Ecological site F153BY100NC
Flooded Organic Soil Flood Plains and Terraces

Last updated: 4/02/2025
Accessed: 03/23/2026

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 153B–Tidewater Area

The MLRA notes section provides a brief description of the entire MLRA. This brief description of the entire MLRA is intended to provide some context about the MLRA that this ecological site is within. A more complete description of the MLRA can be found in Ag Handbook 296 (USDA-NRCS, 2022).

This MLRA stretches along the Atlantic coastline from northern Florida to southern Virginia. It features young marine terrace flats, broad flood plains and deltas, tidal marshes and estuaries, barrier sea islands, and a beach ridge system that spans the length of the MLRA. Its broad, shallow valleys with large rivers, tidal marshes, swamps, estuaries, drowned valleys, sea islands, and beaches, are all features of the Late Quaternary (USDA-NRCS, 2017). The Suffolk Scarp is the upper (western) limit of this MLRA and marks the extent of the ocean shoreline before it retreated during the Wisconsin period of glaciation. Fluctuating ocean levels, along with wave and wind activity, continue to rework sand deposits that comprise the ever-changing barrier sea islands and coastline in this MLRA. The marine terraces are younger to the east and are progressively older and higher inland to the west. The youngest marine terraces adjacent to the coast are very low lying and at high risk of inundation by extreme high tides, wind tides, storm surge, and extreme precipitation events. In addition to the risks of inundation, these low-lying terrestrial and freshwater systems are at high risk of salt water intrusion.

The MLRA is characterized by a persistent high water table. The hydraulic gradient across this MLRA is very low. Overall, elevation ranges from sea level to less than 25 feet (0 to 8 meters). Local relief is mainly about 3 feet (1 meter) or less. Most of the surface water in this MLRA is either coming into the MLRA from the piedmont and upper coastal plain, is

managed by ditching, or is ponded on the surface. Surface flow channels originating within the MLRA are extremely subtle, typically blackwater, and flow generally channelizes mostly near the shoreline where tidal processes also impact flooding processes.

The dominant soil orders in this MLRA are Alfisols and Entisols. Ultisols and Histosols are important but are of lesser extent. The soils in the area are characterized by restricted drainage, a thermic temperature regime, and an aquic moisture regime. The study of subaqueous soils is of increasing importance along nearshore coastal waters.

The major soil suborders of the MLRA include: 1) Endoaqualfs, which are very deep and loamy to clayey, 2) Endoaquults, which are very deep and loamy to clayey, 3) Haplosaprists, which are extensive in North Carolina and Virginia, in the Great Dismal Swamp, and in broad upland wetlands known as pocosins, 4) Hapludults, which are in the higher areas of somewhat better drainage, 5) Psamments, 6) Sulfaquents, which are extensive throughout the brackish tidal marshes protected by the barrier and sea islands, 7) Sulfiwassents (subaqueous soils), which formed in low- to moderate-energy estuarine deposits, and 8) Umbraquults, which are very deep and loamy to clayey.

MLRA 153B has a lengthy north-south extent, and it runs parallel to the Atlantic coast. The MLRA extends from the northeastern corner of Florida to southern Virginia. Five states are intersected by the MLRA, including North Carolina (42 percent), Virginia (21 percent), South Carolina (20 percent), Georgia (14 percent), and Florida (3 percent). The MLRA extent makes up about 11,152 square miles (28,884 square kilometers).

Because of climatic differences between the northern and southern reaches of the MLRA, vegetative communities vary with latitude. Loblolly pine, red oak, and white oak are dominant in the uplands, and blackgum, sweetgum, pond pine, laurel oak, water tupelo, and bald cypress are dominant on the bottomland. Longleaf pine and slash pine were dominant historically in the southern part of the area. Understory species common to the MLRA include switchcane, inkberry, large gallberry, greenbrier, wax myrtle, and cabbage palm. Herbaceous understory species include little bluestem, and various panicgrasses.

Major wildlife species include alligator, black bear, white-tailed deer, fox, raccoon, opossum, otter, muskrat, rabbit, mink, squirrel, quail, and mourning dove. The red wolf, an endangered species, is being reintroduced in several parts of the MLRA. The nearshore estuaries of the Chesapeake Bay, the Albemarle-Pamlico estuary systems, and Atlantic Ocean provide habitat for diverse populations of terrestrial and aquatic animal species. The subaquatic vegetation in these coastal lagoon areas provides critical habitat and cover for many shellfish and juvenile finfish. The estuaries host numerous migratory waterfowl and wading birds throughout the year and are an integral part of the Atlantic Flyway.

(USDA-NRCS, 2022)

LRU notes

Currently, Ecological Site Descriptions (ESDs) for MLRA 153B cover the full north-south range of the MLRA. However, climate variation across the north-south extent warrants the development of Land Resource Unit (LRU) classifications to support more precise Ecological Site Descriptions.

