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SOIL AND WATER RELATIONSHIPS OF FLORIDA'S ECOLOGICAL COMMUNITIES

July, 1992
Adapted

19 - MANGROVE SWAMP



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Forward:

This material has been produced and is provided by Florida Soil Conservation Service Soil Survey Staff, G. Wade Hurt, State Soil Scientist, in consultation with soil scientists from other agencies as well as the private sector. The sections Field Identification of Hydric Soils, Hydric Soil Indicator, and Estimating the Seasonal High Water Table have been updated by Florida Department of Environmental Protection Submerged Lands and Environmental Resources Coordination staff in accordance with the *Field Indicators of Hydric Soils in the United States*, Version 7.0. The purpose of this material is to present an understanding of soil and water relationships by soil scientists in Florida and to promote an appreciation and understanding of these soil and water relationships among others. The ecological community concept is used because only after a thorough understanding of natural systems such as ecological communities can we understand the implication of any soil attribute such as the water table to any proposed land use change.

Ecological Communities of Florida

Introduction

The ecological community concept is based on the awareness that a soil type commonly supports a specific vegetative community. Each specific community may have many different types of soils, but each of these soils has similar characteristics and responds to management in a similar manner.

These vegetative communities form recognizable units in the landscape, most of which are apparent to the casual observer after only a little training. Even with no botanical training, an observer can soon distinguish between pine flatwoods and longleaf pine-turkey oak hills; between upland hardwood hammocks and cypress swamps; and between mangrove swamps and salt marsh. Once the community is recognized, information can be found concerning the general characteristics of the soil in which it occurs and the types of plants and animals that commonly occur there.

For example, more than 50 different soil series occur in the South Florida Flatwoods Ecological Community. Each of these soils are seasonally wet and are acid in the surface layer. Some are hydric, however most are non hydric. There are also more than 50 soil series that occur in the Longleaf Pine – Turkey Oak Hills Ecological Community. Each of these soils are droughty, sandy, and non hydric. Some communities such as Freshwater Marsh and Ponds have more than 300 soil series. Each of these soils is hydric, but the soils range from shallow to very deep and from sandy to clayey.

Each ecological community has characteristic vegetation that is easily identified. Once the ecological community is identified, much knowledge about the soil that supports that community can be inferred due to the fact that each ecological community is supported by soils that have similar characteristics and response to management.

26 Ecological Communities of Florida

As early as 1970, plant and soil scientists of USDA's Soil Conservation Service (SCS) began to try to draw all existing information together for the vegetative communities most often encountered by SCS personnel in their work. Field studies were conducted, in addition to reviewing research and reference materials. Twenty-six different communities were identified, although this is by no means a complete listing of communities occurring in Florida. Strictly aquatic communities (such as rivers, lakes, and bays) were not included, and the 26 picked could obviously be broken down more (or lumped together); depending on which characteristics are of most interest. These 26 were selected because knowledge about them would be most useful to individuals (such as wetland delineators) involved in environmental evaluations.

The communities described are essentially the types that occur in nature where human influence has not greatly altered them. In other words, they have evolved through natural plant succession over long periods of time.

Under this concept, even a cropped field would be expected to revert to a specific type of ecological community if human influence were removed.

For example, a Norfolk soil in northwest Florida that is now a corn field which was originally a Mixed Hardwood and Pine Ecological Community would return to the original community within 25 to 50 years if the field was to be abandoned.

Another example, a Hontoon soil in south Florida that has been drained and is being used to produce vegetables would revert to its original Freshwater Marsh Ecological Community within only a few years if the drainage ditches were filled. This anticipated reversion is the reason this soil would still be considered hydric even if the drainage ditches had not been filled. Another reason is human influences are often temporal, variable, and the effects are often over estimated. Most drainage, even if maintained annually, effects the duration of the seasonal high water table not the depth to that water table.

Field Identification of Ecological Communities

The next few pages contain a brief description of each ecological community. Vegetation, landforms, and locations within the state of each community are discussed. The probability of the occurrence of hydric soils is also discussed. Additional information concerning ecological communities is contained in *26 Ecological Communities of Florida* (Florida Soil Conservation Staff, 1984).

Field Identification of Ecological Communities

Ecological Community No. 1 – North Florida Coastal Strand

The North Florida Coastal Strand ecological community occurs along the Atlantic Ocean north of Sebastian Inlet in Indian River County to St. Mary's River in Nassau County and along the Gulf of Mexico from Perdido Bay in Escambia County to Alligator Point in Franklin County. This community parallels coastal beaches, bays and sounds and encompasses the area affected by salt spray from the ocean, gulf, and salt water bays. Few areas (mostly interdunal swales) of this community have hydric soils.

Ecological Community No. 2 – South Florida Coastal Strand

The South Florida Coastal Strand ecological community occurs along the Atlantic Ocean south of Sebastian Inlet in Indian River County to Key West in Monroe County and along the Gulf of Mexico from the Anclote River in Pinellas County to Naples in Collier County. These communities parallel coastal beaches, bays, and sounds and encompass the area affected by salt spray from the ocean, gulf, and salt water bays. Few areas (mostly interdunal swales) of this community have hydric soils.

