

# **Ecological site F153AY035NC**

## **Dry Clay Rises and Flats**

Last updated: 2/12/2025

Accessed: 05/21/2025

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### **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): 153A–Atlantic Coast Flatwoods

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 resides within. A more complete description of the MLRA can be found in Ag Handbook 296 (USDA-NRCS, 2022).

This MLRA is found on the lower coastal plain and is known as the Atlantic Coast Flatwoods. This flat terrain is formed from marine terraces and fluviomarine sediments of Tertiary and Quaternary age. These marine terraces are younger to the east and are progressively older and higher inland to the west. Post formation these terraces have been crossed by widely meandering river and stream channels producing broad shallow valleys with many high order interfluves. All these factors combine to produce relatively flat landscapes that favor high water tables.

Many rivers and streams that flow through this area have headwaters that originate to the west in the upper coastal plain (MLRA 133A, Southern Coastal Plain) and piedmont (MLRA 136, Southern Piedmont) regions. Large river valleys are extremely flat and of great extent. Most surface water that originates from within the MLRA starts as blackwater in very low energy and subtle low-order channels. Most surface water emerges first as broad, very low energy, very low velocity sheet flow before accumulating in these very subtle channels. Local relief is generally less than 35 feet (10 meters), although some short, steep slopes border the stream valleys.

The dominant soil orders in MLRA 153A are Ultisols and Spodosols. The soils in this MLRA have a thermic temperature regime, an aquic or udic moisture regime, and

generally have siliceous mineralogy. They are generally very deep, well drained to very poorly drained, and loamy or clayey. The major soil suborders of the MLRA include: 1) Alaquods, which formed in marine sediments on flats and terraces and in depressions, 2) Albaquults, which formed in mixed alluvium and marine sediments on flats and terraces, 3) Haplosaprists, which formed in organic deposits over mixed marine and fluvial deposits, 4) Paleaquults, which formed in marine sediments on flats and in depressions, and 5) Paleudults, which formed in marine sediments on uplands.

MLRA 153A has a lengthy north-south extent. It runs parallel to the Atlantic coast and has a width of approximately 10 to 30 miles. The MLRA extends from the northeastern corner of Florida to southern Virginia. Five states are intersected by the MLRA, including Georgia (30 percent), South Carolina (28 percent), North Carolina (28 percent), Florida (10 percent), and Virginia (4 percent). The MLRA extent makes up about 30,319 square miles (78,527 square kilometers).

Because of climatic differences between the northern and southern reaches of the MLRA, vegetative communities vary with latitude. Overall, the MLRA is dominated by pine-oak forest vegetation. Loblolly pine, longleaf pine, slash pine, sweetgum, red maple, red oak, and white oak are dominant in the uplands. Water tupelo, pond pine, swamp blackgum, laurel oak, swamp chestnut oak, bald cypress, and red maple are dominant on the bottomland. Herbaceous understory species common to the MLRA include cutover muhly, toothache grass, little bluestem, and various panicums.

Major wildlife species of the MLRA include alligator, white-tailed deer, black bear, gray fox, red fox, bobcat, raccoon, skunk, opossum, otter, rabbit, squirrel, turkey, and bobwhite quail. The threatened and endangered gopher tortoise inhabits the southern portion of this MLRA. This area provides crucial habitat for neotropical migrants, migratory waterfowl, and wading birds along the Atlantic Flyway.

(USDA-NRCS, 2022)

## **LRU notes**

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

## **Classification relationships**

MLRA 153A overlaps 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 level IV concepts, of which several apply to MLRA 153A. These include: 63c) Swamps and Peatlands, 63e) Mid-Atlantic Flatwoods, 63h) Carolina Flatwoods, 63n) Mid-Atlantic Floodplains and Low Terraces, 75e) Okefenokee Plains, 75f) Sea Island

Flatwoods, 75g) Okefenokee Swamp, and 75i) Floodplains and Low Terraces. (U.S. EPA, 2013)

MLRA 153A overlaps portions of the US Forest Service Outer Coastal Plain Mixed Forest province (232). The MLRA 153A concept roughly corresponds to the western portion of the Atlantic Coastal Flatwoods (232C) and the southcentral portion of the Northern Atlantic Coastal Flatwoods (232I) sections. In combination with MLRA 153B, 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 153A 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 particularly site is approximately aligned with Mesic Pine Flatwoods (Schafale and Weakely, 1990) and Upland Mixed Woodland (FNAI, 2010).

