Field Indicators of Hydric Soils in the United States (Version 5.9)

ALL SOILS

"All soils" refers to soils with any USDA soil texture. All mineral layers above any of the A Indicators 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 considered to be redox concentrations. Use the following Indicators regardless of texture.

A1. Histosol (*For use in all LRRs*) or Histel (*For use in LRRs with permafrost).* Classifies as a Histosol (except Folist) or as a Histel (except Folistel).
Histosol User Notes: A Histosol has 40 cm (16 inches) or more of the upper 80 cm (32 inches) 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).

A2. Histic Epipedon. *For use in all LRRs.* A histic epipedon underlain by mineral soil material with chroma 2 or less.
Histic Epipedon User Notes: Most histic epipedons are surface horizons of organic soil material 20 cm (8 inches) or more thick. Aquic conditions or artificial drainage are required.

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 chroma 2 or less.
Black Histic User Notes: Unlike indicator A2 this indicator does not require proof of aquic conditions or artificial drainage.

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 sulfidic odor is only present when the soil is saturated and anaerobic.

A5. Stratified Layers. *For use in LRRs C, F, K, L, M, N, O, P, R, S, T, and U; for testing in LRRs V and Z.* Several stratified layers starting within the upper 15 cm (6 inches) 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 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 inch)

thick. 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 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.

A6. Organic Bodies. ***For use in LRRs P, 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. In some soils the organic bodies are smaller than 1 cm.**
Organic Bodies User Notes: The percent organic carbon in organic bodies is the same as in the Muck or Mucky Texture Indicators. This indicator includes the indicator previously named "accretions" (Florida Soil Survey Staff, 1992). Many organic bodies lack the required amount of organic carbon and are not indicative of hydric soils. The content of organic carbon should be known before this indicator is used. Organic bodies of hemic (mucky peat) and/or fibric (peat) soil materials do not qualify as this indicator. Material consisting of partially decomposed root tissue does not qualify as the indicator.

A7. 5 cm Mucky Mineral. ***For use in LRRs P, 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 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 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.

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 within 15 cm (6 inches) of the soil surface.**
Muck Presence User Notes: The presence of muck of any thickness within 15 cm (6 inches) is the only requirement. 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 material) if virtually all of the material has undergone sufficient decomposition such that plant parts can not be identified. Hemic (mucky peat) and fibric (peat) soil materials do not qualify. To determine if muck is present, first remove peat and mucky peat. Then examine for decomposed organic soil material. Generally muck is black and has a "greasy" feel; sand grains should not be evident.

A9. 1 cm Muck. ***For use in LRRs D, F, G, H, P, and T; for testing in LRRs C, 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.**
1 cm Muck User Notes: Unlike Indicator A8 (Muck Presence) there is a minimum thickness requirement of 1 cm. 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 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 peat and mucky peat. Then examine for decomposed organic soil material. Generally muck is black and has a "greasy" feel; sand grains should not be evident

A10. 2 cm Muck. ***For use in LRR M and N; for testing in LRRs A, B, E, K, L, S, W, X, and Y.*** **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.**

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 inches). 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 peat and mucky peat material. Then examine for decomposed organic soil material. Generally muck is black and has a "greasy" feel; sand grains should not be evident.

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.

Loamy/clayey layer(s) above the depleted or gleyed matrix must have value 3 or less and chroma 2 or less. Sandy layer(s) above the depleted or gleyed matrix must have value 3 or less, chroma 1 or less, and at least 70% of the visible soil particles must be covered, coated or similarly masked with organic material.

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 inches) thick, use Indicator A12. 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.

A12.Thick Dark Surface. For use in all LRRs. A layer at least 15cm (6 inches) thick with a depleted matrix that has 60% or more chroma 2 or less (or a gleyed matrix) starting below 30cm (12 inches) of the surface. The layer (s) above the depleted or gleyed matrix have value 2.5 or less and chroma 1 or less to a depth of 30cm (12 inches) and value 3 or less and chroma 1 or less in the remainder of the epipedon. If the epipedon is sandy at least 70% of the visible soil particles must be covered, coated, or similarly masked with organic material."

