed matrix.

F3. Depleted Matrix. For use in all LRRs except W, X, and Y. A layer at least 15 cm (6 in.) thick with a depleted matrix that has 60% or more chroma 2 or less starting within 25 cm (10 in.) of the surface.

Depleted Matrix User Notes: The depleted matrix must begin within 25 cm (10 in.) and continue for at least 15 cm (6 in.). The minimum thickness requirement is 5 cm (2 in.) if the depleted matrix is within the upper 15 cm (6 in.) of the mineral soil. Redox concentrations including iron/manganese soft masses and/or pore linings are required in soils with matrix colors of 4/1, 4/2, and 5/2. 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. See glossary for the complete definition of depleted matrix. The low chroma matrix must be due to wetness and not a relict or parent material feature.

F4. Depleted Below Dark Surface. For use in all LRRs except LRRs W, X, and Y. A layer at least 15 cm (6 in.) thick with a depleted matrix that has 60% or more chroma 2 or less starting within 30 cm (12 in.) of the surface. The layer(s) above the depleted matrix have value 3 or less and chroma 2 or less.

Depleted Below Dark Surface User Notes: This indicator often occurs in Mollisols but also applies to soils with umbric epipedons and dark colored ochric epipedons. For soils with dark colored epipedons greater than 30 cm (12 in.) thick, use Indicator F5. Redox concentrations including iron/manganese soft masses and/or pore linings are required in soils with matrix colors of 4/1, 4/2, and 5/2. 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. See glossary for the definition of depleted matrix.

F5. Thick Dark Surface. For use in all LRRs except LRRs W, X, and Y. A layer at least 15 cm (6 in.) thick with a depleted matrix that has 60% or more chroma 2 or less (or a gleyed matrix) starting below 30 cm (12 in.) of the surface. The layer(s) above the depleted or gleyed matrix have hue N and value 3 or less to a depth of 30 cm (12 in.) and value 3 or less and chroma 1 or less in the remainder of the epipedon.

Thick Dark Surface User Notes: The soil has a black or very dark gray surface layer 30 cm (12 in.) or more thick. The dark colored subsoil has value 3 or less, chroma 1 or less. Below the dark colored epipedon is a depleted matrix or gleyed matrix. This indicator is most often associated with overthickened soils in concave landscape positions. Redox concentrations including iron/manganese soft masses and/or pore linings are required in soils with matrix colors of 4/1, 4/2, and 5/2. 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. See glossary for the definition of depleted matrix.

F6. Redox Dark Surface. For use in all LRRs except LRRs W, X, and Y. A layer at least 10 cm (4 in.) thick entirely within the upper 30 cm (12 in.) of the mineral soil that has:

- a. matrix value 3 or less and chroma 1 or less and 2% or more distinct or prominent redox concentrations as soft masses or pore linings, or
- b. matrix value 3 or less and chroma 2 or less and 5% or more distinct or prominent redox concentrations as soft masses or pore linings.

Redox Dark Surface User Notes: Redox concentrations in high organic matter mineral soils with dark surfaces are often difficult to see. The organic matter “masks” some or all of the concentrations that may be present. Careful examination is required in order to see what are often brownish “mottles” in the darkened materials. In some instances, drying of the samples makes the concentrations (if present) easier to see. Dried colors, if used, need to have matrix chromas of 1 or 2 and the redox concentrations need to be distinct or prominent. In soils which are wet due to subsurface saturation, the layer immediately below the dark epipedon should have a depleted or gleyed matrix. Soils which are wet due to ponding or shallow perched layer of saturation may not always have a depleted/gleyed matrix below the dark surface. This morphology has been observed in soils

that have been compacted by tillage and other means. It is recommended that delineators evaluate the hydrologic source and examine and describe the layer below the dark colored epipedon when applying this indicator. Redox concentrations including iron/manganese soft masses and/or pore linings are required in soils with matrix colors of 4/1, 4/2, and 5/2. 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.

F7. Depleted Dark Surface. For use in all LRRs except LRRs W, X, and Y. Redox depletions, with value 5 or more and chroma 2 or less, in a layer at least 10 cm (4 in.) thick entirely within the upper 30 cm (12 in.) of the mineral soil that has:

a. matrix value 3 or less and chroma 1 or less and 10% or more redox depletions, or

b. matrix value 3 or less and chroma 2 or less and 20% or more redox depletions.