**Ecological site concept**

This site is characterized by well drained, clayey and fine silty soils (dominantly Ultisols) on coastal plain rises and flats. Across this broad flat landscape, this relatively dry site is typically found near the edges of interfluves and broad flats where local topography drives a local hydrologic gradient that enables better drainage.

This site has the potential to support a variety of vegetation communities including flatwoods, as well as drier oak-hickory and upland pine communities. Most of this site has been converted to alternative states. Historically, the vegetation communities on this site have been maintained by frequent low-intensity surface fires. Table 1 very briefly lists some of the most dominant vegetation on the reference community for this site. More detailed descriptions of community compositions are available in the State and Transition Model.

**Associated sites**

F153AY045NC	<b>Moist Clay Rises and Flats</b> This site is often adjacent but either lower on the landscape and/or with a shallower water table.
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**Similar sites**

F153AY030NC	<b>Dry Loamy Rises and Flats</b> This site is on very similar landforms but is comprised of loamy soils.
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**Table 1. Dominant plant species**

Tree	(1) <i>Pinus palustris</i> (2) <i>Quercus falcata</i>
Shrub	(1) <i>Ilex glabra</i> (2) <i>Vaccinium arboreum</i>
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Aristida stricta</i>

## Physiographic features

This site is characterized by clayey and fine-silty soils (dominantly Ultisols) on coastal plain rises and flats. Across this broad flat landscape, this relative dry site is typically found near the edges of interfluves and broad flats where local topography drives a local hydrologic gradient that enables better drainage. Even where a seasonal high water table occurs, it is not persistent, and the site is comparatively dry. In comparison to it's surrounding, topographic relief is relatively high on this site, with slopes ranging up to 10 percent.

Table 2 summarizes physiography of the modal soil concepts. Table 3 summarizes physiography of all soils included in this description.

**Table 2. Representative physiographic features**

Hillslope profile	(1) Backslope (2) Shoulder (3) Summit
Landforms	(1) Coastal plain > Marine terrace (2) Hill
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	8–90 m
Slope	2–6%
Water table depth	15–203 cm
Aspect	Aspect is not a significant factor

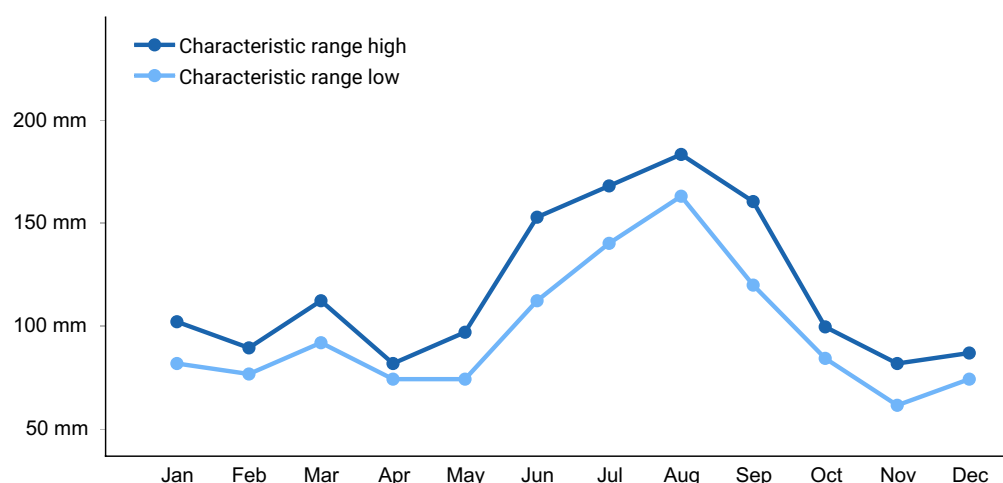
**Table 3. Representative physiographic features (actual ranges)**