Thick Dark Surface User Notes: The soil has a black or very dark gray surface layer 30 cm (12

inches) 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.

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.

Alaska Gleyed User Notes: This indicator can be used for all mineral soils, not just sandy soils. The indicator is looking for two things: First, that within 30 cm. (12 in.) of the soil surface, one or more of the specified gleyed colors is present. These must be colors present on the gley pages of the color book, not simply gray colors. Second, below these gleyed colors, the color of similar soil material is 5Y or redder (2.5Y, 10YR, 7.5YR, etc.). The presence of the truly gleyed colors indicates that the soil has undergone reduction. The requirement for 5Y or redder colors lower in the profile is to insure that the gleyed colors are not simply the basic color of the soil parent material. Tidal sediments, lacustrine sediments, loess, and some glacial tills have base colors that appear as gleyed. On closer examination, their colors will normally not fit on the gleyed color pages. This indicator proves that the near surface gleyed colors are not natural soil material colors, and that they are the result of reduced conditions. When comparing the near surface and underlying colors make sure that you are looking at the same type of soil material. Many soils in Alaska are composed of two or more types of material (e.g., silty loess overlying gravelly glacial till or sand and gravel river deposits).

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 in) of the soil surface.

Alaska Redox User Notes: In a soil layer that has been reduced, one of the first areas where oxygen will be re-introduced is along pores and the channels of live roots. As oxidation occurs in these areas, characteristic reddish-orange redox concentrations (value and chroma of 4 or more) will be apparent along the pores and linings. These will stand out in contrast to the matrix color of the overall soil layer. First, note the dominant color(s) of the soil layer to see if it matches the gley colors indicated. Then break open pieces of the soil and look for reddish-orange redox concentration along pores and root linings (Figure 9 and Figure 10). If these conditions are met, it indicates the soil has been reduced during periods of wetness and now, while in a drier state, the soil is oxidizing.

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.

Alaska Gleyed Pores User Notes: In a soil layer that is turning anaerobic, reduced conditions will first occur where the soil microbes have an ample supply of organic carbon. Colder soils, as in Alaska, normally have low organic carbon, so microbes will congregate along the channels containing dead roots. It is along these channels that gley colors will first appear. In a soil layer that is not already dominated by gleyed colors, break open pieces of the soil and look closely at the root channels. Many of these will be very thin or fine. See if you can observe thin coatings along the channels that match the gleyed colors listed in the indicator. If they are present, they indicate that the soil is beginning to go anaerobic.

A16. Coast Prairie Redox. ***For use in MLRA 150A of LRR T.*** **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.**
Coast Prairie Redox User Notes: These hydric soils occur mainly on depressional landforms and portions of the intermound landforms on the Lissie Formation. Redox concentrations occur mainly as iron dominated pore linings. Common to many redox concentrations are required. Chroma 3 matrices are allowed because they may be the color of stripped sand grains or because few to common sand size reddish chert particles occur and may prevent obtaining chroma 2 or less.

SANDY SOILS

"Sandy soils" refers to those soils with a USDA texture of loamy fine sand and coarser. All mineral layers above any of the S Indicators except for Indicator S6 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 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 and those LRRs that use Indicator A7 (P, T. and U).*** **A mucky modified mineral layer 5 cm (2 inches) or more thick starting within 15 cm (6 inches) 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.

S2. 2.5 cm Mucky Peat or Peat. ***For use in LRRs G and H.*** **A layer of mucky peat or peat 2.5 cm (1 inches) or more thick with value 4 or less and chroma 3 or less starting within 15 cm (6 inches) of the soil surface underlain by sandy soil material.**
2.5 cm Mucky Peat and Peat User Notes: Mucky peat (hemic soil material) and peat (fibric soil material) having 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 determine the percent rubbed and unrubbed fiber content.

