USDA Natural Resources Conservation Service

# Ecological site F133BY007TX
# Southern Sandy Loam Upland

Last updated: 12/13/2023
Accessed: 05/21/2024

## 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): 133B–Western Coastal Plain

Major Land Resource Area (MLRA) 133B, Western Coastal Plain is in eastern Texas, western Louisiana, and the southwest corner of Arkansas. The area is dominated by coniferous forest covering 45,450 square miles (29,088,000 acres). The region is a hugely diverse transition zone between the eastern deciduous forests and the central grasslands to the west.

## Classification relationships

NatureServe, 2002
- CEGL007513: Fire-infrequent Xeric Sandhill
- CEGL008571: Fire-infrequent Mixed Longleaf Pine Forest/Woodland

Soil Survey Staff, 2011
- Woodland Suitability Group – 2s2

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 133B

Van Kley et. al., 2007
- 232Fa.15.1.20 Longleaf Pine-Blackjack Oak/schizachyrium Arenic Dry Uplands Landtype Phase

## Ecological site concept

The Southern Sandy Loam Uplands site has a sandy or loamy surface soil with a gradual increase in clay through the subsurface horizons. The gradual increase in clay content aids in moisture retention, allowing the formation of a well-developed vegetative community. The ecological site has more biomass development than the deep sandy uplands, sometimes located adjacently upslope, and a more open canopy than the adjacent clayey uplands, located downslope.

## Associated sites

| | |
|---|---|
| F133BY003TX | **Loamy Over Clayey Upland**<br>Sites have clay horizons throughout the soil profiles. |
| F133BY004TX | **Loamy Claypan Upland**<br>Sites have an abrupt textural change from loam to clay and some are shallow to bedrock. |
| F133BY009TX | **Southern Deep Sandy Upland**<br>Sites have deeper sands until there is an increase in clay content. Vegetation is more sparse. |

| | |
|---|---|
| F133BY013TX | **Terrace**<br>Sites are on a lower terrace position. |
| F133BY005TX | **Loamy Upland**<br>Sites have deeper soil horizons of sandy and loamy textures. These sites are not as dense in biomass and have lessened accumulations of nutrients due to their sandier nature. |

## Similar sites

| | |
|---|---|
| F133BY008TX | **Northern Deep Sandy Upland**<br>Sites have deeper sands until there is any clay content increase. Sites are located in northern geologies of MLRA and shortleaf pine is the major overstory component. |
| F133BY009TX | **Southern Deep Sandy Upland**<br>Sites have deeper sands until there is an increase in clay percent. |
| F133BY013TX | **Terrace**<br>Sites are on a lower terrace position. |
| F133BY006TX | **Northern Sandy Loam Upland**<br>Very similar except sites are located in the northern geologies of the MLRA. Sites have shortleaf pine as major overstory component. |
| F133BY005TX | **Loamy Upland**<br>Sites have loamy textures through their soil horizons as opposed to sands in the upper profile. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Pinus palustris* |
| Shrub | Not specified |
| Herbaceous | (1) *Schizachyrium scoparium* |

## Physiographic features

The ecological site consists of deep sandy or loamy soils formed from shale or sandstone. These sites range from gently sloping to moderately steep on uplands. Slopes are dominantly 3 to 8 percent, but range from 1 to 20 percent. Flooding and ponding do not occur.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Coastal plain > Interfluve |
| Runoff class | Very low to medium |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 30–213 m |
| Slope | 3–8% |
| Aspect | Aspect is not a significant factor |

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

| | |
|---|---|
| Runoff class | Not specified |
| Flooding frequency | Not specified |
| Ponding frequency | Not specified |
| Elevation | Not specified |
| Slope | 1–20% |

## Climatic features

The climate of the Western Coastal Plain (MLRA 133B) is humid subtropical with hot summers and mild winters. Canadian air masses that move southward across Texas and Louisiana over the Gulf of Mexico in winter produce cool, cloudy, rainy weather with only rare cold waves that moderate in one or two days. Precipitation is distributed fairly even throughout the year and is most often in the form of slow and gentle rains.