Classification relationships

MLRA 153B has overlap with two level III EPA ecoregion concepts: 63) the Middle Atlantic Coastal Plain and 75) the Southern Coastal Plain. Under ecoregions 63 and 75 are a number of lower level (IV) concepts, of which several apply to MLRA 153B. These include: 63b) Chesapeake-Pamlico Lowlands and Tidal Marshes, 63c) Swamps and Peatlands, 63d) Virginia Barrier Islands and Coastal Islands, 63f) Delmarva Uplands), 63g) Carolinian Barrier Islands and Coastal Marshes, and 75j) Sea Islands/Coastal Marsh. (U.S. EPA, 2013)

MLRA 153B overlaps a portion of the US Forest Service Outer Coastal Plain Mixed Forest province (232). The MLRA roughly corresponds to the easternmost portions of the Atlantic Coastal Flatwoods (232C) and the southeastern portion of the Northern Atlantic Coastal Flatwoods (232I) sections. In combination with MLRA 153A, these two MLRAs correspond very closely to the full extent of Sections 232C and 232I. (Cleland et al., 2007)

Based on the USGS physiographic classification system, most of MLRA 153B is in the Sea Island section of the Coastal Plain province, in the Atlantic Plain division. The northern quarter is in the Embayed section of the same province and division. The embayed barrier islands extend from the eastern shore of the Chesapeake Bay in Virginia to north of Charleston, South Carolina (Fenneman et al., 1946). The portion in North Carolina is referred to as the Outer Banks. Large bodies of brackish water, such as Pamlico and Albemarle Sounds, are on the inland side of the barrier islands. The sea islands extend from north of Charleston, South Carolina, to Jacksonville, Florida.

The reference community for this particular site is approximately aligned with Cypress--Gum Swamp (Schafale and Weakely, 1990) and Cypress - Tupelo Floodplain Swamp (FNAI, 2010).

Ecological site concept

This site is characterized by organic soils (Histosols) on coastal plain flood plains and drainageways. The soils on this site are hydric and subject to flooding. Flood plain and riparian processes are considered the defining characteristic of this site. Histosols on flood plains tend to be most common in backswamp positions.

Flood plain and riparian sites in this MLRA include both small blackwater and large brownwater river systems. Brownwater river systems import and transport sediments

derived from Piedmont, Sandhills, and Upper Coast Plain landscapes above this MLRA. Small blackwater drainages originate from within the MLRA and carry waters very low in sediments but high in colored dissolved organic materials which give the water it's dark color. All river systems in this MLRA are subject to tidal influences, and the riparian zones are also at risk of saltwater intrusion and salinization.

This site supports a variety of vegetation communities including bottomland hardwoods, and flood plain swamps.

Associated sites

F153BY010NC	**Dry Sands** Dry sands often comprise an eolian deposit associated with and higher on the landscape than large expansive flood plain systems in this MLRA.
F153BY020NC	**Moist Sands** Moist sands often comprise an eolian deposit associated with and higher on the landscape than large expansive flood plain systems in this MLRA.
F153BY090NC	**Flooded Mineral Soil Flood Plains and Terraces** This site occupies similar landforms and is poorly drained and very poorly drained, but is comprised of mineral soils (mostly Entisols and Inceptisols). The flooded mineral soil flood plains and terraces includes soils with histic epipedons, mineral soils with an organic surface horizon that is significant but not deep enough to classify as a Histosol.
R153BY130NC	**Tidal Marsh on Mineral Soil** Flooded flood plain sites are often associated with tidal marsh where the riverine system is frequently impacted by tidal influences and transitions to an estuarine system.
R153BY140NC	**Tidal Marsh on Organic Soil** Flooded flood plain sites are often associated with tidal marsh where the riverine system is frequently impacted by tidal influences and transitions to an estuarine system.

Similar sites

F153AY100NC	**Flooded Organic Soil Flood Plains and Terraces** This site is on very similar landforms but in an adjacent MLRA where the marine terrace surfaces are older, more dissected, and removed from tidal impacts.
F153BY090NC	**Flooded Mineral Soil Flood Plains and Terraces** This site occupies similar landforms and is poorly drained and very poorly drained, but is comprised of mineral soils (mostly Entisols and Inceptisols). The flooded mineral soil flood plains and terraces includes soils with histic epipedons, mineral soils with an organic surface horizon that is significant but not deep enough to classify as a Histosol.

Table 1. Dominant plant species

Tree	(1) *Taxodium distichum* (2) *Nyssa aquatica*
Shrub	(1) *Fraxinus caroliniana* (2) *Cyrilla racemiflora*
Herbaceous	(1) *Polygonum punctatum* (2) *Saururus cernuus*

Physiographic features

This site is characterized by organic soils (Histosols) on coastal plain flood plains and drainageways. The soils on this site are hydric and subject to flooding. Flood plain and riparian processes are considered the defining characteristic of this site. Histosols on flood plains tend to be most common in backswamp positions.

