Ecological site F153AY010NC
Dry Sands

Last updated: 2/12/2025
Accessed: 05/11/2025

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 Xeric Sandhill Scrub (Schafale and Weakely, 1990) and Sandhill (FNAI, 2010).

Ecological site concept

This site is characterized by well drained and excessively drained, sandy Entisol soils on coastal plain rises. This site represents the driest locations across this MLRA. Across this broad flat landscape, this relatively dry site can be found in a few landscape positions. Most of this site can typically be found in four distinct positions: 1) Carolina bay rims, 2) eolian deposits associated with broad river flood plain systems, 3) natural levees adjacent to stream channels, and 4) relict sandy shoreline features.

This site has the potential to support a variety of vegetation communities. The reference community is dry sandhills scrub with emergent longleaf pine because this was the dominant precolonial condition. This historical vegetation community was maintained on this site by frequent low-intensity surface fires. Much of this site today has been converted to alternative states, but the low productivity of these soils has led to some locations persisting in a forested state. 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

F153AY070NC	**Wet Spodosol Flats and Depressions** Dry sands often comprise a Carolina bay rim adjacent to, and higher on the local landscape than a wet Spodosol flat or depression.

F153AY060NC	**Wet Loamy Flats and Depressions** Dry sands often comprise a Carolina bay rim adjacent to, and higher on the local landscape than a wet loamy flat or depression.
F153AY065NC	**Wet Clay Flats and Depressions** Dry sands often comprise a Carolina bay rim adjacent to, and higher on the local landscape than a wet clay flat or depression.
F153AY080NC	**Wet Organic Soil Flats and Depressions** Dry sands often comprise a Carolina bay rim adjacent to, and higher on the local landscape than a wet organic soil flat or depression.
F153AY090NC	**Flooded Mineral Soil Flood Plains and Terraces** Dry sands often comprise an eolian deposit associated with, and higher on the local landscape than large expansive mineral soil flood plain systems in this MLRA.
F153AY100NC	**Flooded Organic Soil Flood Plains and Terraces** Dry sands often comprise an eolian deposit associated with, and higher on the local landscape than large expansive organic soil flood plain systems in this MLRA.

Similar sites

F153BY010NC	**Dry Sands** This site is on very similar landforms but in an adjacent MLRA where the marine terrace surfaces are younger, less dissected, and more prone to tidal impacts.
R153BY110NC	**Coastal Strand, Beaches, and Dunes** Coastal strand landforms and relict shoreline features are often mapped as dry sands.

Table 1. Dominant plant species

Tree	(1) *Pinus palustris* (2) *Quercus laevis*
Shrub	(1) *Quercus laevis* (2) *Gaylussacia dumosa*
Herbaceous	(1) *Aristida stricta* (2) *Schizachyrium scoparium*

Physiographic features

This site is characterized by sandy Entisol soils on coastal plain rises and flats on uplands. In comparison to it's surrounding, topographic relief is relatively high on this site, with slopes ranging up to 8 percent. Across this broad flat landscape, this relatively dry site can be found in a few landscape positions. Most of this relatively dry site can typically be found in four unique positions: 1) Carolina bay rims, 2) eolian deposits associated with broad river flood plain systems, 3) natural levees adjacent to stream channels, and 4) relict sandy shoreline features.

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) Summit (2) Shoulder (3) Backslope
Landforms	(1) Coastal plain > Marine terrace (2) Ridge (3) Rise
Runoff class	Low
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None to very rare

Ponding frequency	None
Elevation	25–295 ft
Slope	0–6%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Very low to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	25–295 ft
Slope	0–8%
Water table depth	48–80 in

Climatic features

The climate across MLRA 153A is generally warm, temperate, and humid with some maritime influences near the coast. The maximum precipitation occurs during summer. 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. On rare occasions snowfall occurs in the northern third of the area. The average annual temperature is 59 to 70 degrees F (15 to 21 degrees C), increasing to the south. (USDA-NRCS, 2022)

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)	49-52 in
Frost-free period (actual range)	211-241 days
Freeze-free period (actual range)	250-350 days
Precipitation total (actual range)	46-53 in
Frost-free period (average)	229 days
Freeze-free period (average)	286 days
Precipitation total (average)	50 in