S3. 5 cm Mucky Peat or Peat. ***For use in LRRs F, and M; for testing in LRR R*** **A layer of mucky peat or peat 5 cm (2 inches) or more thick with value 3 or less and chroma 2 or less starting within 15 cm (6 inches) of the soil surface underlain by sandy soil material.**
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 determine the percent rubbed and unrubbed fiber content.

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 inches) 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 (Gretag/Macbeth, 2000). 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 inches) of the surface. Soils with gleyed matrices are saturated for a significant duration; this is why no thickness of the layer is required.

S5. Sandy Redox. ***For use in all LRRs except V, W, X, and Y.*** **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 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. 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 value 3 or less and chroma 3 or less; most commonly they are black. Iron/manganese masses should not be confused with concretions and nodules associated with plinthitic or relict concretions. Common to many redox concentrations are required.

S6. Stripped Matrix. ***For use in all LRRs except V, W, X, and Y.*** **A layer starting within 15 cm (6 inches) 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 faint 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 inches) in diameter.**
Stripped Matrix User Notes: This indicator includes the indicator previously named "polychromatic matrix" as well as the term "streaking." Common to many areas of stripped (uncoated) soil materials are required. The stripped areas are approximately 1 to 3 cm (0.5 to 1 inches) in size; they may be smaller. 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.

S7. Dark Surface. ***For use in LRRs N, P, R, S, T, U, V, and Z.*** **A layer 10 cm (4 inches) or more thick starting within the upper 15 cm (6 inches) of the soil surface with a matrix value 3 or less and chroma 1 or less. At least 70% of the visible soil particles must be covered, coated, or similarly masked with organic material. The matrix color of the layer immediately below the dark layer must have chroma 2 or less.**

Dark Surface User Notes: The organic carbon content of this indicator is slightly less than required for "mucky." An undisturbed sample must be observed. A 10X or 15X hand lens is an excellent tool to help aid this decision. Many wet soils have a ratio of about 50 percent soil particles that are covered or coated with organic matter and about 50 percent uncoated or uncovered soil particles, giving the soil a salt and pepper appearance. Where the percent of coverage is less than 70 percent, a Dark Surface indicator is not present.

S8. Polyvalue Below Surface. ***For use in LRRs R, S, T, and U; for testing in LRRs K and L.*** **A layer with value 3 or less and chroma 1 or less starting within 15 cm (6 inches) of the soil surface underlain by a layer(s) where translocated organic matter unevenly covers the soil material forming a diffuse splotchy pattern. At least 70% of the visible soil particles in the upper layer must be covered, coated, or masked with organic material. Immediately below this layer, the organic coating occupies 5% or more of the soil volume and has value 3 or less and chroma 1 or less. The remainder of the soil volume has value 4 or more and chroma 1 or less.**

Polyvalue Below Surface User Notes: This indicator describes soils with a very dark gray or black surface or near surface layer less than 10 cm (4 inches) thick underlain by a layer where organic matter has been differentially distributed within the soil by water movement. The mobilization and translocation of organic matter results in splotchy coated and uncoated soil areas as described in the Sandy Redox and Stripped Matrix Indicators except that for S8 the whole soil is in shades of black and gray. The chroma 1 or less is critical because it limits application of this indicator to only those soils which are depleted of iron. This indicator includes the indicator previously termed "streaking."