Ecological Community No. 3 – Sand Pine Scrub

The Sand Pine Scrub ecological community occurs throughout Florida. It is most commonly found inland from the coast and in the central portion of the state. The largest areas are in the Ocala National Forest in and around Marion County. It is easily identified by the very droughty soils, rolling topography, and the even height stands of sand pine or by the dense stands of scrub oak vegetation. This community does not have hydric soils.

Ecological Community No. 4 – Longleaf Pine – Turkey Oak Hills

The Longleaf Pine – Turkey Oak Hills ecological community occurs throughout Florida. It is most commonly found north of Lake Placid to Georgia and in the Florida panhandle inland from the coast. It is easily identified by the droughty soils, rolling topography, and the longleaf pine and turkey oak vegetation; palmetto shrubs and small hollies are common. Hydric soils are absent in this ecological community.

Ecological Community No. 5 – Mixed Hardwood and Pine

The Mixed Hardwood and Pine ecological community occurs in the Florida panhandle and east to Madison County. It is most commonly found north Interstate 10 in the Florida panhandle inland from the coast. This community is easily identified by the mixed hardwood and pine vegetation occurring on well drained but non droughty soils. It contains most of the prime farmland of Florida. Few areas of this community have hydric soils.

Ecological Community No. 6 – South Florida Flatwoods

The South Florida Flatwoods ecological community occurs throughout south and central Florida. The northern limit of its occurrence is approximately a line from Levy County on the west to St. Johns County on the east. This community covers more land area than any other in Florida. It is easily identified by the seasonally wet soils, flat topography, and the pine and palmetto vegetation. Approximately 30 percent of this community has hydric soils. The hydric soil areas are usually adjacent to wetter communities such as Sloughs and Freshwater Marsh and Ponds.

Ecological Community No. 7 – North Florida Flatwoods

The North Florida Flatwoods ecological community occurs throughout north and west Florida. The southern limit of its occurrence is approximately a line from Levy County on the west to St. Johns County on the east. It is easily identified by the seasonally wet soils, flat topography, and the pin and palmetto vegetation. Approximately 40 percent of this community has hydric soils in north Florida. The hydric soil areas are usually adjacent to wetter communities such as Sloughs and Freshwater Marsh and Ponds. Due to the increase in rainfall and corresponding wetter vegetation, a higher percentage of this community has hydric soils in west Florida.

Ecological Community No. 8 – Cabbage Palm Flatwoods

The Cabbage Palm Flatwoods ecological community occurs throughout south Florida and, to a limited extent in, central Florida. The northern limit of its occurrence is approximately a line from Levy County on the west to St. Johns County on the east. It is easily identified by the seasonally wet soils, flat topography, and the cabbage palm and palmetto vegetation. Appropriately 40 percent of this community has hydric soils.

Ecological Community No. 9 – Everglades Flatwoods

The Everglades Flatwoods ecological community occurs only in Monroe, Collier, Dade, and Henry counties of south Florida. The largest areas are west of Miami and east of Flamingo in Dade County and on Big Pine Key in Monroe County. It is easily identified by the seasonally wet, shallow to limestone soils, flat topography, and the South Florida slash pine and palmetto vegetation. Outcropping of limestone bedrock is common. Approximately 30 percent of this community has hydric soils.

Ecological Community No. 10 – Cutthroat Seeps

The Cutthroat Seeps ecological community occurs in Polk and Highlands Counties and, to a lesser extent, adjacent counties. It is easily identified by the wet soils, nearly level to gently sloping topography, and the slash pine and cutthroat grass vegetation. Most areas of this community have hydric soils.

Ecological Community No. 11 – Upland Hardwood Hammocks

The Upland Hardwood Hammocks ecological community occurs from Madison and Hamilton Counties in the north to Polk and Pasco Counties in the south, most commonly near Gainesville, Brooksville, and Ocala. It is readily identified by the moist soils, rolling topography, and vegetation dominated by shade tolerant hardwood and with few pine. Few areas of this community have hydric soils.

Ecological Community No. 12 – Wetland Hardwood Hammocks

The Wetland Hardwood Hammocks ecological community occurs from Wakulla County to Pasco County inland from the gulf. The largest area is near the Waccasassa River in Levy County. It is readily identified by the wet soils, level topography, and vegetation dominated by water tolerant evergreen conifer and evergreen hardwood trees. This community is dominated by hydric soils.

Ecological Community No. 13 – Cabbage Palm Hammocks

The Cabbage Palm Hammocks ecological community occurs throughout central and south Florida. The largest areas are east and west of Lake Okeechobee in Glades and Martin Counties, west of the beaches in Volusia County, and west of the St. Johns River in Seminole and Orange Counties. It is readily identified by the seasonally wet soils, level to gently sloping topography, and vegetation dominated by cabbage palms and scattered oak. Approximately 40 percent of this community has hydric soils.