Flood plain and riparian sites in this MLRA include both small blackwater and large brownwater river systems. Brownwater river systems import into and transport through this Lower Coastal Plain MLRA sediments derived from Piedmont, Sandhills, and Upper Coast Plain landscapes above this MLRA. Small blackwater drainages originate from within the MLRA and carry waters very low in sediments but high in colored dissolved organic materials which give the water it's dark color.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Flood plain (2) Drainageway
Runoff class	Negligible to very low
Flooding duration	Long (7 to 30 days) to very long (more than 30 days)
Flooding frequency	Frequent
Ponding duration	Not specified
Ponding frequency	None
Elevation	0–8 m
Slope	0–2%
Ponding depth	0 cm
Water table depth	0–15 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to very low

Flooding duration	Long (7 to 30 days) to very long (more than 30 days)
Flooding frequency	Frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	0–8 m
Slope	0–2%
Ponding depth	0–30 cm
Water table depth	0–15 cm

Climatic features

The climate of MLRA 153B is generally warm, temperate, and humid with maritime influences along the coast. The maximum precipitation occurs in summer, and the minimum occurs in autumn. Rainfall is usually of moderate intensity. Occasionally, extreme weather events (e.g., northeasters, tropical storms, and hurricanes) produce large amounts of precipitation and destructive winds. Snowfall may occur in the northern end of the area. The average annual temperature is 57 to 70 degrees F (14 to 21 degrees C), increasing to the south. (USDA-NRCS, 2022)

The youngest marine terraces adjacent to the coast are very low lying and at high risk of inundation by extreme high tides, wind tides, storm surge, and extreme precipitation events. Hurricanes and other storms that combine strong winds with extreme precipitation can topple trees and place this entire MLRA at risk of inundation. Furthermore, sea-level rise puts these low-lying terrestrial and freshwater systems at high risk of salt water intrusion and the damaging impacts of salinization.

Table 4. Representative climatic features

Frost-free period (characteristic range)	211-260 days
Freeze-free period (characteristic range)	261-339 days
Precipitation total (characteristic range)	1,143-1,219 mm
Frost-free period (actual range)	199-272 days
Freeze-free period (actual range)	242-359 days
Precipitation total (actual range)	1,143-1,245 mm
Frost-free period (average)	236 days
Freeze-free period (average)	300 days
Precipitation total (average)	1,194 mm