Runoff class	Very low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	8–90 m
Slope	0–10%
Water table depth	15–203 cm

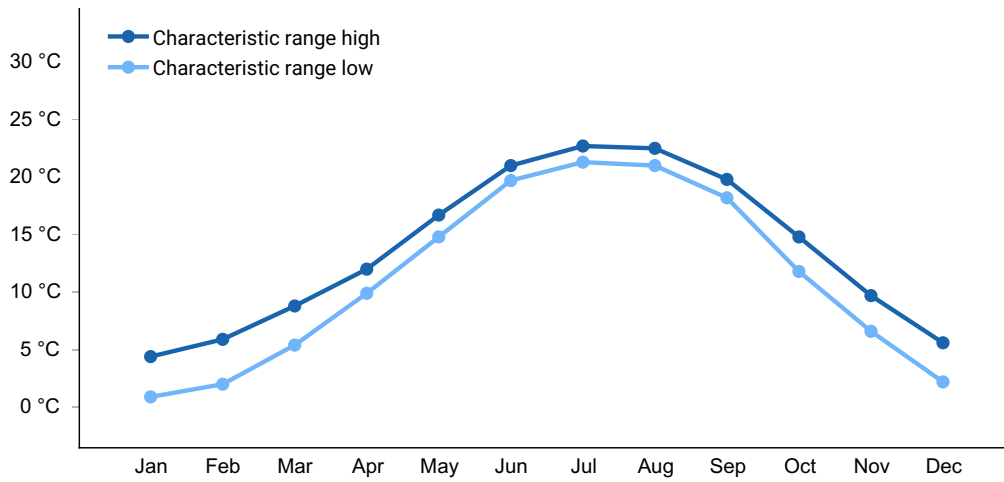
## Climatic features

**Table 4. Representative climatic features**

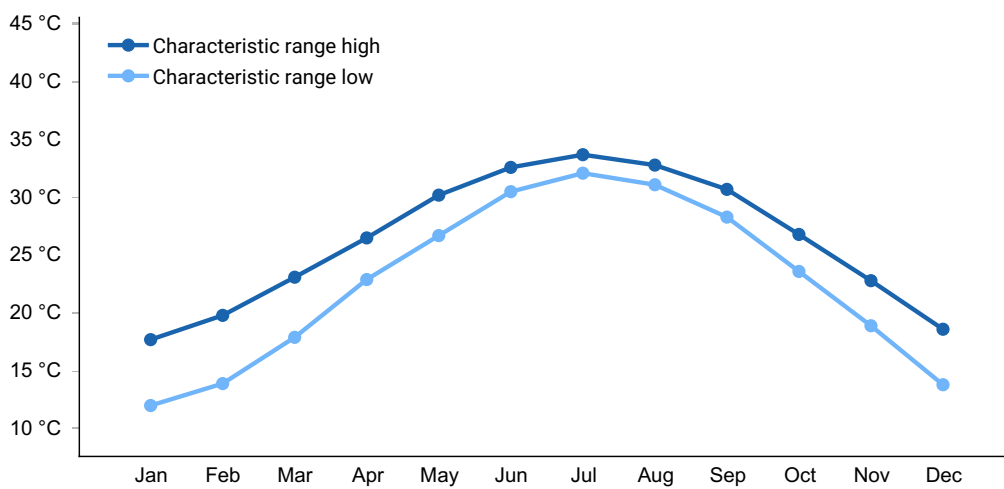
Frost-free period (characteristic range)	222-237 days
Freeze-free period (characteristic range)	257-306 days
Precipitation total (characteristic range)	1,245-1,321 mm
Frost-free period (actual range)	211-241 days
Freeze-free period (actual range)	250-350 days
Precipitation total (actual range)	1,168-1,346 mm
Frost-free period (average)	229 days
Freeze-free period (average)	286 days
Precipitation total (average)	1,270 mm