Ecological Community No. 14 – Tropical Hammocks

The Tropical Hammocks ecological community occurs only in south Florida. The largest areas are on Key Largo and other keys in Monroe County. This community also occurs in south Dade County. It is readily identified by the somewhat poorly drained to well drained organic soils, nearly level topography, and the dense stands of small to medium-sized trees and shrubs which give areas a “jungle like” appearance. Although the soils are organic, this community does not have hydric soils. The organic material is leaf and other vegetative litter that has become soil material beneath the dense stand trees and shrubs.

Ecological Community No. 15 – Oak Hammocks

The Oak Hammocks ecological community occurs throughout central Florida south to Lake Okeechobee and west to Tallahassee. The largest areas are in Marion and Sumter Counties. It is readily identified by the moist soils, nearly level topography, and the dense stands of laurel oak and live oak trees. Approximately 30 percent of this community has hydric soils.

Ecological Community No. 16 – Scrub Cypress

The Scrub Cypress ecological community occurs in Monroe, Collier, Broward, and Dade Counties in south Florida, dominantly in Big Cypress National Preserve. One additional large area is in Tate's Hell Swamp in Franklin County. This community is easily identified by the wet, shallow to limestone soils and marl soils, level topography, and vegetation dominated by marsh grasses and dwarf cypress. The area in Tate's Hell Swamp has deep sandy soils. This community is dominated by hydric soils.

Ecological Community No. 17 – Cypress Swamp

The Cypress Swamp ecological community occurs throughout Florida along rivers, streams, and lakes; or as isolated "cypress domes" and "cypress heads". This community is easily identified by the very poorly drained soils, level to depressional topography, and the normally pure stand of cypress trees with few shrubs and no grasses. This community is dominated by hydric soils.

Ecological Community No. 18 – Salt Marsh

The Salt Marsh ecological community occurs along the Atlantic and Gulf coasts and inland along tidal streams. One large continuous area extends from Tarpon Springs in Pinellas County to St. Marks National Wildlife Refuge in Wakulla County. This community is very easily identified by the poorly drained organic soils, level topography, and the vegetation that is grasses, rushes, and sedges. This community is dominated by hydric soils.

Ecological Community No. 19 – Mangrove Swamps

The Mangrove Swamp ecological community occurs along saltwater shorelines south of Pasco County on the Gulf coast and south of Volusia County on the Atlantic coast. The Ten Thousand Islands area of Monroe and Collier Counties is the largest area of this community in Florida and, perhaps, the world. This community is very easily identified by the very poorly drained organic and marl soils, level topography, and the mangrove monoculture. This community is dominated by hydric soils.

Ecological Community No. 20 – Bottomland Hardwoods

The Bottomland Hardwoods ecological community occurs within flood plains of rivers and streams of west Florida. The forests along the Apalachicola River are typical of this community. It is readily identified by the seasonally flooded soils, level topography, and the myriad of hardwood trees. Bottomland Hardwoods have an open park-like appearance. Approximately 50 percent of this community is dominated by hydric soils.

Ecological Community No. 21 – Swamp Hardwoods

The Swamp Hardwoods ecological community occurs throughout Florida along rivers, streams, and poorly defined drainage ways. It is readily identified by the very poorly drained soils, level topography, the deciduous hardwood trees, and dense undergrowth. Ferns and other shade tolerant herbaceous plants are common. This community is dominated by hydric soils.

Ecological Community No. 22 – Scrub Bog – Bay Swamp

The Scrub Bog – Bay Swamp ecological community occurs throughout Florida on hillsides, in depressions, ravines, and along poorly defined drainage ways. This community is readily identified by the very poorly drained soils, level to sloping topography, and evergreen shrub vegetation. Vegetation is dominantly less than twenty feet high. This community is dominated by hydric soils.

Ecological Community No. 23 – Pitcher Plant Bogs

The Pitcher Plant Bogs ecological community occurs in north Florida, primarily in the panhandle. This community appears as an open expanse of grasses, sedges, and picture plants with scattered, stunted pine and cypress. It is readily identified by the poorly drained soils, level to sloping topography, and insect-eating plants. This community is dominated by hydric soils.

Ecological Community No. 24 – Sawgrass Marsh

The Sawgrass Marsh ecological community occurs in one large almost continuous area south of Lake Okeechobee County and extending into Dade, Monroe, and Collier Counties. It also occurs as small isolated areas in other parts of south Florida and, to a lesser extent, north Florida. This community is very easily identified by monoculture. This community is dominated by hydric soils.

Ecological Community No. 25 – Freshwater Marsh and Ponds

The Freshwater Marsh and Ponds ecological community occurs throughout Florida. The largest area is on the flood plain of the Kissimmee River. This community appears as an open expanse of grasses, sedges, and rushes. It is readily identified by the very poorly drained, and almost continuously, wet soils, level topography, and absence of trees and shrubs. This community is dominated by hydric soils.

Ecological Community No. 26 – Slough

The Slough ecological community occurs throughout peninsular Florida. The largest areas are in Charlotte, Lee, and Collier Counties. This community appears as a nearly open expanse of grasses, sedges, and rushes with scattered pine trees. The percentage of tree and other woody vegetation cover increases from south to north Florida. This community is readily identified by the poorly drained soils that are covered with a few inches of slowly moving water during wet season, the level topography, and the absence of shrubs. Some areas in North Florida are dominated by trees; these areas are also covered with a few inches of slowly moving water during wet seasons. This community is dominated by hydric soils.