S9. Thin Dark Surface. ***For use in LRRs R, S, T and U; for testing in LRRs K and L.*** **A layer 5 cm (2 inches) or more thick within the upper 15 cm (6 inches) of the surface, with value 3 or less and chroma 1 or less. At least 70% of the visible soil particles in this layer must be covered, coated, or masked with organic material. This layer is underlain by a layer(s) with value 4 or less and chroma 1 or less to a depth of 30 cm (12 inches) or to the spodic horizon, whichever is less.**

Thin Dark Surface User Notes: This indicator describes soils with a very dark gray or black near-surface layer at least 5 cm (2 inches) thick underlain by a layer where organic matter has been carried downward by flowing water. The mobilization and translocation of organic matter results in an even distribution of organic matter in the eluvial (E) horizon. The chroma 1 or less is critical because it limits application of this indicator to only those soils which are depleted of iron. This indicator commonly occurs in hydric Spodosols; however, a spodic horizon is not required.

S10. Alaska Gleyed. This Indicator is now Indicator A13 (Alaska Gleyed).

LOAMY AND CLAYEY SOILS

"Loamy and clayey soils" refers to those soils with USDA textures of loamy very fine sand and finer. All mineral layers above any of the F Indicators except for Indicators F8, F12, F19, and F20 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, except for Indicator F16, 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, and Y, those using A7, and MLRA 1 of LRR A.*** **A mucky modified mineral layer 10 cm (4 inches) or more thick starting within 15 cm (6 inches) 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.

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 inches) 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 (Gretag/Macbeth. 2000). 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 inches) of the surface. Soils with gleyed matrices are saturated for a significant duration; this is why no thickness of the layer is required.

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

a. 5 cm (2 inches) if 5 cm (2 inches) is entirely within the upper 15 cm (6 inches) of the soil, or

b. 15 cm (6 inches) and starts within 25 cm (10 inches) of the soil surface.

Depleted Matrix User Notes: 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. The low chroma matrix must be due to wetness and not a relict or parent material feature.

F4. Depleted Below Dark Surface. This Indicator is now Indicator A11 (Depleted Below Dark Surface).

F5. Thick Dark Surface. This Indicator is now Indicator A12 (Thick Dark Surface.

F6. Redox Dark Surface. ***For use in all LRRs except LRRs W, X, and Y; for testing in LRRs***

W, X, and Y. **A layer at least 10 cm (4 inches) thick entirely within the upper 30 cm (12 inches) 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. 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 W, X, and Y; for testing in 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 inches) thick entirely within the upper 30 cm (12 inches) 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; for testing in 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 inches) or more thick entirely within the upper 15 cm (6 inches) of the soil surface.**

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

F9. Vernal Pools. ***For use in LRRs B, C and D.*** **In closed depressions subject to ponding, presence of a depleted matrix with 60% or more chroma 2 or less in a layer 5 cm (2 inches)**

thick entirely within the upper 15 cm (6 inches) of the soil surface.
Vernal Pools User Notes: Most often soils pond water for two reasons: they occur on landscape positions that collect water and they have a restrictive layer(s) that prevents water from moving downward through the soil. Normally this indicator occurs at the soil surface. 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.

F10. Marl. ***For use in LRR U.*** **A layer of marl with a value 5 or more starting within 10 cm (4 inches) of the soil surface.**
Marl User Notes: Marl is a limnic material deposited in water by precipitation of $CaCO_3$ by algae as defined in Soil Taxonomy (USDA, NRCS, Soil Survey Staff. 1999). It has a Munsell value 5 or more and reacts with dilute HCl to evolve CO_2. Marl is not the carbonatic substrate material associated with limestone bedrock. Some soils have materials with all the properties of marl except they lack the required Munsell value. These soils are hydric if the required value is present within 10 cm (4 in) of the soil surface. Normally this indicator occurs at the soil surface.

F11. Depleted Ochric. ***For use in MLRA 151 of LRR T.*** **A layer(s) 10 cm (4 inches) or more thick that has 60% or more of the matrix with value 4 or more and chroma 1 or less. The layer is entirely within the upper 25 cm (10 inches) of the soil surface.**
Depleted Ochric User Notes: This indicator is applicable on accreting deltaic areas of the Mississippi River.