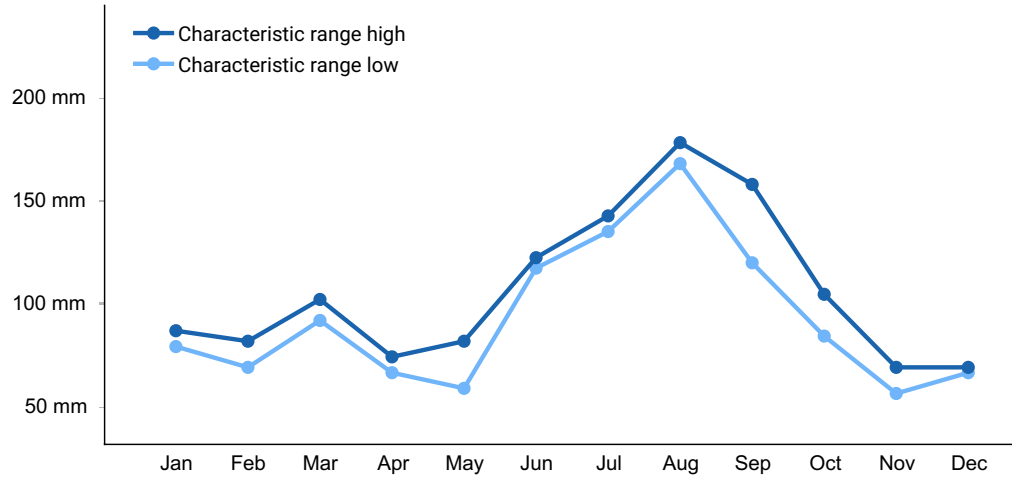


Figure 1. Monthly precipitation range

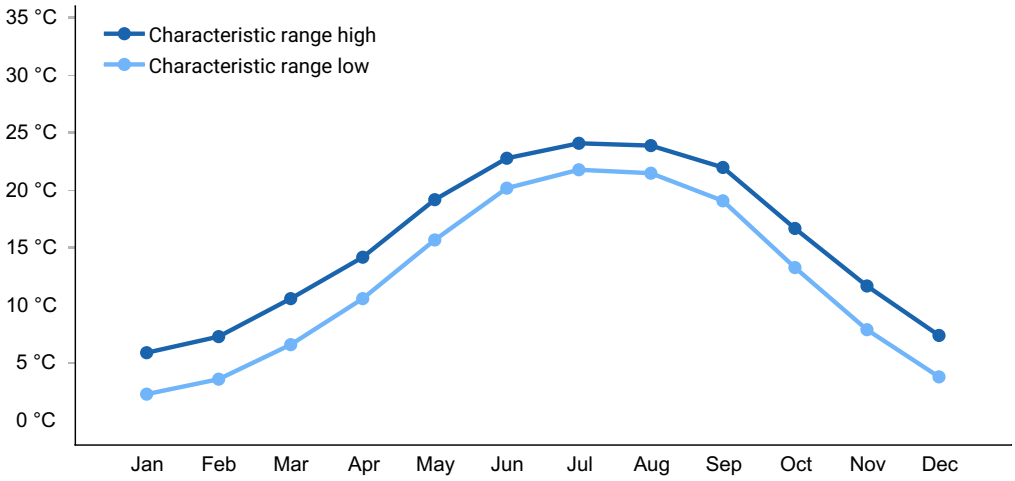


Figure 2. Monthly minimum temperature range

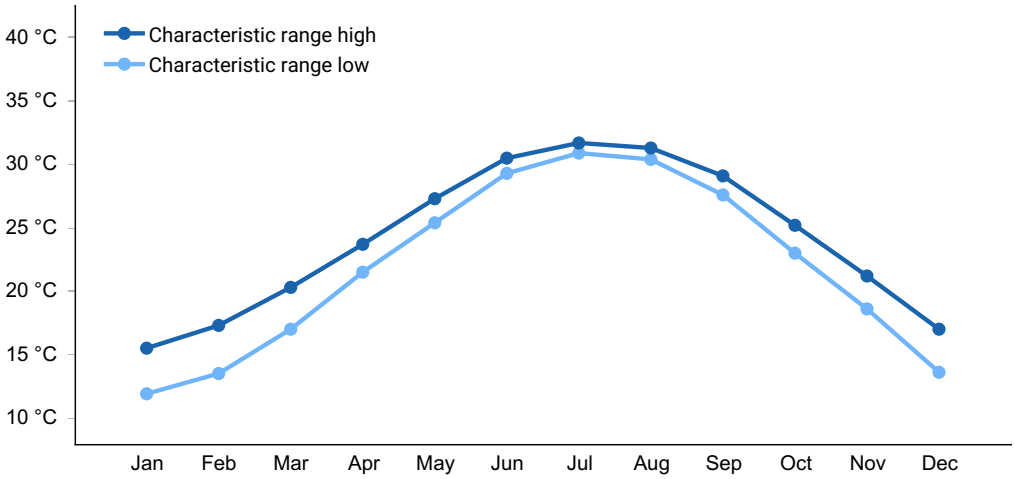


Figure 3. Monthly maximum temperature range

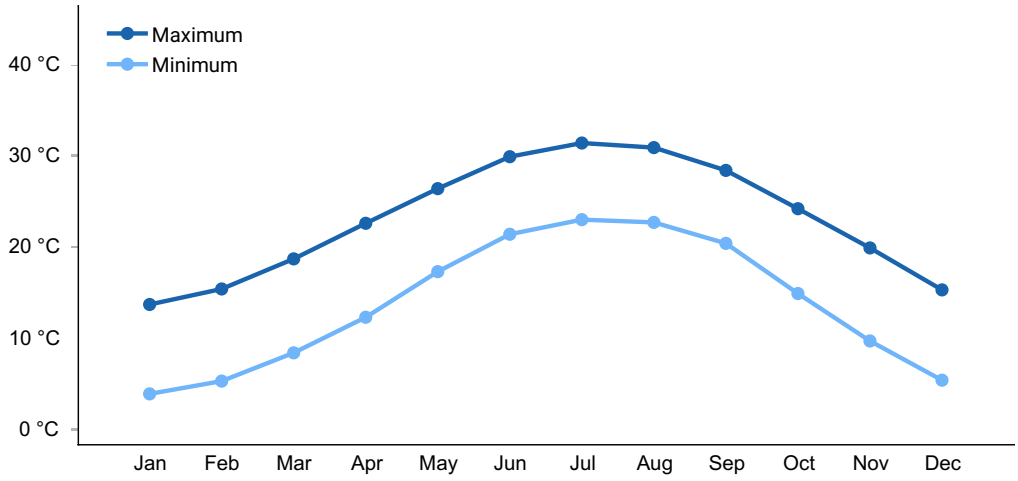


Figure 4. Monthly average minimum and maximum temperature

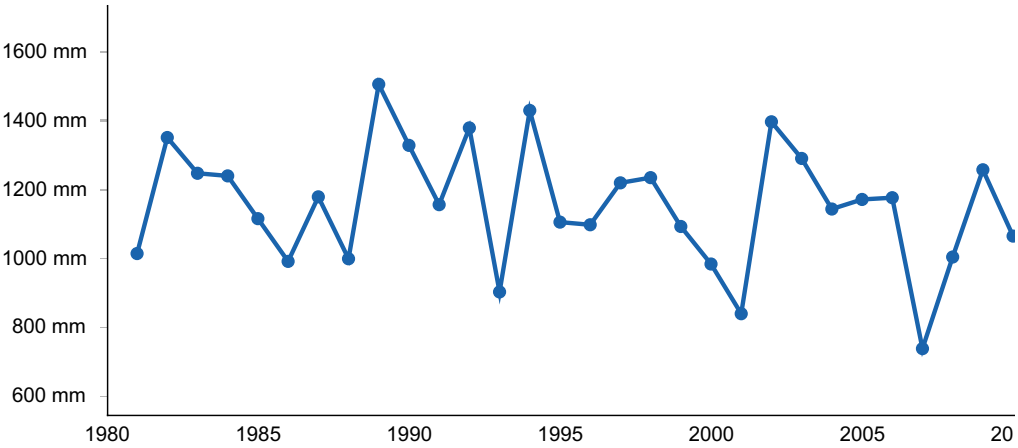


Figure 5. Annual precipitation pattern

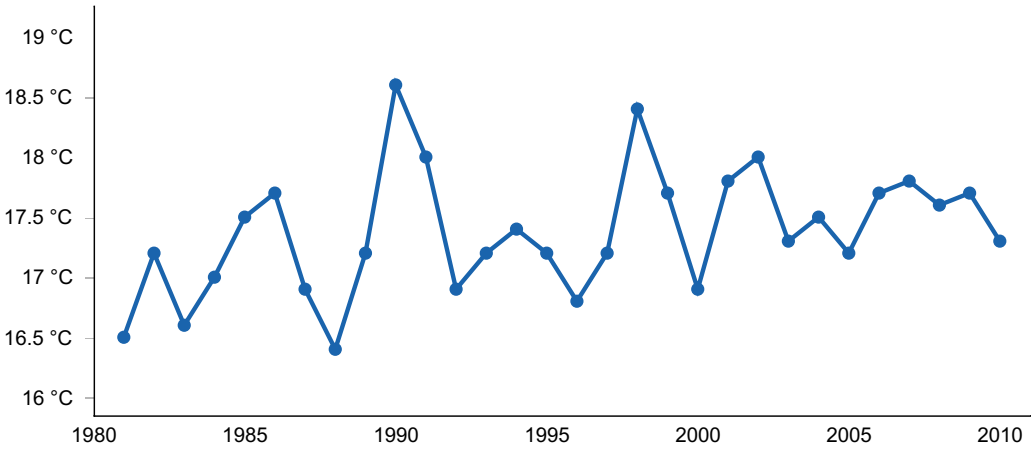


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ELIZABETH CITY CGAS [USW00013786], Elizabeth City, NC
- (2) CHARLESTON CITY [USW00013782], Charleston, SC
- (3) BRUNSWICK 23 S [USW00063856], Saint Marys, GA

Influencing water features

On this site, flooding is a dominant process. This site is potentially exposed to both riverine and tidal flooding processes.

Wetland description

These soils are hydric, but, in order to classify as a wetland, a location must meet soils, hydrology, and vegetation criteria. This site is flooded. Some of these sites are sufficiently inland and are not exposed to tidal influences, so they would be palustrine in nature. Those locations exposed to tidal influences classify as estuarine. Most locations associated with frequent tidal influences are likely best described by a different ESD, R153BY130NC, tidal marsh on mineral soil, or R153BY140NC, tidal marsh on organic soil.

Soil features

Soils on this site are all Histosols meaning that they all have thick organic surface soil horizons, greater than 40 to 60 cm (16 to 24 inches) over marine and fluviomarine mineral soil deposits. They are deep and acidic.

Surface water flooding is a dominant process on this site. The soils on this site are very poorly drained. These soils are saturated near the surface during a portion of the growing season for a period sufficiently long to produce anaerobic conditions. This site does not include soils with a shallow organic surface horizon (i.e., histic epipedons). In this MLRA, these soils are at risk of salt water intrusion.