Hydric Soils of Florida

From all of the attributes which can be applied to soils one of the most requested is the question of hydric vs. non hydric. For that reason on the next few pages hydric soils are discussed. This discussion includes the definition, criteria, and field identification of hydric soils.

Hydric Soils of Florida

Introduction

Wetlands possess three essential characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology (Cowardin et al., 1979; Tiner, 1985; Federal Interagency Committee for Wetland Delineation, 1989). Most agencies consider that technical criteria for each of the characteristics must be met for an area to be identified as a wetland. Therefore the synonymy of hydric soils and wetlands is implied; undrained hydric soils with natural vegetation should support a dominant population of ecologically facultative wetland and obligate wetland plant species.

Definition of Hydric Soils

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (USDA Soil Conservation Service, 1987). This definition identified soils that are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

Hydric Soil Criteria

The above definition identifies in generalities those soil properties that are associated with wetness. However, in order to determine whether a specific soil is or is not a hydric soil, specific information such as inundation depth and duration is needed. For that reason, criteria which identify those soil properties unique to hydric soils have been established. These criteria are utilized to identify phases of soil series that normally are associated with wetlands. The criteria used in Florida are those criteria established by the NTCHS (USDA, Soil Conservation Service, 1991).

By comparing the hydric soil criteria with data in published soil surveys, county lists of hydric soils are developed. These individual lists are available at local field offices of the Soil Conservation Service. A state list of hydric soils is available by combining the county lists. Hydric soil lists when used in conjunction with the published soil survey series are excellent land use planning tools; however, an on-site examination is required when making a hydric soil determination for a specific site. An area is not considered to have hydric soils just because it is dominated by soils on any hydric soils list. Hydric soils must be field identified by verifying the presence of one or more of the indicators.

Field Identification of Hydric Soils

Hydric Soil Indicator Concept

The Hydric Soil Indicator concept is based on the premise that hydric soils develop and exhibit characteristic morphologies that result from repeated periods of saturation and/or inundation for more than a few days. Saturation or inundation when combined with anaerobic microbiological activity in the soil causes a depletion of oxygen. This anaerobiosis promotes biogeochemical processes such as the accumulation of organic matter and the reduction, translocation, and/o-accumulation of iron and other reducible elements. These processes result in characteristic morphologies which persist in the soil during both wet and dry periods, making them particularly useful for identifying hydric soils.

Hydric soil indicators are formed predominantly by the accumulation or loss of iron, manganese, sulfur, or carbon compounds. The presence of hydrogen sulfide gas (rotten egg odor) is a strong indicator of a hydric soil, but this indicator is found in only the wettest sites containing sulfur.

Hydric Soil Indicator Identification Procedure

To document a hydric soil, dig a hole and describe the soil profile to a depth of approximately 50 cm (20 inches). Using the completed soil description specify which of the Hydric Soil Indicators have been matched. Deeper examination of soil may be required where Hydric Soil Indicators are not easily seen within 50 cm (20 in.) of the surface. It is always recommended that soils be excavated and described as deep as necessary to make reliable interpretations. Examination to less than 50 cm (20 in.) may suffice in soils with surface horizons of organic material or mucky mineral material because these shallow organic accumulations only occur in hydric soils. Depths used in are measured from the muck or mineral soil surface unless otherwise indicated. All colors refer to moist Munsell colors.