F12. Iron/Manganese Masses. ***For use in LRRs N, O, P, and T; for testing in LRR M.*** **On flood plains, a layer 10 cm (4 inches) or more thick with 40% or more chroma 2 or less, and 2 percent or more distinct or prominent redox concentrations as soft iron/manganese masses with diffuse boundaries. The layer occurs entirely within 30 cm (12 inches) of the soil surface. Iron/manganese masses have value 3 or less and chroma 3 or less; most commonly they are black. The thickness requirement is waived if the layer is the mineral surface layer.**
Iron/Manganese Masses User Notes: These iron/manganese masses are usually small (2 to 5 mm in size) and have a value and chroma 3 or less. They can be dominated by manganese and therefore have a color approaching black. The low matrix chroma must be due to wetness and not be a relict or parent material feature. Iron/manganese masses should not be confused with the larger and redder iron nodules associated with plinthite or with concretions that have sharp boundaries. This indicator occurs on flood plains of rivers such as the Apalachicola, Congaree, Mobile, Savannah, and Tennessee Rivers.

F13. Umbric Surface. ***For use in LRRs P, T, and U and MLRA 122 of LRR N.*** **In depressions and other concave landforms, a layer 25 cm (10 inches) or more thick starting within 15 cm (6 inches) of the soil surface in which the upper 15 cm (6 inches) must have value 3 or less and chroma 1 or less, and the lower 10 cm (4 inches) of the layer must have the same colors**

as above or any other color that has a chroma 2 or less.
Umbric Surface User Notes: Thickness requirements maybe slightly less than those required for an umbric epipedon. Microlows are not considered to be concave landforms. Umbric surfaces on higher landscape positions, such as side slopes dominated by Humic Dystrudepts, are excluded.

F14. Alaska Redox Gleyed. This Indicator is now Indicator A14 (Alaska Redox).

F15. Alaska Gleyed Pores. This Indicator is now Indicator A15 (Alaska Gleyed Pores).

F16. High Plains Depressions. ***For use in MLRAs 72 and 73 of LRR H; for testing in other MLRAs of LRR H.*** **In closed depressions subject to ponding, a mineral soil that has chroma 1 or less to a depth of at least 35 cm (13.5 inches) and a layer at least 10 cm (4 inches) thick within the upper 35 cm (13.5 inches) of the mineral soil that has either:**

a. 1% or more redox concentrations as nodules or concretions, or

b. redox concentrations as nodules or concretions with distinct or prominent corona.

High Plains Depressions User Notes: This indicator is for closed depressions (FSA "playas") in western Kansas, southwestern Nebraska, eastern Colorado, and southeastern Wyoming. It occurs in soils such as the Ness and Pleasant series. The matrix color of the 35 cm (13.5 inches) layer must be a chroma 1 or less; chroma 2 matrix colors are excluded; value is usually 3. The nodules/concretions are rounded, hard to very hard, range in size from < 1 mm to 3 mm, and most commonly are black or reddish black. The corona usually are reddish brown, strong brown, or yellowish brown. The nodules/concretions can be removed from the soil and the corona (halos) will occur as coatings on the concentration or will remain attached to the soil matrix. Use of 10X to 15X magnification aids in the identification of these features.

F17. Delta Ochric. ***For use in MLRA 151 of LRR T.*** **A layer 10 cm (4 inches) or more thick that has 60% or more of the matrix with value 4 or more and chroma 2 or less with no redox concentrations. This layer occurs entirely within the upper 30 cm (12 inches) of the soil surface.**
Delta Ochric User Notes: This indicator is applicable in accreting areas of the Mississippi River Delta.