Spring weather can be variable. March is relatively dry while thunderstorm activities increase in April and May. Occasional slow-moving thunderstorms or other weather disturbances may dump excessive amounts of precipitation on the area. Fall has moderate temperatures. Fall experiences an increase of precipitation and frequently has periods of mild, dry, sunny weather. Heavy rain may occur early in the fall because of tropical disturbances, which move westward from the gulf. Tropical storms are a threat to the area in the summer and fall but severe storms are rare. Prolonged droughts and snowfall are rare.

The total annual precipitation ranges from 39 inches in the western part of the region to 60 inches in the eastern part of the region. Approximately 50 percent of the rainfall occurs between April and September, which includes the growing season for most crops. Thunderstorms occur on about 50 days each year and most occur during the summer.

The average relative humidity in mid-afternoon is about 60 percent. Humidity is higher at night and the average at dawn is about 90 percent. The sun shines 70 percent of the time in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average wind-speed is highest at 11 miles per hour in spring.

**Table 4. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 236 days |
| Freeze-free period (average) | 272 days |
| Precipitation total (average) | 1,448 mm |

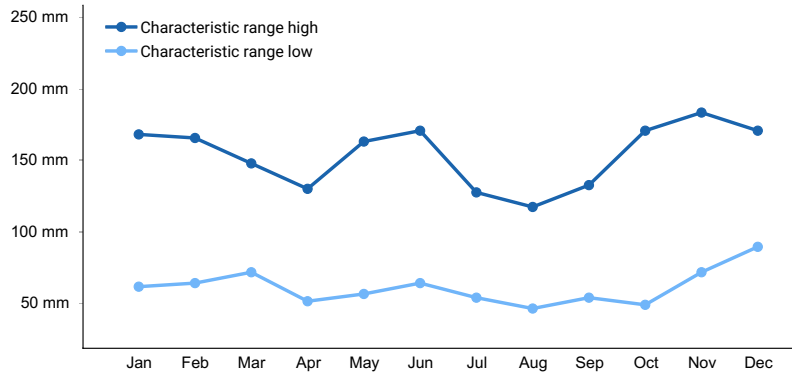



**Figure 1. Monthly precipitation range**

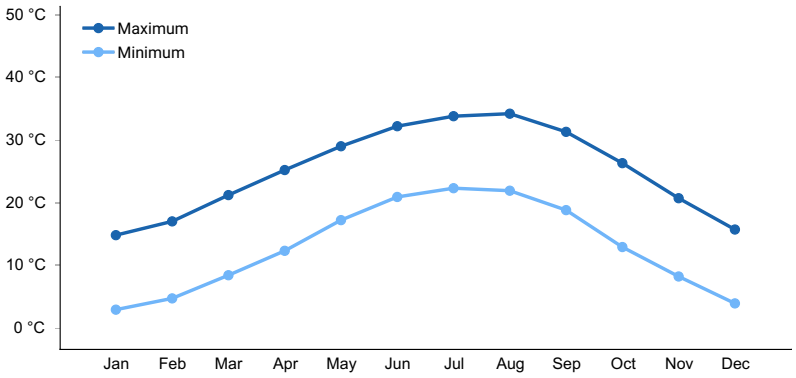



**Figure 2. Monthly average minimum and maximum temperature**

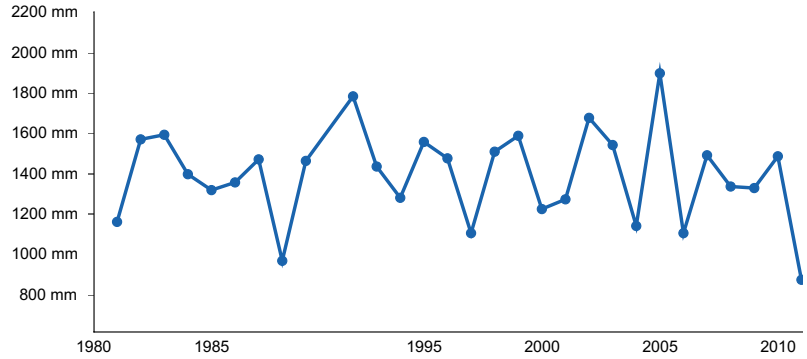



**Figure 3. Annual precipitation pattern**

## Climate stations used

- (1) OLLA [USC00166978], Olla, LA
- (2) HUNTSVILLE [USC00414382], Huntsville, TX
- (3) LIVINGSTON 2 NNE [USC00415271], Livingston, TX
- (4) TOLEDO BEND DAM [USC00419068], Anacoco, TX
- (5) GROVETON [USC00413778], Groveton, TX
- (6) LEESVILLE [USC00165266], Leesville, LA
- (7) HODGES GARDENS [USC00164288], Florien, LA
- (8) JENA 4 WSW [USC00164696], Trout, LA
- (9) SAM RAYBURN DAM [USC00417936], Brookeland, TX
- (10) LUFKIN ANGELINA CO AP [USW00093987], Lufkin, TX

## Influencing water features

Due to the well drained nature of the soils, water is not usually a factor.

## Wetland description

Wetlands are not associated with this site.

## Soil features

The ecological site is associated with deep, well-drained, moderate to rapidly-permeable soils on uplands. Surface soils range from loamy sands, sandy loams, or loams. The clay increase is gradual throughout the soil profile. The profile typically transitions from a sandy/loamy surface to a sandy loam or sandy clay loam subsurface. Soils correlated to this site include: Boykin, Choates, Depcor, Doucette, Hillister, Kurth, Laska, Letney, Lovelady, Malbis, Pinetucky, and Stringtown.