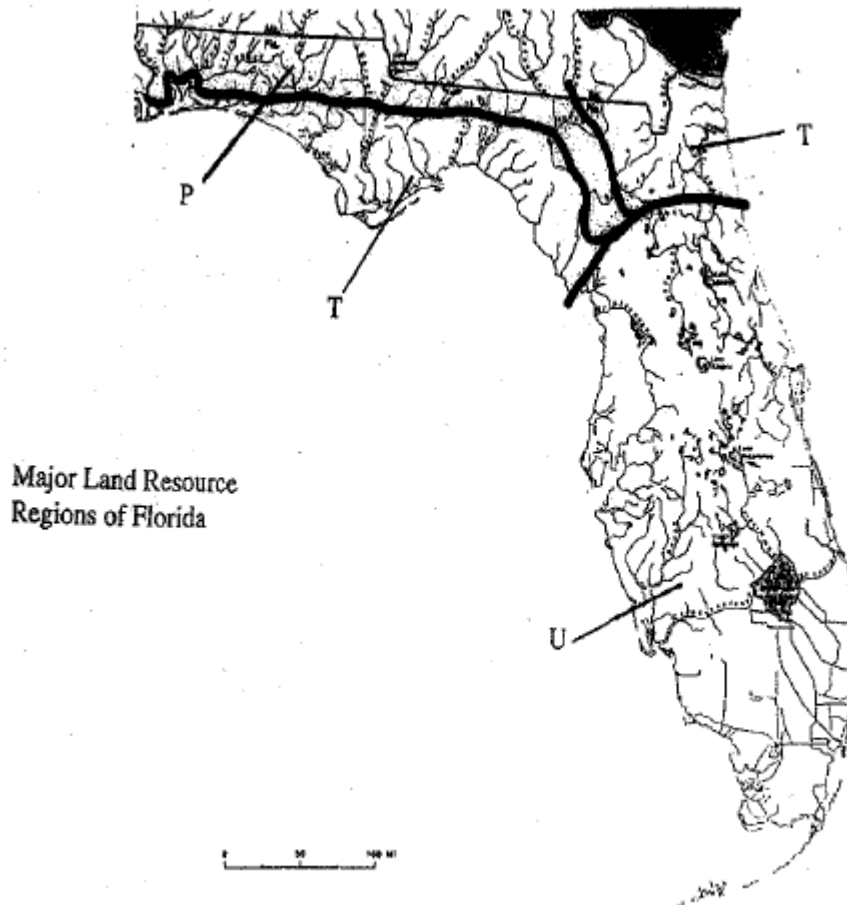
Hydric Soil Indicator Schema

Each of the Hydric Soil Indicators is structured as follows:

1. Alpha-numeric Listing (A, S, or F indicators)
2. Short Name
3. Applicable Land Resource Regions (LRRs)
4. Description of the Field Indicator
5. User Notes

For example, AI indicates the first indicator for all soils; Histosol is the short name; the indicator is for use in all LRRs; classifies as a Histosol, except Folists is the indicator description; helpful User Notes are added. 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.

The indicators are designed to be regionally specific. Each indicator states the Land Resource Regions (LRRs) in which it can be used. The geographic extent of LRRs is defined in USDA Ag. Handbook 296 (USDA, SCS, 1981) and displayed for Florida below.



Land Resource Region P is typified by gently sloping to steep uplands. Dominate soils are sandy excessively well drained soils like those of Eglin Air Force Base and in Suwannee County and well drained red and yellow soils that extend from Pensacola to Tallahassee. Land Resource Regions T and U have similar soils. The regions are separated climatically by a line from Cedar Key through Alachua County to St. Augustine.

Hydric Soil Indicators

Hydric Soil Delineation Indicators for All Soils

These indicators are to be used for all soils regardless of texture.

A1. Histosol (*for use in all LRRs*). Classifies as a Histosol (except Folist).

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* (Soil Survey Staff, 2010) for a complete definition.

A2. Histic Epipedon. *For use in all LRRs*. A histic epipedon underlain by mineral soil material with chroma of 2 or less.

User Notes: Most histic epipedons are surface horizons 20 cm (8 inches) or more thick of organic soil material. Aquic conditions or artificial drainage is required. See *Keys to Soil Taxonomy* (Soil Survey Staff, 2010) for a complete definition.

A3. Black Histic. *For use in all LRRs*. A layer of peat, mucky peat, or muck 20 cm (8 inches) or more thick that starts within the upper 15 cm (6 inches) of the soil surface; has hue of 10YR or yellower, value of 3 or less, and chroma of 1 or less; and is underlain by mineral soil material with chroma of 2 or less.

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.

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 occurs only when the soils are saturated and anaerobic.

A5. Stratified Layers. *For use in LRRs P, T, and U*. Several stratified layers starting within the upper 15 cm (6 inches) of the soil surface. At least one of the layers has value of 3 or less and chroma of 1 or less, or it is muck, mucky peat, peat, or a mucky modified mineral texture. The remaining layers have chroma of 2 or less. For any sandy material that constitutes the layer with value of 3 or less and chroma of 1 or less, at least 70 percent of the visible soil particles must be masked with organic material, viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear 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 is required for indicator A7 (5 cm Mucky Mineral). 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 soils do not meet the requirements of this indicator. Many alluvial soils have stratified layers at the required depths but do not have chroma of 2 or less; these do not meet the requirements of this indicator. The stratified layers occur in any soil texture.

A6. Organic Bodies. *For use in LRRs P, T, and U.* Presence of 2 percent or more organic bodies of muck or a mucky modified mineral texture starting within 15 cm (6 inches) of the soil surface.

User Notes: Organic bodies typically occur at the tips of fine roots. The content of organic carbon in organic bodies is the same as that in the Muck or Mucky 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, but the content of organic carbon is critical. 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 textures. Many organic bodies do not have the required content of organic carbon and are not examples 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.

A7. 5 cm Mucky Mineral. *For use in LRRs P, T, and U.* A layer of mucky modified mineral soil material 5 cm (2 inches) or more thick, starting within 15 cm (6 inches) of the soil surface.

User Notes: “Mucky” is a USDA texture modifier for mineral soils. The content of organic carbon is at least 5 percent and ranges to as high as 18 percent. The percentage required depends on the clay content of the soil; the higher the clay content, the higher the content of organic carbon required. An example is mucky fine sand, which has at least 5 percent organic carbon but not more than about 12 percent. Another example is mucky sandy loam, which has at least 7 percent organic carbon but not more than about 14 percent.

A8. Muck Presence. *For use in LRR U.* A layer of muck with value of 3 or less and chroma of 1 or less, starting within 15 cm (6 inches) of the soil surface.