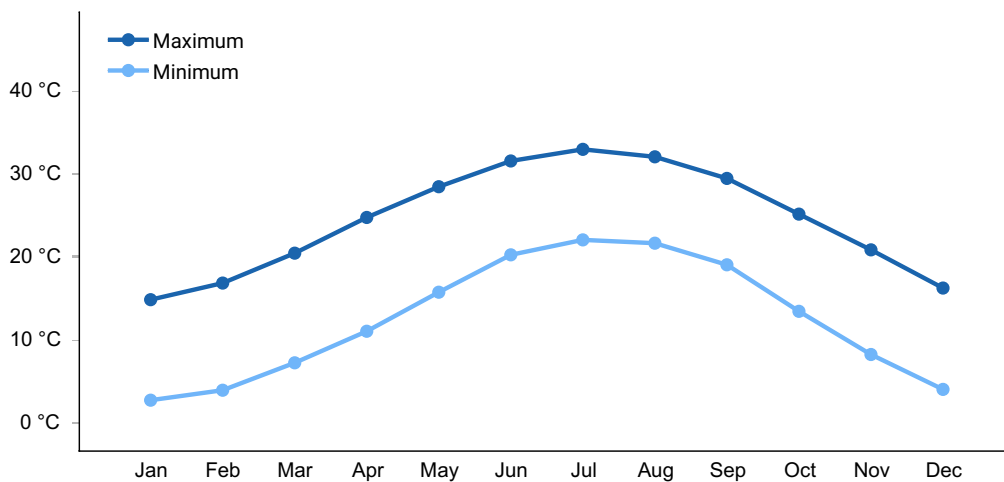
**Figure 1. Monthly precipitation range**



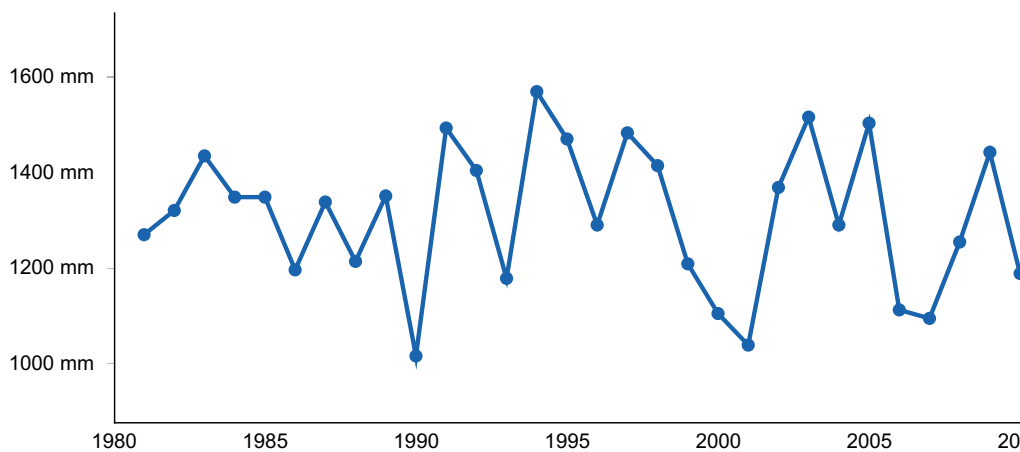
**Figure 2. Monthly minimum temperature range**



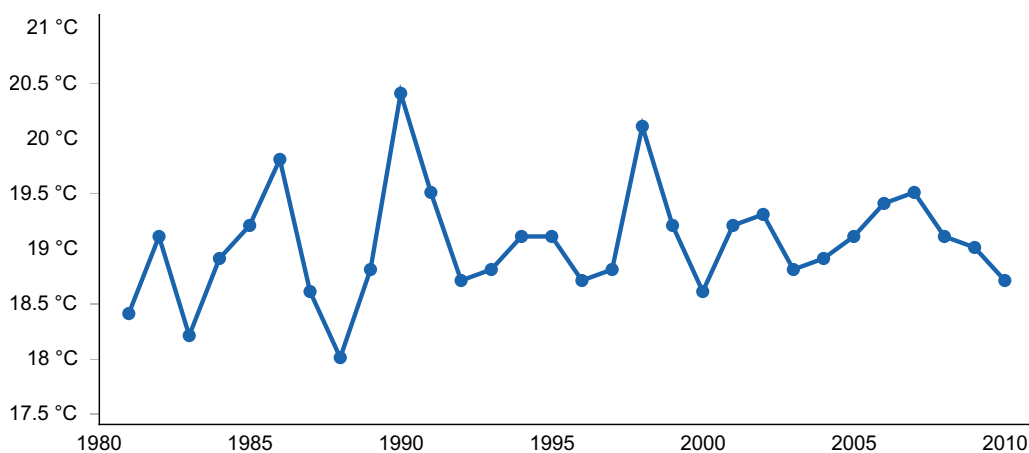
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) NEWPORT NEWS INTL AP [USW00093741], Newport News, VA
- (2) NEW BERN CRAVEN CO AP [USW00093719], New Bern, NC
- (3) CHARLESTON INTL AP [USW00013880], Charleston AFB, SC
- (4) FT STEWART [USC00093538], Fort Stewart, GA
- (5) JACKSONVILLE CECIL FLD NAS [USW00093832], Jacksonville, FL