F18. Reduced Vertic. ***For use in MLRA 150 of LRR T; for testing in all LRRs with Vertisols and Vertic intergrades*****. In Vertisols and Vertic intergrades, a positive reaction to alpha-alpha-Dipyridyl that: (a) is the dominant (60% or more) condition of a layer at least 4 inches thick within the upper 12 inches (or at least 2 inches thick within the upper 6 inches) of the mineral or muck soil surface, (b) occurs for at least 7 continuous days and 28 cumulative days, and (c) occurs during a normal (within 16-84% of probable precipitation) or drier season and month.**
Reduced Vertic User Notes: The time requirements for this indicator were identified from research in MLRA 150A in LRR T (Gulf Coastal Prairies); these or slightly modified time requirements may be found to identify wetland Vertisols and Vertic Intergrades in other parts of the nation. These soils usually have thick dark surface horizons but Indicators F4, F5, and F6 are often lacking; possibly due to masking of redoximorphic features by organic carbon. These soils are a special case of the Problem Soils with Thick, Dark A Horizons listed in the 1987 Corps of

Engineers Wetlands Delineation Manual. Please follow the procedures and note the considerations in Hydric Soil Tech. Note 8 (use of alpha-alpha-Dipyridyl).

F19. Piedmont Flood Plain Soils. For use in MLRAs 149A and 148 of LRR S; for testing on flood plains subject to Piedmont deposition throughout LRRs P, S, and T. On active flood plains, a mineral layer at least 15 cm (6 inches) thick starting within 25 cm (10 inches) of the soil surface with a matrix (60 percent or more of the volume) chroma less than 4 and 20% or more distinct or prominent redox concentrations as soft masses or pore linings.
Piedmont Flood Plain Soils User Notes: This indicator is for use or testing with soils located on active flood plains in the Mid-Atlantic and Southern Piedmont provinces and in areas where sediments derived from the Piedmont are being deposited on flood plains of the Coastal Plain.

F20. Anomalous Bright Loamy Soils. For use in MLRA 149A of LRR S and MLRA 153C and 153D of LRR T; for testing in MLRA 153B of LRR T. Within 200m (656 feet) of estuarine marshes or waters and within 1 m (3.28 feet) of mean high water, a mineral layer at least 10cm (4 inches) thick starting within 20 cm (8 inches) of the soil surface with a matrix (60 percent or more of the volume) chroma less than 5 and 10 percent or more distinct or prominent redox concentrations as soft masses or pore linings and/or depletions.
Anomalous Bright Loamy Soils (ALBS) User Notes: ALBS soils are expected to exist on linear to convex landforms that are adjacent to estuarine marshes or waters.

TEST INDICATORS OF HYDRIC SOILS:

The Indicators listed above should be tested for use in LRRs other than those listed. Other Indicators for testing are listed below. Users of the Indicators are encouraged to submit descriptions of other soil morphologies they think indicative of hydric soils along with supporting data for inclusion in subsequent editions of *Field Indicators of Hydric Soils in the United States.*

ALL SOILS

TA1. Playa Rim Stratified Layers. This test Indicator has been deleted.

TA2. Structureless Muck. This test Indicator has been deleted.

TA3. Coast Prairie Redox. This test Indicator has been approved for use and is now A16 (Coast Prairie Redox.

TA4. Alaska Color Change. For testing in LRRs W, X, and Y. A mineral layer 10 cm (4 inches) or more thick starting within 30 cm of the surface (12 inches) of the soil surface that has a matrix value of 4 or more and chroma of 2 or less that becomes redder by one or more in hue and/or chroma when exposed to air within 30 minutes.
Alaska Color Change User Notes: The soil should be at or near saturation when examined. Care

must be taken to immediately obtain an accurate color of the soil sample upon excavation. The colors should then be closely examined again after several minutes. Do not allow the sample to begin drying as drying will also result in a color change. Care must be taken to closely observe the colors. As always, do not obtain colors while wearing sunglasses. Colors must be obtained in the field under natural lighting and not under artificial light. Look for the presence of other indicators also.