User Notes: The presence of muck of any thickness within a depth of 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 a minimum content of organic carbon that ranges from 12 to 18 percent, depending on the content of clay. Organic soil material is called muck if virtually all of the material has undergone sufficient decomposition to prevent the identification of plant parts. Hemic soil material (mucky peat) and fibric soil material (peat) do not qualify. Generally, muck is black and has a “greasy” feel; sand grains should not be evident.

A9. 1 cm Muck. *For use in LRRs P and T.* A layer of muck 1 cm (0.5 inch) or more thick with value of 3 or less and chroma of 1 or less and starting within 15 cm (6 inches) of the soil surface.

User Notes: Unlike indicator A8 (Muck Presence), this indicator has 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 a minimum content of organic carbon that ranges from 12 to 18 percent, depending on the content of clay. Organic soil material is called muck if virtually all of the material has undergone sufficient decomposition to limit the recognition of plant parts. Hemic soil material (mucky peat) and fibric soil material (peat) do not qualify. 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 P, T, and U.* A layer with a depleted or gleyed matrix that has 60 percent or more chroma of 2 or less, starting within 30 cm (12 inches) of the soil surface, and having a minimum thickness of either:

- a. 15 cm (6 inches), or
- b. 5 cm (2 inches) if the 5 cm consists of fragmental soil material.

Loamy or clayey layer(s) above the depleted or gleyed matrix must have value of 3 or less and chroma of 2 or less. Any sandy material above the depleted or gleyed matrix must have value of 3 or less and chroma of 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. Observed without a hand lens, the particles appear to be close to 100 percent masked.

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 more than 30 cm (12 inches) thick, use indicator A12. A depleted matrix requires value of 4 or more and chroma of 2 or less. Redox concentrations, including soft iron-manganese masses and/or pore linings, are required in soils with matrix colors of 4/1, 4/2, or 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 the soil has common or many distinct or prominent redox concentrations occurring as soft masses or pore linings.

A12. Thick Dark Surface. *For use in LRRs P, T, and U.* A layer at least 15 cm (6 inches) thick with a depleted or gleyed matrix that has 60 percent or more chroma of 2 or less starting below 30 cm (12 inches) of the surface. The layer(s) above the depleted or gleyed matrix must have value of 2.5 or less and chroma of 1 or less to a depth of at least 30 cm (12 inches) and value of 3 or less and chroma of 1 or less in any remaining layers above the depleted or gleyed matrix. In any sandy material above the depleted or gleyed matrix, at least 70 percent of the visible soil particles must be masked with organic material, viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100 percent masked.

User Notes: This indicator applies to soils that have a black layer 30 cm (12 inches) or more thick and have value of 3 or less and chroma of 1 or less in any remaining layers directly above a depleted or gleyed matrix. This indicator is most often associated with overthickened soils in concave landscape positions. A depleted matrix requires value of 4 or more and chroma of 2 or less. Redox concentrations, including soft iron-manganese masses and/or pore linings, are required in soils with matrix colors of 4/1, 4/2, or 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 the soil has common or many distinct or prominent redox concentrations occurring as soft masses or pore linings.

Hydric Soil Delineation Indicators for Sandy Soils

These indicators are to be used for soil materials with a USDA texture of loamy fine sand and coarser.

S4. Sandy Gleyed Matrix. *For use in LRRs P, T, and U.* A gleyed matrix that occupies 60 percent or more of a layer starting within 15 cm (6 inches) of the soil surface.

User Notes: Gley colors are not synonymous with gray colors. They are the colors on the gley color pages in the Munsell color book (Gretag-Macbeth, 2000). They have hue of N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5PB and value of 4 or more. For this indicator, the gleyed matrix only has to be present within 15 cm (6 inches) of the surface. Soils with gleyed matrices are saturated for periods of a significant duration; as a result, there is no thickness requirement for the layer.

S5. Sandy Redox. *For use in LRRs P, T, and U.* 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 percent or more chroma of 2 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings.

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 the concept of redox concentrations are iron-manganese bodies occurring as soft masses with diffuse boundaries. Common (2 to less than 20 percent) or many (20 percent or more) redox concentrations are required (USDA, NRCS, 2002). If the soil is saturated at the time of sampling, it may be necessary to let it dry to a moist condition for redox features to become visible

This is a very common indicator of hydric soils and is often used to identify the hydric/nonhydric soil boundary in sandy soils.

S6. Stripped Matrix. *For use in LRRs P, T, and U.* 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 and the primary base color of the soil material has been exposed. The stripped areas and translocated oxides and/or organic matter form a faintly contrasting pattern of two or more colors with diffuse boundaries. The stripped zones are 10 percent or more of the volume and are rounded.

User Notes: This indicator includes the indicator previously named “polychromatic matrix” as well as the term “streaking.” Common or many areas of stripped (unmasked) soil materials are required. The stripped areas are typically 1 to 3 cm (0.5 to 1 inch) in size but may be larger or smaller. Commonly, the stripped areas have value of 5 or more and chroma of 1 and/or 2, and the unstripped areas have chroma of 3 and/or 4. The matrix (predominant color) may not have the material with chroma of 3 and/or 4. The mobilization and translocation of oxides and/or organic matter is the important process and should result in splotchy masked and unmasked soil areas. This may be a difficult pattern to recognize and is more evident when a horizontal slice is observed.