## Influencing water features

This MLRA is dominated by a persistent high water table, but this site is characterized by better internal drainage, and/or a higher local hydraulic gradient which is often found near the edges of broad flats.

## Wetland description

This site is not a wetland.

## Soil features

The soils of this site are all primarily clayey or fine-silty in texture, and most are Ultisols formed in deep and acidic marine and fluviomarine mineral soil deposits. This site represents those locations where soils are relatively dry for the MLRA. The soils on this site are primarily well drained.

Soil series on this site include: Carnegie, Caroline, Esto, Faceville, Hiwassee, Marlboro, Nankin, Neeses, Smithboro, Summerton, Sunsweet, Turbeville, Varina, and Wicksburg.

Carnegie is modal.

**Table 5. Representative soil features**

Parent material	(1) Marine deposits
Surface texture	(1) Sandy loam (2) Fine sandy loam
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	178–191 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	9.14–14.22 cm
Soil reaction (1:1 water) (0-25.4cm)	4–6
Subsurface fragment volume ≤3" (0-101.6cm)	0–3%
Subsurface fragment volume >3" (0-101.6cm)	0%

**Table 6. Representative soil features (actual values)**

Drainage class	Somewhat poorly drained to well drained
Permeability class	Very slow to moderately rapid
Soil depth	152–203 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.11–20.57 cm



Soil reaction (1:1 water) (0-25.4cm)	3.5–6.5
Subsurface fragment volume <=3" (0-101.6cm)	0–9%
Subsurface fragment volume >3" (0-101.6cm)	0%

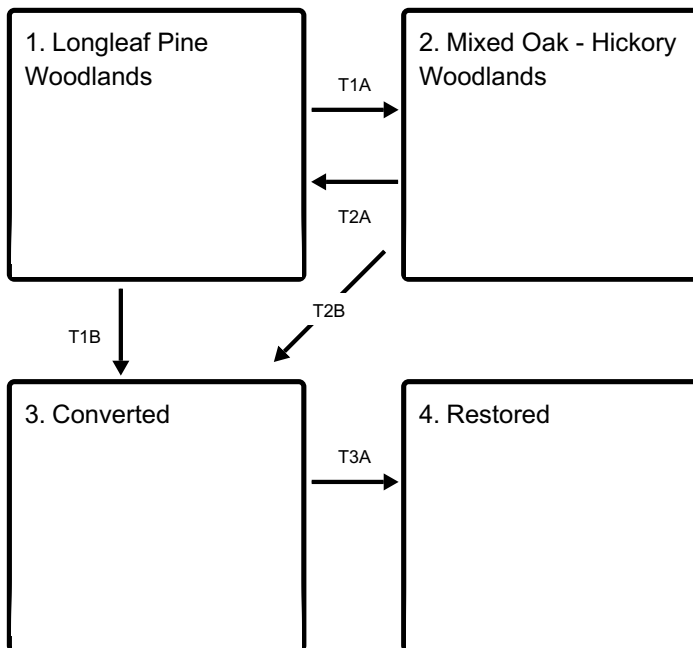
## Ecological dynamics

The most dominant ecological drivers on this site are fire and landuse conversion. This site is relatively fertile and nearly all of these locations have been converted to agriculture and other development. This site tends to occur in locations that are somewhat sheltered from fire, but frequent low intensity fire on a return interval of roughly 3 to 5 years is thought to be necessary to maintain the reference community. On this ecological site, longleaf pine woodlands is the reference community, because it represents the dominant precolonial forest community. It is probable that longleaf pine woodlands were a cultural state maintained by indigenous civilizations but, in most locations today, they no longer dominate the landscape. Historically, the use of fire by indigenous civilizations may have been extensive. Some limited wildfire and prescribed fire occur today, but fire suppression has been the norm since the 20th century.