Soil series on this site include: Croatan, Dorovan, Hobonny, Kingsland, and Pamlico.

Dorovan is modal.

Table 5. Representative soil features

Parent material	(1) Woody organic material (2) Fluviomarine deposits
Surface texture	(1) Muck (2) Mucky peat
Drainage class	Very poorly drained
Permeability class	Moderately rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	24.89–39.88 cm
Soil reaction (1:1 water) (0-25.4cm)	3.1–4.5
Subsurface fragment volume <=3" (0-101.6cm)	0%
Subsurface fragment volume >3" (0-101.6cm)	0%

Table 6. Representative soil features (actual values)

Drainage class	Very poorly drained
Permeability class	Moderately rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	20.07–50.04 cm
Soil reaction (1:1 water) (0-25.4cm)	3.1–6.5
Subsurface fragment volume <=3" (0-101.6cm)	0%
Subsurface fragment volume >3" (0-101.6cm)	0%

Ecological dynamics

The dominant ecological drivers on a flood plain site are tides as well as the flooding dynamics of the adjacent waterway. Brownwater systems can redistribute nutrients by scouring and depositing sediments as well as organic detritus, whereas blackwater systems redistribute only organic detritus. Locations adjacent or proximate to the primary waterway tend to be exposed to aerobic floodwaters, whereas locations distant from the primary waterway tend to be flooded by stagnant backwaters. Flooding dynamics can cause the location of the waterway channel to shift, which will cause changes to hydrology at the effected locations. Flooding dynamics at any individual location will be impacted by the type and size of the river or stream system as well as the relative distance from the main channel. Beaver activity may also alter local flooding dynamics.