S7. Dark Surface. *For use in LRRs P, T, and U.* A layer 10 cm (4 inches) thick, starting within the upper 15 cm (6 inches) of the soil surface, with a matrix value 3 or less and chroma of 1 or less. At least 70 percent of the visible soil particles must be masked with organic material, viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100 percent masked. The matrix color of the layer directly below the dark layer must have the same colors as those described above or any color that has chroma of 2 or less.

User Notes: For this indicator, the content of organic carbon is slightly less than is required for “mucky.” An undisturbed sample must be observed. Many wet soils have a ratio of about 50 percent soil particles that are masked with organic matter and about 50 percent unmasked soil particles, giving the soils a salt-and-pepper appearance. Where the coverage is less than 70 percent, a Dark Surface indicator does not occur.

S8. Polyvalue Below Surface. *For use in LRRs T and U.* A layer with value of 3 or less and chroma of 1 or less starting within 15 cm (6 inches) of the soil surface. At least 70 percent of the visible soil particles must be masked with organic material, viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100 percent masked. Directly below this layer, 5 percent or more of the soil volume has value of 3 or less and chroma of 1 or less, and the remainder of the soil volume has value of 4 or more and chroma of 1 or less to a depth of 30 cm (12 inches) or to the spodic horizon, whichever is less.

User Notes: This indicator applies to soils with a very dark gray or black surface or near-surface layer that is less than 10 cm (4 inches) thick and is underlain by a layer in which organic matter has been differentially distributed within the soils by water movement. The mobilization and translocation of organic matter result in splotchy coated and uncoated soil.

S9. Thin Dark Surface. *For use in LRRs T and U.* A layer 5 cm (2 inches) or more thick, within the upper 15 cm (6 inches) of the soil, with value of 3 or less and chroma of 1 or less. At least 70 percent of the visible soil particles must be masked with organic material, viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100 percent masked. This layer is underlain by a layer or layers with value of 4 or less and chroma of 1 or less to a depth of 30 cm (12 inches) or to the spodic horizon, whichever is less.

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

Hydric Soil Delineation Indicators for Loamy and Clayey Soils

These indicators are to be used for soil materials with a USDA texture of loamy very fine sand and finer.

F2. Loamy Gleyed Matrix. *For use in all LRRs.* A gleyed matrix that occupies 60 percent or more of a layer starting within 30 cm (12 inches) of the soil surface.

User Notes: Gley colors are not synonymous with gray colors. They are the colors on the gley color pages of the Munsell color book (Gretag-Macbeth, 2000). They have hue of N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5PB and value of 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 periods of a significant duration; as a result, there is no thickness requirement for the layer.

F3. Depleted Matrix. *For use in LRRs P, T, and U.* A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

- a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or**
- b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.**

User Notes: A depleted matrix requires a value of 4 or more and chroma of 2 or less. Redox concentrations, including soft iron-manganese masses and/or pore linings, are required in soils with matrix colors of 4/1, 4/2, or 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 the soil has common or many distinct or prominent redox concentrations occurring as soft masses or pore linings. The low-chroma matrix must be the result of wetness and not a weathering or parent material feature.

F6. Redox Dark Surface. *For use in LRRs P, T, and U.* A layer that is at least 10 cm (4 inches) thick, is entirely within the upper 30 cm (12 inches) of the mineral soil, and has:

- a. Matrix value of 3 or less and chroma of 1 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings, or**
- b. Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.**

User Notes: This is a very common indicator used to delineate wetland soils that have a dark surface layer. Redox concentrations in mineral soils with a high content of organic matter and a dark surface layer commonly are small and difficult to see. The organic matter masks some or all of the concentrations that may be present. Careful examination is required to see what are commonly brownish redox concentrations in the darkened materials. If the soil is saturated at the time of sampling, it may be necessary to let it dry at least to a moist condition for redox features to become visible. Soils that are wet because of ponding or have a shallow, perched layer of saturation may have any color 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.

F7. Depleted Dark Surface. *For use in LRRs P, T, and U.* Redox depletions with value of 5 or more and chroma of 2 or less in a layer that is at least 10 cm (4 inches) thick, is entirely within the upper 30 cm (12 inches) of the mineral soil, and has:

- a. Matrix value of 3 or less and chroma of 1 or less and 10 percent or more redox depletions, or**
- b. Matrix value of 3 or less and chroma of 2 or less and 20 percent or more redox depletions.**

User Notes: Care should be taken not to mistake mixing of an E or calcic horizon into the surface layer for 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 that are wet because of subsurface saturation, the layer directly below the dark surface layer should have a depleted or gleyed matrix. Redox depletions should have associated microsite 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 LRRs P, T, and U.* In closed depressions subject to ponding, 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings in a layer that is 5 cm (2 inches) or more thick and is entirely within the upper 15 cm (6 inches) of the soil.