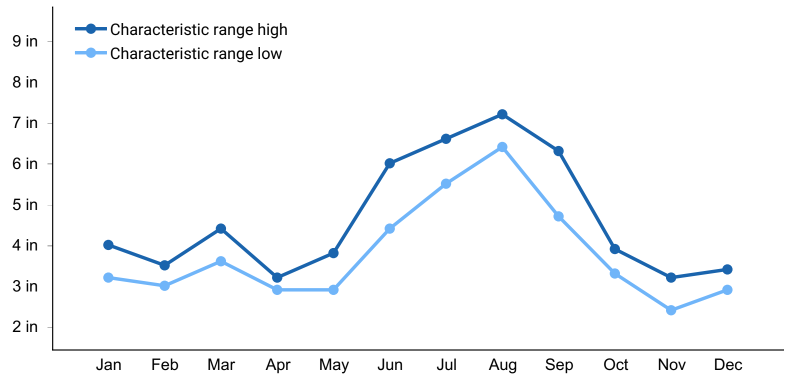


Figure 1. Monthly precipitation range

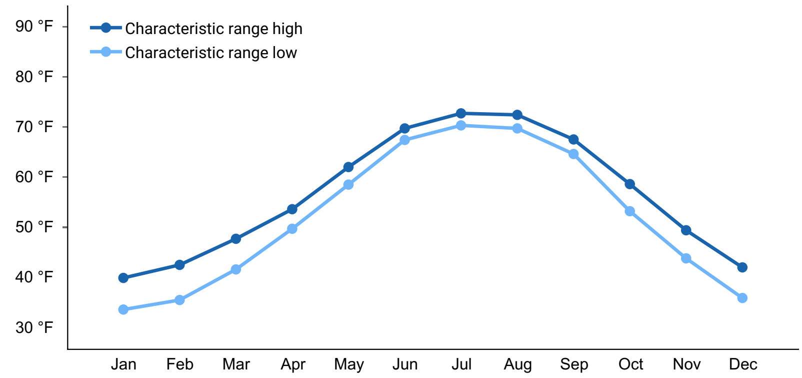


Figure 2. Monthly minimum temperature range

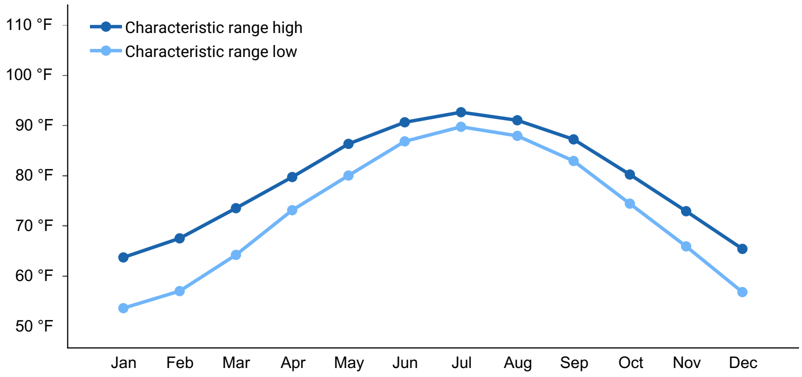


Figure 3. Monthly maximum temperature range

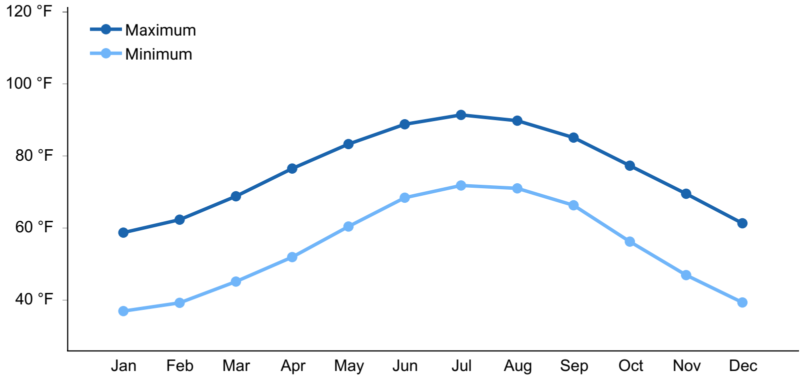


Figure 4. Monthly average minimum and maximum temperature

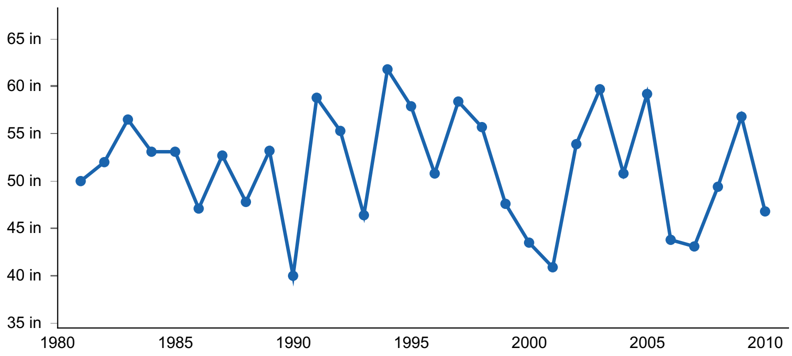


Figure 5. Annual precipitation pattern

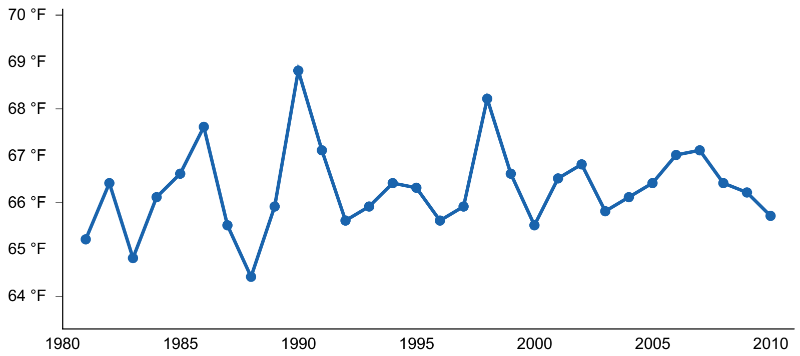


Figure 6. Annual average temperature pattern

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 site is variable, but most of this relatively dry site can typically be found in four unique positions: 1) Carolina bay rims, 2) eolian deposits associated with broad river flood plain systems, 3) natural levees adjacent to stream channels, and 4) relict sandy shoreline features, three of which are heavily influenced by water features during development. Today, this site is mostly water shedding.

Wetland description

This site is not a wetland.

Soil features

The soils of this site are all primarily sandy, and most are Entisols. They are deep and acidic. This site represents those locations where soils are relatively dry. The soils on this site primarily range from excessively drained to well drained.

Soil series on this site include: Alpin, Buncombe, Cainhoy, Foxworth, Kershaw, Kureb, Lakeland, Lakewood, Neilhurst, Penney, Rimini, Tarboro, Wakulla, and Wando.