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Residuum–sandstone and shale |
| Surface texture | (1) Loamy sand |
| Family particle size | (1) Loamy |
| Drainage class | Well drained to moderately well drained |
| Permeability class | Moderate to rapid |
| Soil depth | 203 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 7.62–15.24 cm |

| | |
|---|---|
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 4.5–6 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–4% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

The information in this ecological site description (ESD), including the state-and-transition model (STM), was developed using archeological and historical data, professional experience, and scientific studies. The information is representative of a complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals, and ecological processes are described to inform land management decisions.

Introduction – Southern Arkansas, western Louisiana, and eastern Texas have been deemed the Pineywoods because of the vast expanse of pine trees. The region represents the western edge of the southern coniferous belt. Historically, the area was covered by pines with mixed hardwoods, sparse shrubs, and a diverse understory of grasses and forbs. Fire played a significant role in reducing the woody competition that generally out-competes the herbaceous understory layer. Fire suppression and land conversion have reduced the amount of historical communities in existence today.

Background – Prior to settlement by the Europeans, the reference state for the Southern Sandy Loam Uplands was a Longleaf Pine Woodland. Remnants of this presumed historic plant community still exist where natural conditions are replicated through conservation management techniques. Evidence of the reference state is found in accounts of early historic explorers to the area, historic forest and biological survey teams, as well as recent ecological studies in the last 30 years. The community is an uneven-aged woodland with a diverse understory of grasses and forbs.

Settlement Management – As human settlement increased throughout the area, so did the increase in logging and grazing by domestic livestock. The logging became so extensive that by the 1930’s most of the region had been cut-over. Replanting trees to historic communities was not common and early foresters began planting loblolly pine (*Pinus taeda*) for its quick growth. As more people colonized they began suppressing fire, which allowed dense thickets of shrubs to replace the herbaceous understory.