Depleted Dark Surface User Notes: Care should be taken not to mistake mixing of an E or calcic horizon into the surface layer as depletions. The “pieces” of E and calcic horizons are not redox depletions. Knowledge of local conditions is required in areas where E and/or calcic horizons may be present. In soils which are wet due to subsurface saturation, the layer immediately below the dark surface should have a depleted or gleyed matrix. Redox depletions should have associated microsites redox concentrations that occur as Fe pore linings or masses within the depletion(s) or surrounding the depletion(s).

F8. Redox Depressions. For use in all LRRs except LRRs W, X, and Y. In closed depressions subject to ponding, 5% or more distinct or prominent redox concentrations as soft masses or pore linings in a layer 5 cm (2 in.) or more thick entirely within the upper 15 cm (6 in.) of the soil surface.

Redox Depressions User Notes: This indicator occurs on landforms such as: vernal pools, playa lakes, rainwater basins, Grady ponds, and potholes: not micro-depressions on convex or plane landscapes.

GLOSSARY:

A Horizon - A mineral horizon that formed at the surface or below an O horizon where organic material is accumulating. See Keys to Soil Taxonomy (1994) for complete definition.

*Abrupt Boundary – Used to describe redoximorphic features that grade sharply from one color to another. The color grade is commonly less than 0.5mm wide. Clear and gradual are used to describe boundary color gradations intermediate between abrupt and diffuse.

Accreting Areas - Landscape positions where soil material accumulates through deposition from higher elevations or upstream positions more rapidly than is being lost through erosion.

Anaerobic - A condition in which molecular oxygen is virtually absent from the soil.

Anaerobiosis - Microbiological activity under anaerobic conditions.

Aquic Conditions - Conditions in the soil represented by: depth of saturation, occurrence of reduction, and redoximorphic features. See Keys to Soil Taxonomy (1994) for complete definition.

*Artificial Drainage - The use of human efforts and devices to remove free water from the soil surface or from the ground, or the use of human efforts and devices to prevent surface or ground water from reaching the soil. Dams and levees are included as devices that are used to artificially drain soils. The presence of artificial drainage does not alter the hydric status of a soil.

Calcic Horizon - An illuvial horizon in which carbonates have accumulated to a significant extent. See Keys to Soil Taxonomy (1994) for complete definition.

Calcium Carbonate (CaCO₃) - Calcium carbonate effervesces when treated with cold hydrochloric acid.

CaCO₃ Equivalent - Is the acid neutralizing capacity of a soil expressed as a weight percentage of CaCO₃ (molecular weight of CaCO₃ equals 100).

Closed Depressions - A low-lying area surrounded by higher ground with no natural outlet for surface drainage.

COE - US Army Corps of Engineers.

Common - When referring to redox concentrations and/or depletions common represents 2 to 20 percent of the observed surface.

Concave Landscapes - A landscape whose surface curves downward.

*Covered, Coated, Masked - These are terms used to describe all of the redoximorphic processes by which the color of soil particles are hidden by organic material, silicate clay, iron, aluminum, or some combination of these.

*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. The following combinations of value and chroma identify a depleted matrix:

1. Matrix value 5 or more and chroma 1 or less with or without redox concentrations as soft masses and/or pore linings; or
2. Matrix value 6 or more and chroma 2 or less 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.

*Diffuse Boundary - Used to describe redoximorphic features that grade gradually from one color to another. The color grade is commonly more than 2 mm wide. Clear is used to describe boundary color gradations intermediate between sharp and diffuse

*Distinct - Readily seen but contrast only moderately with the color to which compared; a class of contrast intermediate between faint and prominent. If 1) delta hue = 0, delta value <4, and delta chroma >1 and <4, or 2) delta hue = 0, delta value >2 to <4, and chroma <4, or 3) delta hue = 1, delta value >1 to <3, and delta chroma >1 to <3, or 4) delta hue = 2, delta value ≥ 0 to <2, and delta chroma ≥ 0 to <2 the contrast is distinct.

E Horizon - A mineral horizon in which the main dominant process is loss of silicate clay, iron, and/or aluminum, leaving a concentration of

sand and silt particles. See Keys to Soil Taxonomy (1994) for complete definition.

EPA - US Environmental Protection Agency.

Epipedon - A horizon that has developed at the soil surface. See Keys to Soil Taxonomy (1994) for complete definition.

Faint - Evident only on close examination. If 1) delta hue = 0, delta value ≤ 2 and delta chroma ≤ 1 or 2) delta hue = 1, delta value ≤ 1 and delta chroma = ≤ 1 the contrast is faint.