In this MLRA, intrusion of salt water into the soil profile can have significant impacts on vegetation. Low lying riparian areas are at particularly high risk of salinization, especially near their outlet. In forested areas, this phenomenon is sufficiently common that ghost

forests are increasingly recognized as a widespread example of the impacts of sea level rise and salinization. Extensive ditching across this MLRA increases exposure of the landscape to salinization. As sea level rises, a dense salt-water wedge moves further inland up these ditches exposing more of the landscape to these processes.

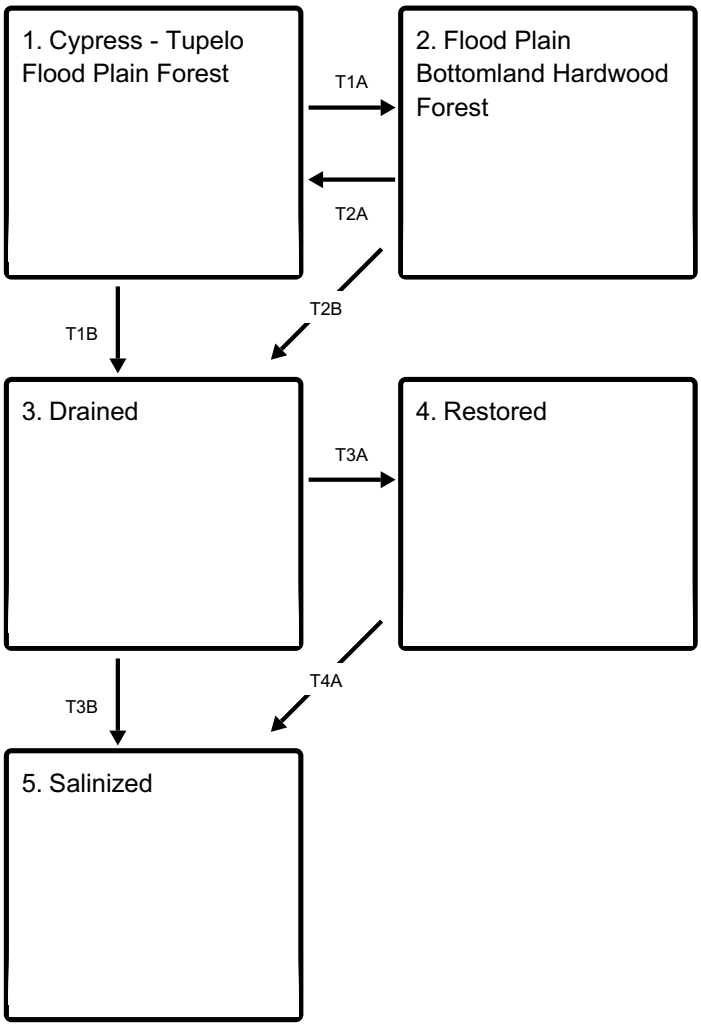
Flood plain forests tend to be relatively stable. Flood plain forests along brownwater systems appear to be more diverse than those along blackwater systems. Historical logging practices may have artificially reduced the prevalence of cypress (Taxodium sp.) and increased the relative dominance of tupelo (Nyssa sp.) and other flood adapted hardwoods.

If following the soil survey has brought you to this ESD, but you find yourself in a graminoid marsh community, please refer to the ESD titled Tidal Marsh on Organic Soil, R153BY140NC. Some of the same soils mapped on this ecological site are also mapped on marsh locations, but the complexity of salinity and tidal dynamics make it necessary to describe the marsh systems in a separate ESD.

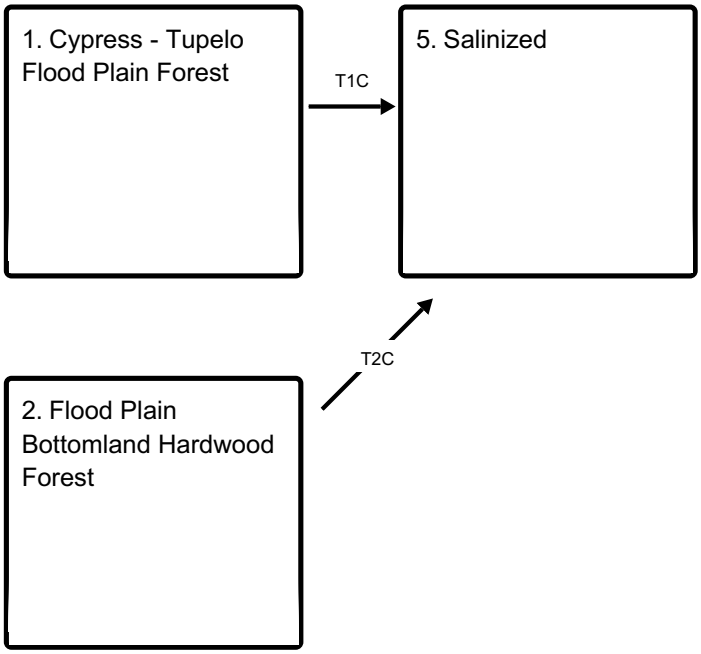
(FNAI, 2010; Schafale and Weakley, 1990)