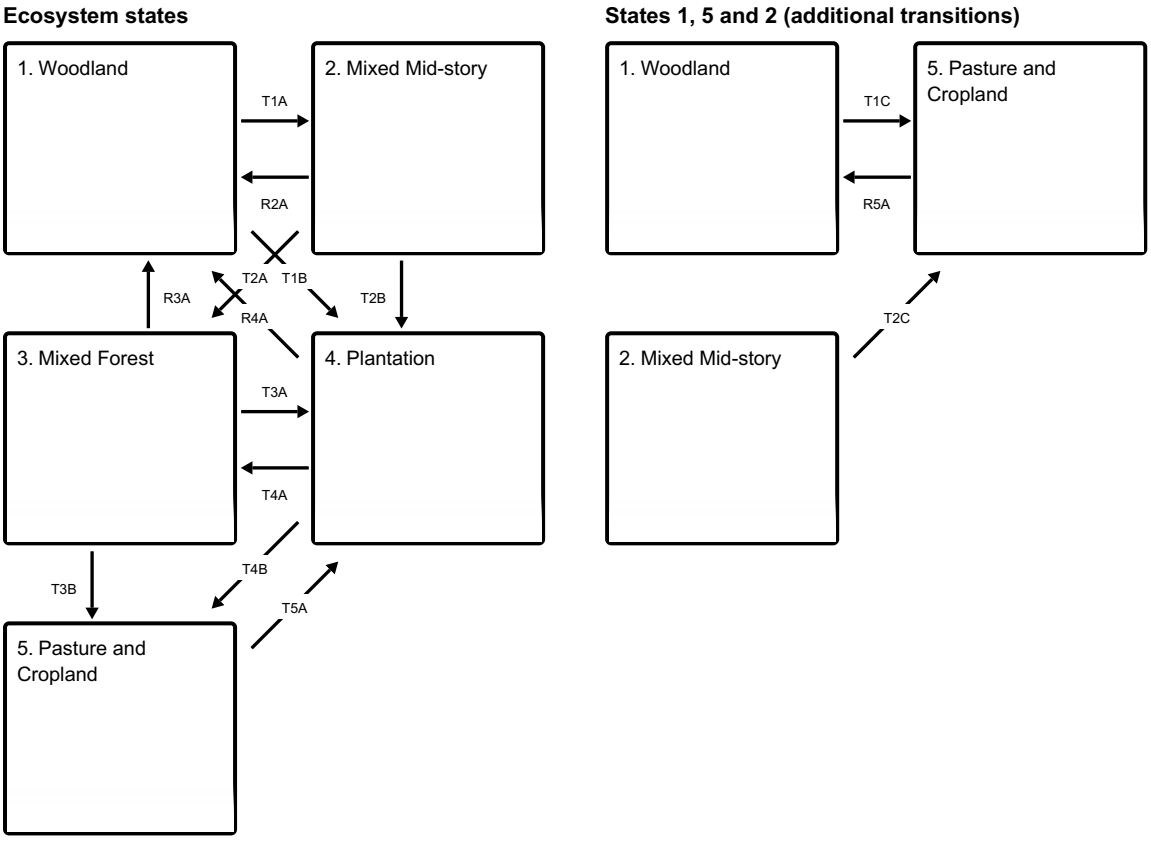
Current Management and State – Today much of the remnant forest is gone, replaced by pine plantations, crops, and pastures. The areas that were not converted have been fire-suppressed so long that loblolly pine and fire intolerant hardwoods populate the overstory structure. Currently, U.S. Forest Service properties are the best place to view the remnant sites. Some private individuals have begun restoring communities through selective tree planting and retention of communities that remain. Other restoration efforts include mimicking natural-disturbance regimes through gap-phase regeneration on plantation sites.

Fire Regimes – Fire was a natural and important disturbance throughout the Western Gulf Plain. Fire occurred naturally from lightning strikes and was started by Native Americans for game movement. The reference community developed with a frequency of fire every 1 to 3 years. Fires usually occurred in early spring, removing senescent vegetation, recycling nutrients and minerals, and spurring new plant growth. Late summer fires occurred as well, but with a different community effect. Summer fires burned hotter and with more intensity, greatly suppressing the shrub canopy layer. The summer fires also shifted the ecological site transitional state by decreasing grass densities and increasing forb densities. The topography, fuel loads, and other conditions caused patchy burns throughout the region resulting in mosaic patterns of plant communities and a heterogeneous landscape.