Fe/Mn Concretions - Firm to extremely firm irregularly shaped bodies with sharp to diffuse boundaries. When broken in half concretions have concentric layers. See Vepraskas (1994) for complete discussion.

Fe/Mn Nodules - Firm to extremely firm irregularly shaped bodies with sharp to diffuse boundaries. When broken in half nodules do not have visibly organized internal structure. See Vepraskas (1994) for complete discussion.

Few - When referring to redox concentrations and/or depletions few represents less than 2 percent of the observed surface.

Fibric - See peat.

Fragmental Soil Material - Soil material that consists of 90% or more rock fragments. Less than 10% of the soil volume consists of particules 2 mm or smaller.

Frequently Flooded or Pondered - A frequency class in which flooding or ponding is likely to occur often under usual weather conditions (more than 50 percent chance in any year, or more than 50 times in 100 years).

FWS - US Department of Interior, Fish and Wildlife Service.

Glauconitic - A mineral aggregate that contains micaceous mineral resulting in a characteristic green color, e.g. glauconitic shale or clay.

*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, 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.

*Hemic - See Mucky peat.

Histic Epipedon - A thick (20-60 cm {8-24 in.}) organic soil horizon that is saturated with water at some period of the year unless artificially drained and that is at or near the surface of a mineral soil. See Keys to Soil Taxonomy (1994) for complete definition.

Histosols - Organic soils that have organic soil materials in more than half of the upper 80 cm (32 in.), or that are of any thickness if they overly rock or fragmental materials that have interstices filled with organic soil materials. See Keys to Soil Taxonomy (1994) for complete definition.

Horizon - A layer, approximately parallel to the surface of the soil, distinguishable from adjacent layers by a distinctive set of properties produced by soil forming processes. See Keys to Soil Taxonomy (1994) for complete definition.

Hydric Soil Criteria (2000):

1. All Histels except Folistels and all Histosols except Folist. or
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that are:
 - a. somewhat poorly drained with a water table equal to 0.0 foot (ft.) from the surface during the growing season, or
 - b. poorly drained or very poorly drained and have either:
 1. water table equal to 0.0 ft. during the growing season if textures are coarse sand, sand, or fine sand in all layers within 20 inches (in.), or for other soils, or
 2. water table at less than or equal to 0.5 ft. from the surface during the growing season if permeability is equal to or greater than 6.0 in./hour (h.) in. all layers within 20 in., or
 3. water table at less than or equal to 1.0 ft. from the surface during the growing season, if permeability is less than 6.0 in./h. in any layer within 20 in., or

3. Soils that are frequently ponded for long or very long duration during the growing season, or
4. Soils that are frequently flooded for long or very long duration during the growing season.

Hydric Soil Definition (1994) - 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.

Hydrogen Sulfide Odor - An odor similar to rotten eggs.

Hydromorphic - Features in the soil caused or formed by water.

Layer(s) - A horizon, subhorizon, or combination of contiguous horizons or subhorizons that share a property(s) referred to in the Indicators.

Lithologic Discontinuity - Occurs in a soil that has developed in more than one type of parent material. Commonly determined by a significant change in particle- size distribution, mineralogy, etc. that indicates a difference in material from which the horizons formed.

LRR - Land Resource Region. LRRs are geographic areas characterized by a particular pattern of soils, climates, water resources, and land use. Each LRR has a different letter of the alphabet (A-Z). LRRs are defined in USDA Ag. Handbook 296.

Many - When referring to redox concentrations and/or depletions many represents more than 20 percent of the observed surface.

Marl - An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under fresh water lacustrine conditions. See Keys to Soil Taxonomy (1994) for complete definition.

Matrix - The dominant soil volume which is continuous in appearance and envelops microsites. When three colors exist, such as when a matrix, depletions, and concentrations are present, the matrix may represent less than 50 percent of the total soil volume.

MLRA - Major Land Resource Areas. MLRAs are geographically associated divisions of Land Resource Regions. MLRAs are defined in USDA Ag. Handbook 296.

Mollic Epipedon - A mineral surface horizon that is relatively thick, dark colored, humus rich, and has high base saturation. See Keys to Soil Taxonomy (1994) for complete definition.

Mollisols - Mineral soils that have a mollic epipedon. See Keys to Soil Taxonomy (1994) for complete definition.

*Muck - A sapric organic soil material in which virtually all of the organic material is decomposed not allowing for identification of plant forms. Bulk density is normally 0.2 or more. Muck has <1/6 fibers after rubbing, and sodium pyrophosphate solution extract color has lower value and chroma than 5/1, 6/2, and 7/3.