(Peat and Allard, 1993; Schafale and Weakley, 1990)

## State and transition model

### Ecosystem states



**T1A** - Lack of fire

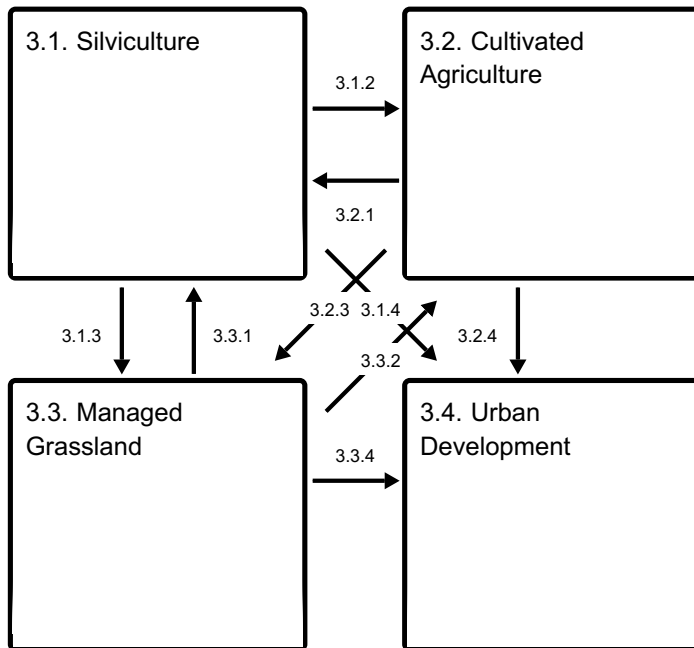
**T1B** - Land use conversion

**T2A** - Reintroduction of fire

**T2B** - Land use conversion

**T3A** - Restoration

### State 3 submodel, plant communities



**3.1.2** - Establishment of cultivated agriculture

**3.1.3** - Establishment of managed grassland

**3.1.4** - Urban development

**3.2.1** - Establishment of trees for silviculture

**3.2.3** - Establishment of managed grassland

**3.2.4** - Urban development

**3.3.1** - Establishment of trees for silviculture

**3.3.2** - Establishment of cultivated agriculture

**3.3.4** - Urban development

## State 1

### Longleaf Pine Woodlands

On this site, this vegetation community ranges from an open overstory to a nearly closed canopy. Fire helps to establish and maintain a more open canopy, but, on this site, some locations with a frequent fire return interval maintain a nearly closed canopy of mixed pine and oak. This vegetation community on this site is exceptionally rare today, due mostly to land use conversion to agriculture. (Peat and Allard, 1993; Schafale and Weakley, 1990)

**Resilience management.** This community is maintained by fires on a return interval of 3 to 5 years. Fires at this return interval maintain both vegetation and fuels so that the overall vegetation community is well adapted to the resulting fire intensity. Longleaf pine is well adapted to frequent low intensity surface fires, and the oak species common on this site are capable of withstanding low intensity fire.

## **Dominant plant species**

- longleaf pine (*Pinus palustris*), tree
- southern red oak (*Quercus falcata*), tree
- bluejack oak (*Quercus incana*), tree
- sand post oak (*Quercus margaretta*), tree
- blackjack oak (*Quercus marilandica*), tree
- inkberry (*Ilex glabra*), shrub
- Beyrich threeawn (*Aristida beyrichiana*), grass
- pineland threeawn (*Aristida stricta*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- shortleaf skeletongrass (*Gymnopogon brevifolius*), grass
- western brackenfern (*Pteridium aquilinum*), other herbaceous
- roundleaf thoroughwort (*Eupatorium rotundifolium*), other herbaceous