Disturbance Regimes – Extreme weather events occur occasionally throughout the region. Tornados uproot trees and open canopies in the spring months. In the late summer and early fall, hurricanes or tropical depressions often make landfall, dumping excessive amounts of rain and toppling trees with high winds. Another cause of large canopy openings is the effects of the southern pine beetle (Dendroctonus frontalis). Starting in the late 1950's, beetle outbreaks have occurred every 6 to 9 years, usually when the trees are stressed due to multiple environmental factors.

Plant Community Interactions – The high amount of loamy sand in the upper soil profile reduces the water-holding capacity of the site. The droughtiness lessens the shrub-layer accumulation which causes the the sites to be dominant in grasses and forbs. The length of fire intervals (1 to 3 years) coupled with the soils inability to hold significant moisture maintains an open canopy (40 to 70 percent). The understory is dominated by little bluestem and minor patches of bare ground. Overstory trees sometimes include blackjack oak (*Quercus marilandica*) and post oak (Querucs stellata) in small amounts.

## State and transition model




**T1A** - Fire suppression, no management

**T1B** - Clearcut, site preparation, tree planting

**T1C** - Clearcut, grass/crop planting

**R2A** - Selective timber harvest, prescribed burns

**T2A** - Fire suppression, no management

**T2B** - Clearcut, site preparation, tree planting

**T2C** - Clearcut, grass/crop planting

**R3A** - Selective timber harvest, mid-story shrub control, prescribed burns

**T3A** - Clearcut, site preparation, tree planting

**T3B** - Clearcut, grass/crop planting

**R4A** - Gap-phase regeneration or clearcut with tree planting

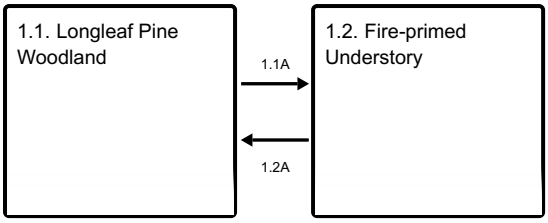
**T4A** - Fire suppression, no management

**T4B** - Clearcut, grass/crop planting

**R5A** - Tree planting, mid-story shrub control, prescribed burns

**T5A** - Clearcut, site preparation, tree planting

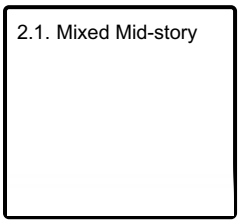
**State 1 submodel, plant communities**



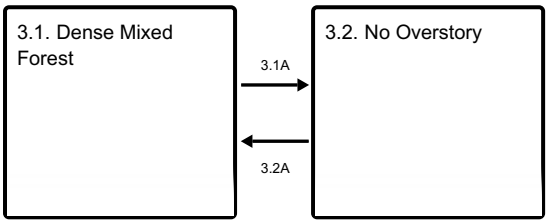

**1.1A** - Natural development between fire intervals

**1.2A** - Fire (1-3 year interval)

**State 2 submodel, plant communities**



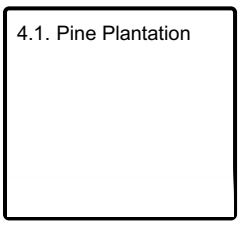

**State 3 submodel, plant communities**



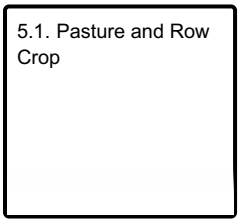

**3.1A** - Fire suppression, no management

**3.2A** - Clearcut or natural disturbance

**State 4 submodel, plant communities**




**State 5 submodel, plant communities**




## State 1
## Woodland

There are two communities in the Woodland State: Longleaf Pine Woodland Community (1.1) and the Fire-primed Understory Community (1.2). The reference state has a moderate overstory cover (40 to 70 percent) of longleaf pine with an occasional upland oak mixed in (blackjack oak and post oak are most common). The understory is diverse, dominated by grasses and forbs. Significant portions of the forest floor are dominated by little bluestem, sometimes up to 75 percent of the site. Saplings and some shrubs are in the area, but make up a small percentage of the mid-story canopy. The forest composition is uneven-aged with members of the pine community probably over