State and transition model

Ecosystem states



States 1, 5 and 2 (additional transitions)



T1A - Decreased flooding

T1B - Drainage

T1C - Salinization

T2A - Increased flooding

T2B - Drainage

T2C - Salinization

T3A - Restoration

T3B - Salinization

T4A - Salinization

State 1
Cypress - Tupelo Flood Plain Forest

The cypress-tupelo flood plain community tends to occur relatively close to the main channel in areas that are more frequently flooded and for longer periods of time.

Dominant plant species

- bald cypress (*Taxodium distichum*), tree
- water tupelo (*Nyssa aquatica*), tree
- swamp tupelo (*Nyssa biflora*), tree
- red maple (*Acer rubrum*), tree
- black willow (*Salix nigra*), tree
- Carolina ash (*Fraxinus caroliniana*), shrub
- planertree (*Planera aquatica*), shrub
- swamp titi (*Cyrilla racemiflora*), shrub
- common buttonbush (*Cephalanthus occidentalis*), shrub
- cabbage palmetto (*Sabal palmetto*), shrub
- dotted smartweed (*Polygonum punctatum*), grass

- lizard's tail (*Saururus cernuus*), other herbaceous

State 2
Flood Plain Bottomland Hardwood Forest

The flood plain bottomland hardwood forest tends to occur at some distance from the main channel in more stagnant backwater type settings that do not flood as often.

Dominant plant species

- laurel oak (*Quercus laurifolia*), tree
- overcup oak (*Quercus lyrata*), tree
- red maple (*Acer rubrum*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- American elm (*Ulmus americana*), tree
- pond cypress (*Taxodium ascendens*), tree
- Virginia sweetspire (*Itea virginica*), shrub
- Carolina ash (*Fraxinus caroliniana*), shrub
- dotted smartweed (*Polygonum punctatum*), grass
- lizard's tail (*Saururus cernuus*), other herbaceous

State 3
Drained

This is a relatively wet site. Historically, these sites have been drained frequently to support a variety of land uses including forestry, agriculture, and development. This drained state is included in this STM because this state exists widely today across the landscape. Drainage of wetlands today is significantly regulated. NRCS is required to consider impacts to wetlands according to Federal laws including, but not limited to, the Clean Water Act, the Wetland Conservation provisions of the Food Security Act of 1985, and State, Tribal, and local laws. It is the policy of NRCS to protect and promote wetland functions and values in all NRCS assistance (National Environmental Compliance Handbook (NECH) 610.36).

State 4
Restored

After land on this site has been drained, it is impossible to return fully to reference conditions that existed at that location prior to drainage, especially at locations that remained under active drainage management for long periods of time. Restoration efforts might include blocking and removing drainage structures, and revegetation.

State 5
Salinized

Any community on this site that has become salinized by the impacts of salt water inundation or intrusion. Saltwater intrusion is the movement of saltwater into freshwater systems. The process occurs mostly by lateral flow into areas adjacent to coastal waters or ditch systems that connect saltwater bodies. These ditch systems are designed to drain freshwater off of a site, but sea level rise and extreme tidal events push saltwater up these ditch systems and expose more of the landscape to salinization processes. Salinization can also occur as storm surge and/or extreme high tides push saltwater over the top of these terrestrial freshwater systems. Freshwater flooding can reduce salinization by flushing salts from the soil profile. Depending on the frequency and intensity of flooding, some salinization impacts may be only temporary in floodplain locations.

Transition T1A
State 1 to 2

Decreased flooding frequency and duration.

Transition T1B
State 1 to 3

The drained state is included in this STM because this state exists widely today across the landscape. This transition is included to show how we got to where we are today. Drainage of wetlands today is significantly regulated. NRCS is required to consider impacts to wetlands according to Federal laws including, but not limited to, the Clean Water Act, the Wetland Conservation provisions of the Food Security Act of 1985, and State, Tribal, and local laws. It is the policy of NRCS to protect and promote wetland functions and values in all NRCS assistance (National Environmental Compliance Handbook (NECH) 610.36).

Transition T1C
State 1 to 5

Sea level rise, tidal inundation, and soil saltwater intrusion.

Transition T2A
State 2 to 1

Increased flooding frequency and duration.

Transition T2B
State 2 to 3

The drained state is included in this STM because this state exists widely today across the landscape. This transition is included to show how we got to where we are today. Drainage of wetlands today is significantly regulated. NRCS is required to consider

impacts to wetlands according to Federal laws including, but not limited to, the Clean Water Act, the Wetland Conservation provisions of the Food Security Act of 1985, and State, Tribal, and local laws. It is the policy of NRCS to protect and promote wetland functions and values in all NRCS assistance (National Environmental Compliance Handbook (NECH) 610.36).