## **State 2**

### **Mixed Oak - Hickory Woodlands**

On this site, this vegetation community ranges from an open overstory to a nearly closed canopy. This community often occurs as a transition between frequently burned sandhills and fire intolerant upland hardwoods. This site tends to occur in locations that are partially sheltered from fire, but fire continues to play a role on this site, and the hardwoods common on this site are more tolerant of fire than other hardwoods. Disturbed areas tend to have an increased prominence of pines. (FNAI, 2010; Peat and Allard, 1993; Schafale and Weakley, 1990)

## **Dominant plant species**

- southern red oak (*Quercus falcata*), tree
- post oak (*Quercus stellata*), tree
- white oak (*Quercus alba*), tree
- blackjack oak (*Quercus marilandica*), tree
- black oak (*Quercus velutina*), tree
- mockernut hickory (*Carya tomentosa*), tree
- pignut hickory (*Carya glabra*), tree
- longleaf pine (*Pinus palustris*), tree
- flowering dogwood (*Cornus florida*), shrub
- farkleberry (*Vaccinium arboreum*), shrub
- eastern poison ivy (*Toxicodendron radicans*), shrub
- little bluestem (*Schizachyrium scoparium*), grass
- Virginia tephrosia (*Tephrosia virginiana*), other herbaceous

## **State 3**

### **Converted**

## **Community 3.1**

### **Silviculture**

Native forests are typically converted to silvicultural systems in order to facilitate timber production. The application of artificial regeneration is common. The timber industry in the Southeast has artificially expanded the ecological footprint of Loblolly pine in particular.

#### **Dominant plant species**

- loblolly pine (*Pinus taeda*), tree

## **Community 3.2**

### **Cultivated Agriculture**

Much of this site has been converted to cultivated agriculture.

## **Community 3.3**

### **Managed Grassland**

Lands converted in order to support pasture and/or hayland management.

## **Community 3.4**

### **Urban Development**

Lands developed to urban land use conditions.

### **Pathway 3.1.2**

#### **Community 3.1 to 3.2**

Establishment of cultivated agriculture

### **Pathway 3.1.3**

#### **Community 3.1 to 3.3**

Establishment of managed grassland

### **Pathway 3.1.4**

#### **Community 3.1 to 3.4**

Urban development

### **Pathway 3.2.1**

#### **Community 3.2 to 3.1**

Establishment of trees for silviculture

### **Pathway 3.2.3**

#### **Community 3.2 to 3.3**

Establishment of managed grassland

### **Pathway 3.2.4**

#### **Community 3.2 to 3.4**

Urban development

### **Pathway 3.3.1**

#### **Community 3.3 to 3.1**

Establishment of trees for silviculture

### **Pathway 3.3.2**

#### **Community 3.3 to 3.2**

Establishment of cultivated agriculture

### **Pathway 3.3.4**

#### **Community 3.3 to 3.4**

Urban development

## **State 4**

### **Restored**

Restoration efforts might include revegetation and reintroduction of periodic fire. There is increased interest in restoration of longleaf pine and its associated vegetation communities including the application of prescribed and controlled fire. However, it is unclear whether or not the full historical range of fire behavior and fire seasonality can be restored on the modern landscape, and the limited scope of modern fire application may impact full restoration to historical conditions.

## **Transition T1A**

### **State 1 to 2**

Lack of fire, or a fire return interval that exceeds 5 years on a consistent basis for a long period of time.

## **Transition T1B**

### **State 1 to 3**

Land use conversion

## **Transition T2A**

### **State 2 to 1**

Reintroduction of fire on a 3 to 5 year return interval.

## **Transition T2B**

### **State 2 to 3**

Land use conversion

## **Transition T3A**

### **State 3 to 4**

Restoration of vegetation community and application of managed fire.

## **Additional community tables**

### **Inventory data references**

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

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## Contributors

Matthew D. Duvall

## Approval

Charles Stemmans, 2/12/2025

## 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	05/21/2025
Approved by	Charles Stemmans
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

### 1. Number and extent of rills:

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

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

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

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

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

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

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

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

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

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

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**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:

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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:**
-