User Notes: This indicator occurs on depressional landforms, such as vernal pools, playa lakes, rainwater basins, “Grady” ponds, and potholes. It does not occur in microdepressions (approximately 1 m) on convex or plane landscapes.

F10. Marl. *For use in LRR U.* A layer of marl with value of 5 or more and starting within 10 cm (4 inches) of the soil surface.

User Notes: Marl is a limnic material deposited in water by precipitation of CaCO₃ by algae as defined in *Soil Taxonomy* (Soil Survey Staff, 1999). It has a Munsell value of 5 or more and reacts with dilute HCl to evolve CO₂. Marl is not the carbonatic substrate material associated with limestone bedrock. Some soils have materials with all of the properties of marl, except for the required Munsell value. These soils are hydric if the required value is present within 10 cm (4 inches) of the soil surface. Normally, this indicator occurs at the soil surface.

F12. Iron-Manganese Masses. *For use in LRRs P and T.* On flood plains, a layer 10 cm (4 inches) or more thick with 40 percent or more chroma of 2 or less and 2 percent or more distinct or prominent redox concentrations occurring 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 and chroma of 3 or less. Most commonly, they are black. The thickness requirement is waived if the layer is the mineral surface layer.

User Notes: These iron-manganese masses generally are small (2 to 5 mm in size) and have value and chroma of 3 or less. They can be dominated by manganese and therefore have a color approaching black. The low matrix chroma must be the result of wetness and not be a weathering 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 along rivers, such as the Apalachicola, Congaree, Mobile, Savannah, and Tennessee Rivers.

F13. Umbric Surface. *For use in LRRs P, T, and U.* 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) has value of 3 or less and chroma of 1 or less and in which the lower 10 cm (4 inches) has the same colors as those described above or any other color that has chroma of 2 or less.

User Notes: The thickness requirements may be slightly less than those for an umbric epipedon. Microlows (approximately 1 m) are not considered to be concave landforms. Umbric surfaces in the higher landscape positions, such as side slopes dominated by Humic Dystrudepts, are excluded.

Seasonal High Water Table

Often more information concerning the water regime of a spoil than if it is hydric or not is desired. If more exacting information is desired, that information is usually the exact location of the Seasonal High Water Table (SHWT). The depth to the SHWT is used to identify inundated hydric soils vs. saturated hydric soils, for identifying crop production limitations, for siting on-site sewage disposal systems, and for a number of additional reasons.

In the following pages a method of determining the depth to the SHWT is outlined for inundated hydric soils, saturated hydric soils, and for non hydric soils that have a water table.

Estimating Seasonal High Saturation

Introduction

Seasonal High Water Table (SHWT) is the shallowest depth to free water that stands in an unlined borehole or where the soil moisture tension is zero for a significant period (more than a few weeks). The depth to the estimated SHWT is the used soil interpretation in Florida. This method of estimating SHWT applies only to areas lacking hydrologic modifications. Hydrologic modifications such as ditches and dikes can make the soil either wetter or drier.

By observing soil features, SHWT predictions can be made for hydric soils as well as other soils.

Field Identification of SHWT

The procedure for field Identification of SHWT is based on the assumption that, when soils are wet enough, for a long enough duration to develop SHWT, they should exhibit certain visible properties that are to be used to determine on-site SHWT. All SHWT determinations should be based on field observations of moist soils.

Procedure

SHWT is determined by examining soils with a hydric soil indicator in a freshly dug pit for the SHWT indicators listed below. Presence of the shallowest of the SHWT indicators listed below indicates the depth to SHWT.

1. Soils with the following hydric soil indicators have SHWT at or above the surface:

A1 (Histosol or Histel), A2 (Histic Epipedon), A3 (Black Histic), A4 (Hydrogen Sulfide), A7 (5 cm Mucky Mineral), A8 (Muck Presence) or A9 (1 cm Muck), S4 (Sandy Gleyed Matrix), and F2 (Loamy Gleyed Matrix).

2. Soils with the following hydric soil indicators have SHWT within 6 inches of the surface:

A5 (Stratified Layers), A6 (Organic Bodies), A11 (Depleted Below Dark Surface), A12 (Thick Dark Surface), S5 (Sandy Redox), S6 (Stripped Matrix), S7 (Dark Surface), S8 (Polyvalue Below Surface), S9 (Thin Dark Surface), F10 (Marl), and F13 (Umbric Surface). Depth to SHWT is the depth at which all requirements of a particular indicator are met.

For example, if S6 (Stripped Matrix) starts at 4 inches, depth to SHWT is 4 inches or if S7 (Dark Surface) starts at the soil surface, depth to SHWT is the soil surface.

3. Soils with the following hydric soil indicators have SHWT within 12 inches of the surface:

F3 (Depleted Matrix), F6 (Redox Dark Surface), and F7 (Depleted Dark Surface). Depth to SHWT is the depth at which all requirements of a particular indicator are met.

For example, if F3 (Depleted Matrix) starts at 8 inches, depth to SHWT is 8 inches.

4. Soils with the following hydric soil indicators lack significant saturation but are inundated for long or very long duration

F8 (Redox Depressions) and F12 (Iron/Manganese Masses).

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