TA5. Alaska Alpine Swales. For testing in LRRs W, X, and Y. On concave landforms, the presence of a surface mineral layer 10 cm (4 inches) or more thick having hue of 10YR or yellower, value 2.5 or less, and chroma 2 or less. The dark surface layer is at least twice as thick as the surface mineral layer of soils on adjacent convex micro-positions.
Alaska Alpine Swales User Notes: Soils with this indicator occur in concave positions where moisture accumulates. Here the source of the hydrology is melt-water from adjacent snow packs that persist well into the growing season. The landscape is usually a complex micro-topography of concave depressions and adjacent convex "micro-highs." Soils should be examined in both landscape positions and compared. If both positions have a mineral surface of the same color, but the layer is a least twice as thick in the concave position, the soil in the concave position is considered hydric. Make sure that there is reasonable evidence of the hydrology source. This includes either direct observation of the melting snow pack or aerial imagery that shows snow pack at that location earlier in the growing season.

SANDY SOILS

TS1. Iron Staining. This test Indicator has been deleted.

TS2. Thick Sandy Dark Surface. This test Indicator has been deleted. The concepts of this test indicator have been approved for use and are now included with Indicator A12 (Thick Dark Surface).

TS3. Dark Surface 2. This test Indicator has been deleted. This is the same Indicator as Indicator S7 (Dark Surface).

TS4. Sandy Neutral Surface. This test Indicator has been deleted. Most of the concepts of this test indicator have been approved for use and are now included with Indicator A11 (Depleted Below Dark Surface).

TS5. Chroma 3 Sandy Redox. This test Indicator has been deleted. It has been approved for use as Indicator A16 (Coast Prairie Redox).

LOAMY AND CLAYEY SOILS

TF1. ? cm Mucky Peat or Peat. This test Indicator has been deleted.

TF2. Red Parent Material. ***For testing in LRRs with red parent material.*** **In parent material with a hue of 7.5YR or redder, a layer at least 10 cm (4 inches) thick with a matrix value 4 or less and chroma 4 or less and 2% or more redox depletions and/or redox concentrations**

as soft masses and/or pore linings. The layer is entirely within 30 cm (12 inches) of the soil surface. The minimum thickness requirement is 5 cm (2 inches) if the layer is the mineral surface layer.

Red Parent Material User Notes: This indicator was developed for use in areas of red parent material such as: Triassic/Jurassic sediments in the Connecticut River valley, Permian "red beds" in Kansas, clayey red till and associated lacustrine deposits around the Great Lakes, and Jurassic sediments associated with "hogbacks" on the eastern edge of the Rocky Mountains. This indicator also occurs on "Red River" flood plains such as the Chattahoochee, Congaree, Red, and Tennessee Rivers. Redox features most noticeable in red materials include redox depletions and soft manganese masses that are black or dark reddish black.

TF3. Alaska Concretions. This test Indicator has been deleted.

TF4. 2.5Y/5Y Below Dark Surface. This test Indicator has been deleted.

TF5. 2.5Y/5Y Below Thick Dark Surface. This test Indicator has been deleted.

TF6. Calcic Dark Surface. This test Indicator has been deleted.

TF7. Thick Dark Surface 2/1. This test Indicator has been deleted. The concepts of this test indicator have been approved for use and are now included with Indicator A12 (Thick Dark Surface).

TF8. Redox Spring Seeps. This test Indicator has been deleted.

TF9. Delta Ochric. This test Indicator has been approved for use and is now F17 (Delta Ochric).

TF10. Alluvial Depleted Matrix. This test Indicator has been deleted

TF11. Reduced Vertic. This test Indicator has been approved for use and is now F18 (Reduced Vertic).