*Mucky Modified Texture - A USDA soil texture modifier, e.g. mucky sand. Mucky modified mineral soil with 0 percent clay has between 5 and 12 percent organic carbon. Mucky modified mineral soil with 60 percent clay has between 11 and 18 percent organic carbon. Soils with an intermediate amount of clay have intermediate amounts of organic carbon.

*Mucky Peat - A hemic organic material with decomposition intermediate between that of fibric and sapric organic material. Bulk density is normally between 0.1 and 0.2 g/cm³. Mucky peat does not meet fiber content (after rubbing) or sodium pyrophosphate solution extract color requirements for either fibric or sapric soil material.

Nodules - See Fe/Mn nodules.

NRCS - USDA - Natural Resources Conservation Service (formerly Soil Conservation Service).

NTCHS - National Technical Committee for Hydric Soils.

Organic Matter - Plant and animal residue in the soil in various stages of decomposition.

Organic Soil Material - Soil material that is saturated with water for long periods or artificially drained and, excluding live roots, has an organic carbon content of: 18 percent or more with 60 percent or more clay, or 12 percent or more organic carbon with 0 percent clay. Soils with an intermediate amount of clay have an intermediate amount of organic carbon. If the soil is never saturated for more than a few days, it contains 20 percent or more organic carbon. Organic soil material includes *Muck, *Mucky Peat, and *Peat. (See Figure 32).

*Peat - A fibric organic soil material with virtually all of the organic material allowing for identification of plant forms. Bulk density is normally <0.1. Peat has 3/4 or more fibers after rubbing, or 2/5 or more fibers after rubbing and sodium pyrophosphate solution extract color of 7/1, 7/2, 8/2, or 8/3.

Plinthite - The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. See Keys to Soil Taxonomy (1994) for a complete discussion of plinthite.

Ponding - Standing water in a closed depression that is removed only by percolation, evaporation, or transpiration. Duration is greater than seven days.

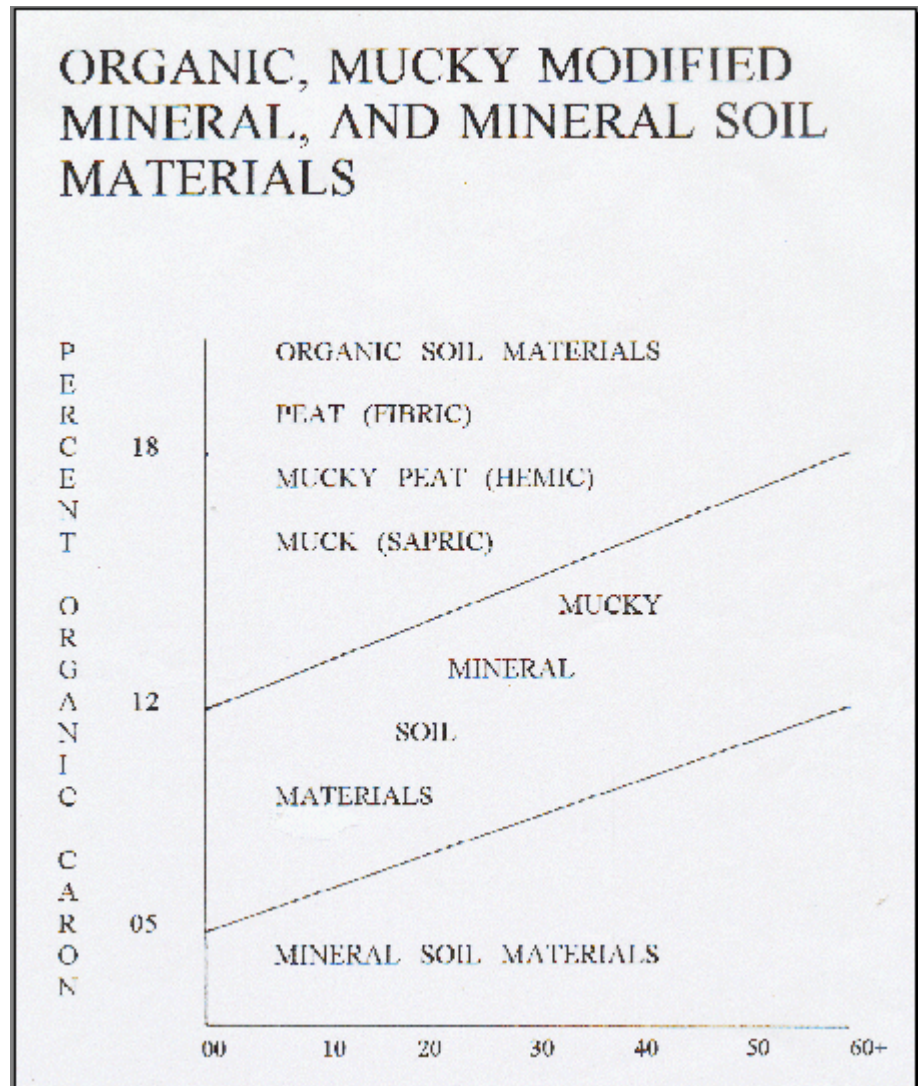
Pore Linings - Zones of accumulation that may be either coatings on a pore surface or impregnations of the matrix adjacent to the pore. See Vepraskas (1994) for complete discussion.