Transition T2C
State 2 to 5

Sea level rise, tidal inundation, and soil saltwater intrusion.

Transition T3A
State 3 to 4

Remove, plug, or otherwise restore drainage and revegetate.

Transition T3B
State 3 to 5

Sea level rise, tidal inundation, and soil saltwater intrusion.

Transition T4A
State 4 to 5

Sea level rise, tidal inundation, and soil saltwater intrusion.

Inventory data references

Data collection and analysis of field data will be performed during the Verification Stage of ESD development.

Other references

Ash, A., E. McDonald, E. Kane, and C. Pories. 1983. Natural and modified pocosins: Literature synthesis and management options. U.S. Fish and Wildlife Services, Dept. Biol., Tech. Rep. FWS/OBS-83/04. U.S. Fish and Wildlife Services, Washington, D.C.

Caldwell, P., M. Vepraskas, J.D. Gregory, R.W. Skaggs, and R.L. Huffman. 2011. Linking Plant Ecology and Long-Term Hydrology to Improve Wetland Restoration Success. Transactions of the ASABE. 54: 2129-2137. DOI: 10.13031/2013.40662

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C.A. Carpenter, W.H. McNab. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. General Technical Report WO-76D. U.S. Department of Agriculture, Forest Service.

Washington, D.C.

Dimick, B. P., J. Stucky, W. Wall, M. Vepraskas, T. Wentworth, and C. Arellana. 2010. Plant-soil- hydrology relationships in three Carolina bays in Bladen County, North Carolina, USA. Castanea 75(4): 407-420

Fenneman, N.M., and D.W. Johnson. 1946. Physical divisions of the United States. U.S. Geological Survey, Physiographic Committee. Scale 1:700,000.

Florida Chapter, Soil and Water Conservation Society. 1989. 26 Ecological Communities of Florida. 147 pp.

Florida Natural Areas Inventory (FNAI). 2010. Guide to the natural communities of Florida: 2010 edition. Florida Natural Areas Inventory, Tallahassee, FL.

McNab, W.H.; D.T. Cleland, J.A Freeouf, J.E. Keys Jr., G.J. Nowacki, C.A. Carpenter, comps. 2007. Description of ecological subregions: sections of the conterminous United States [CD-ROM]. Gen. Tech. Report WO-76B. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 pp.

Moritz, C. 2021. Evaluating mitigation sites in Carolina bay wetlands that were previously converted to agriculture. Institutional Repository at North Carolina State University, North Carolina State University, Raleigh, NC, 1–323.

Moritz C., M. Vepraskas, and M. Ricker. 2022. Hydrology and Vegetation Relationships in a Carolina Bay Wetland 15 Years after Restoration. Wetlands. 42. DOI: 10.1007/s13157-022-01530-0.

Nelson, J.B. 1986. The Natural Communities of South Carolina Initial Classification and Description, South Carolina Wildlife and Marine Resources Department, Division of Wildlife and Freshwater Fisheries.

Peet, R.K., and D.J. Allard. 1993. Longleaf Pine Vegetation of the Southern Atlantic and Eastern Gulf Coast Regions: A Preliminary Classification. In Proceedings of the Tall Timbers Fire Ecology Conference, No. 18, The Longleaf Pine Ecosystem: ecology, restoration and management, edited by Sharon M. Hermann, Tall Timbers Research Station, Tallahassee, FL, 1993.

Ross, T.E. 2003. Pocosins and Carolina Bays Compared, The North Carolina Geographer, Volume 11: 22-32

Schafale, M.P., and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina Third Approximation. North Carolina Natural Heritage Program. 321 pp.

Sharitz R.R., and J.W. Gibbons. 1982. The ecology of southeastern shrub bogs (pocosins)

and Carolina bays: a community profile. U.S. Fish and Wildlife Service, Division of Biological Services, Washington, D.C. FWS/OBS-82/04. 93 pp.

Soil Survey Staff. 2023. Web Soil Survey. USDA Natural Resources Conservation Service. http://websoilsurvey.sc.egov.usda.gov/ (accessed 16 February 2023).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2017. Geomorphic Description System, Version 5.0. Schoeneberger, P.J., and D.A. (eds). USDA-NRCS, National Soil Survey Center, Lincoln, NE.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. Agriculture Handbook 296.

U.S. Environmental Protection Agency. 2013. Level III and IV ecoregions of the continental United States: Corvallis, Oregon, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000, https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states.

Contributors

Matthew D. Duvall

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	03/23/2026
Approved by	Charles Stemmans
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

---

2. **Presence of water flow patterns:**

---

3. **Number and height of erosional pedestals or terracettes:**

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

---

5. **Number of gullies and erosion associated with gullies:**

---

6. **Extent of wind scoured, blowouts and/or depositional areas:**

---

7. **Amount of litter movement (describe size and distance expected to travel):**

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**