Table 1: Use Indicators by Land Resource Regions (LRRSs) and certain Major Land Resource Areas (MLRAs)

LRR	Indicators
A	A1, A2, A3, A4, A11, A12, S1, S4, S5, S6, F1 (except MLRA 1), F2, F3, F6, F7, F8.
B	A1, A2, A3, A4, A10, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8, F9.
C	A1, A2, A3, A4, A5, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8, F9.
D	A1, A2, A3, A4, A9, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8, F9.
E	A1, A2, A3, A4, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8.
F	A1, A2, A3, A4, A5, A9, A11, A12, S1, S3, S4, S5, S6, F1, F2, F3, F6, F7, F8.
G	A1, A2, A3, A4, A9, A11, A12, S1, S2, S4, S5, S6, F1, F2, F3, F6, F7, F8.
H	A1, A2, A3, A4, A9, A11, A12, S1, S2, S4, S5, S6, F1, F2, F3, F6, F7, F8, F16 (MLRAs 72 & 73).
I	A1, A2, A3, A4, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8.

J A1, A2, A3, A4, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8.
K A1, A2, A3, A4, A5, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8.
L A1, A2, A3, A4, A5, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8.
M A1, A2, A3, A4, A5, A10, A11, A12, S1, S3, S4, S5, S6, F1, F2, F3, F6, F7, F8, F12.
N A1, A2, A3, A4, A5, A10, A11, A12, S1, S4, S5, S6, S7, F2, F3, F6, F7, F8, F12, F13 (MLRA 122).
O A1, A2, A3, A4, A5, A11, A12, S1, S4, S5, S6, F1, F2, F3, F6, F7, F8, F12.
P A1, A2, A3, A4, A5, A6, A7, A9, A11, A12, S4, S5, S6, S7, F2, F3, F6, F8, F12, F13.
R A1, A2, A3, A4, A5, A11, A12, S1, S3, S4, S5, S6, S7, S8, S9, F2, F3, F6, F7, F8.
S A1, A2, A3, A4, A5, A11, A12, S1, S4, S5, S6, S7, S8, S9, F2, F3, F6, F7, F8, F19 (MLRAs 148 and 149A, F20 (MLRA 149A).
T A1, A2, A3, A4, A5, A6, A7, A9, A11, A12, A16 (MLRA 150A), S4, S5, S6, S7, S8, S9, F2, F3, F6, F8, F11 (MLRA 151), F12, F13, F18 (MLRA 150), F20 (MLRAs 149A and 153C).
U A1, A2, A3, A4, A5, A6, A7, A8, A11, A12, S4, S5, S6, S7, S8, S9, F2, F3, F6, F10, F13.
V A1, A2, A3, A4, A5, A8, A11, A12, S4, S7, F2, F3, F6, F7, F8.
W A1, A2, A3, A4, A12, A13, A14, A15, F14, F15.
X A1, A2, A3, A4, A12, A13, A14, A15, F14, F15.
Y A1, A2, A3, A4, A12, A13, A14, A15, F14, F15.
Z A1, A2, A3, A4, A5, A6, A7, A8, A11, A12, S4, S5, S6, S7, F2, F3, F6, F7, F8.

Table 2: Test Indicators by Land Resource Regions (LRRs) and certain Major Land Resource Areas (MLRAs)*****

LRR	Indicators
A	A10.
B	A10.
C	A9, F18 (MLRA 14).
D	S1.
E	A10.
F	A16, TF2, F18 (MLRA 56).
G	A16, S7, TF2.
H	A16, TF2.
I	A9.
J	A9, F18 (MLRA 86).
K	A10, A16, S8, S9, TF2.
L	A10, A16, S8, S9, TF2.
M	F12, A16.
N	TF2.
O	A9, F18 (MLRA 131)
P	F18 (MLRA 135), F19.
R	A16, F19, TF2.
S	A10, TF2.
T	F19, F20 (MLRA 153B), TF2.
U	none
V	A5, TF2.
W	A10, A11, F6, F7, F8, TA4, TA5.
X	A10, A11, F6, F7, F8, TA4, TA5.
Y	A10, A11, F6, F7, F8, TA4, TA5.
Z	A5, TF2.

*** These indicators are for test only, not for use**.