Prominent - Contrasts strongly with the color to which they are compared. If 1) delta hue = 0, delta value ≥ 4 or delta chroma ≥ 4 , or 2) delta hue = 1, delta value ≥ 3 , or delta chroma ≥ 3 , or 3) delta hue = 2, delta value ≥ 2 , or delta chroma ≥ 2 , or 4) delta hue ≥ 3 the contrast is prominent.

Redox Concentrations - Bodies of apparent accumulation of Fe/Mn oxides. Redox concentrations include soft masses, pore linings, nodules, and concretions. For the purposes of the Indicators nodules and concretions are excluded from the concept of redox concentrations unless otherwise specified by specific Indicators. See Vepraskas (1994) for complete discussion.

Redox Depletions - Bodies of low chroma (2 or less) having value 4 or more where Fe-Mn oxides have been stripped or where both Fe-Mn oxides and clay have been stripped. Redox deletions contrast

Figure 32



Organic soil material, mucky mineral soil material, and mineral soil material as they relates to percent clay content have specific organic carbon requirements

distinctly or prominently with the matrix. See Vepraskas (1994) for complete discussion.

Redoximorphic Features - Features formed by the processes of reduction, translocation, and/or oxidation of Fe and Mn oxides. Formerly called mottles and low chroma colors. See Vepraskas (1994) for complete discussion.

Reduced Matrix - Soil matrices that have low chroma and high value, but whose color changes in hue or chroma when exposed to air. See Vepraskas (1994) for complete discussion.

*Reduction - For the purpose of the Indicators, when the redox potential (Eh) is below the ferric/ferrous iron threshold as adjusted for pH. In hydric soils, this is the point when the transformation of ferric iron (Fe⁺⁺⁺) to ferrous iron (Fe⁺⁺) occurs.

Relict Features - Soil morphological features that do not reflect recent hydrologic conditions of saturation and anaerobiosis. See Vepraskas, M. J. (1994) for complete discussion.

*Sapric - See muck.

Saturation - When the soil water pressure is zero or positive. Most all the soil pores are filled with water.

SCS - USDA - Soil Conservation Service (now Natural Resources Conservation Service).

Sharp Boundary - Used to describe redoximorphic features that grade sharply from one color to another. The color grade is commonly less than 0.1 mm wide and change is abrupt under a 10X hand lens.

Soft Masses - Redox concentrations, that are not hard, frequently within the matrix, whose shape is variable. See Vepraskas, M. J. (1994) for complete discussion.

Soil Texture - The weight proportion of the soil separates for particles less than 2 mm.

Spodic Horizon - A mineral soil horizon that is characterized by the illuvial accumulation of amorphous materials composed of aluminum and organic carbon with or without iron. The spodic horizon has certain minimum thickness, and a minimum quantity of oxalate extractable carbon plus aluminum. It also has specific color requirements. See Keys to Soil Taxonomy (1994) for complete definition.

Umbric Epipedon - A thick, dark mineral surface horizon with base saturation of less than 50 percent. See Keys to Soil Taxonomy (1994) for complete definition.

Vertisol - A mineral soil with 30 percent or more clay in all layers. These soils expand and shrink depending on moisture content and contain slickensides or wedge-shaped peds. See Keys to Soil Taxonomy (1994) for complete definition.

* These terms, as defined in this glossary, are either defined for the first time or they have definitions that are slightly different from the definitions in the referenced materials. These definitions are to assist users of this document and are not intended to add to or replace definitions in the referenced materials.