Lakeland is modal.

Table 5. Representative soil features

Parent material	(1) Marine deposits (2) Eolian sands (3) Fluviomarine deposits
Surface texture	(1) Sand (2) Fine sand (3) Coarse sand
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-40in)	1–3.3 in
Soil reaction (1:1 water) (0-10in)	4.5–6
Subsurface fragment volume <=3" (0-40in)	0–3%
Subsurface fragment volume >3" (0-40in)	0%

Table 6. Representative soil features (actual values)

Drainage class	Moderately well drained to excessively drained
Permeability class	Rapid to very rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.2–3.9 in
Soil reaction (1:1 water) (0-10in)	3.5–7.3
Subsurface fragment volume <=3" (0-40in)	0–7%
Subsurface fragment volume >3" (0-40in)	0%

Ecological dynamics

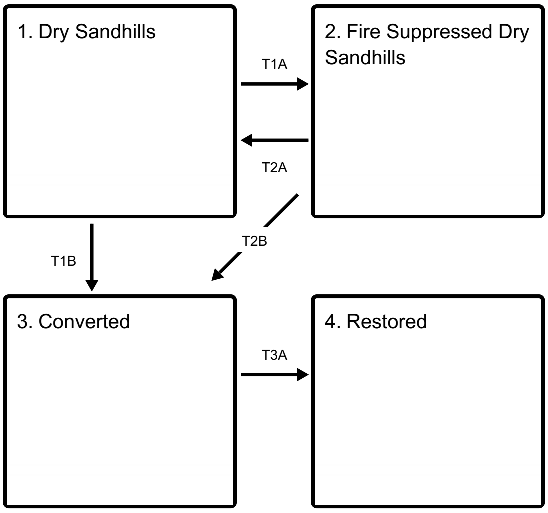
The most dominant ecological driver on this site is fire; frequency, intensity, and seasonality in all of it's combinations. The variation in vegetation communities that occur on this site are mostly the consequences of fire history. For example, longleaf pines are well adapted to periodic low intensity surface fires on short return intervals. On this ecological site, dry longleaf pine and oak sandhills is the reference community, because it represents the dominant precolonial forest community. It is probable that dry longleaf pine and oak sandhills 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.

Due to widespread fire suppression, the forest today is more of a closed canopy with considerably less development of understory graminoids and herbs. Due to the infertile nature of the soils, many locations of this site remain in forested conditions today, but some locations have been converted cropping, pasture, or development. There is increased interest in restoration of longleaf pine and it's associated vegetation communities including the application of prescribed and controlled fire, but it is unclear whether or not the full historical range of fire behavior and fire seasonality can be restored on the modern landscape.

(FNAI, 2010; Peat and Allard, 1993; Schafale and Weakley, 1990)

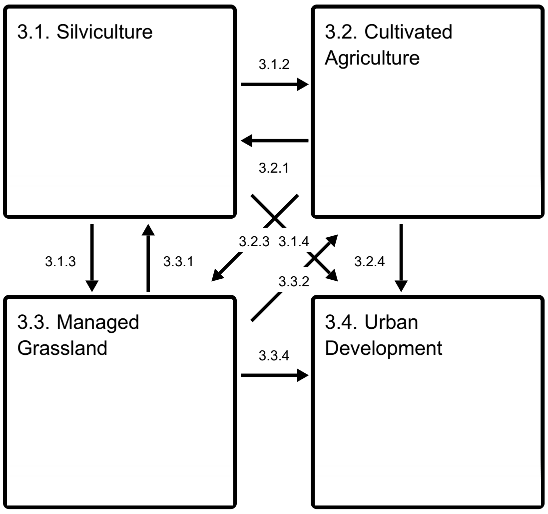
State and transition model

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
Dry Sandhills

These woodlands are characterized by an open canopy of longleaf pine above a sparse midstory and understory of scrub oaks and a moderate to dense groundcover of a diversity of grasses and other herbaceous plants. (FNAI, 2010; Peat and Allard, 1993; Schafale and Weakley, 1990)

Resilience management. This community is maintained by fires on a return interval of 1 to 3 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. These fires maintain most of the oaks in a shrub lifeform as sprouts are killed back by each fire, and they stimulate both productivity and diversity of the grasses and herbs.

Dominant plant species

- longleaf pine (*Pinus palustris*), tree
- turkey oak (*Quercus laevis*), tree
- turkey oak (*Quercus laevis*), shrub
- sand post oak (*Quercus margaretta*), shrub
- bluejack oak (*Quercus incana*), shrub
- dwarf huckleberry (*Gaylussacia dumosa*), shrub
- pineland threeawn (*Aristida stricta*), grass
- Beyrich threeawn (*Aristida beyrichiana*), grass
- little bluestem (*Schizachyrium scoparium*), grass

State 2
Fire Suppressed Dry Sandhills

These woodlands are characterized by a dense and closed midstory canopy of scrub oaks, with or without an open emergent canopy of longleaf pine above. The shade cast by the oaks decreases shrub, grass, and herbaceous diversity and cover. (FNAI, 2010; Peat and Allard, 1993; Schafale and Weakley, 1990)

Resilience management. This community develops as fire return intervals exceed 3 years on a consistent basis for a long period of time. The size and cover of oaks both increase as time since fire increases. The shade cast by the oaks decreases shrub, grass, and herbaceous diversity and cover.

Dominant plant species

- turkey oak (*Quercus laevis*), tree
- sand post oak (*Quercus margaretta*), tree
- bluejack oak (*Quercus incana*), tree
- longleaf pine (*Pinus palustris*), tree
- dwarf huckleberry (*Gaylussacia dumosa*), shrub
- pineland threeawn (*Aristida stricta*), grass
- Beyrich threeawn (*Aristida beyrichiana*), grass
- little bluestem (*Schizachyrium scoparium*), grass

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

Relatively infertile soils and a lack of soil moisture renders cultivated agriculture a difficult proposition on this site, but some crops are relatively well suited, especially with irrigation. Some areas are cultivated for peanuts, watermelons, and other truck crops.

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

There is increased interest in restoration of longleaf pine and it's 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 3 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 1 to 3 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	05/11/2025
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):**

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

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

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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:**

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17. **Perennial plant reproductive capability:**