200 years old. Natural disturbances of fires, lightning strikes, hurricanes (wind throw), ice events (rare), and beetle infestations maintain the uneven-age structure. The natural canopy spacing is kept intact by periodic fires ranging from 1 to 3 years. Representative basal areas range from 40 to 70 square feet per acre. The basal area and canopy cover generally increase at a parallel rate. Growth competition can be seen in the outer rings on trees in locations where the basal area exceeds 90 square feet per acre.

### Community 1.1
### Longleaf Pine Woodland

Longleaf pine trees comprise the majority of the overstory. The occurrence in the overstory on any given site is between 75 to 100 percent. Blackjack and post oaks have established on some sites, each ranging from 0 to 10 percent of the overall canopy structure. Shortleaf pine (*Pinus echinata*) will be found in lesser amounts, usually less than 5 percent. Farkleberry (*Vaccinium arboreum*), yaupon (*Ilex vomitoria*), sassafras (Sassafras albidium), and oak saplings are common in the mid-story layer (4.5 to 13 feet), although overall presence in the system is quite low (0 to 10 percent). Both communities are characterized by a diverse ground layer with minor patches of bare ground and litter (5 to 15 percent and 10 to 30 percent, respectively). Little bluestem and needleleaf rosette grass (*Dichanthelium aciculare*) are the most abundant grasses seen in the two communities. Indicator forbs include, Virginia tephrosia (*Tephrosia virginiana*), St. Andrew's cross (*Hypericum hypericoides*), healing croton (*Croton argyranthemus*), and flowering spurge (*Euphorbia corollata*).

**Table 6. Ground cover**

| | |
|---|---|
| Tree foliar cover | 0-15% |
| Shrub/vine/liana foliar cover | 0-10% |
| Grass/grasslike foliar cover | 25-75% |
| Forb foliar cover | 10-50% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 10-30% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 5-15% |

**Table 7. Canopy structure (% cover)**

| Height Above Ground (M) | Tree | Shrub/Vine | Grass/ Grasslike | Forb |
|---|---|---|---|---|
| <0.15 | 0-5% | 0-3% | 5-10% | 5-30% |
| >0.15 <= 0.3 | 0-10% | 0-3% | 10-25% | 5-20% |
| >0.3 <= 0.6 | 0-10% | 0-3% | 10-50% | 0-5% |
| >0.6 <= 1.4 | 0-15% | 0-5% | 0-5% | – |
| >1.4 <= 4 | 0-1% | – | – | – |
| >4 <= 12 | 5-20% | – | – | – |
| >12 <= 24 | 20-60% | – | – | – |
| >24 <= 37 | 20-80% | – | – | – |
| >37 | – | – | – | – |

### Community 1.2
### Fire-primed Understory

Phase 1.1 is the most representative community with fire recently traveling through the system. Litter accumulation is minimal and understory vegetation is occupied with grasses and forbs. Phase 1.2 has an increased abundance of grasses and forbs, increasing the fuel load for fire. Litter accumulation has built up, bare ground has lessened, and last year's vegetative growth may still be seen on the ground layer. Under natural conditions, only fire tolerant saplings will grow into the overstory.

### Pathway 1.1A
### Community 1.1 to 1.2

The driver for the community shift is time since the last fire. As post-fire time increases, so does the foliar cover by shrub species. As the perennial grasses and forbs age their senesced leaves increase fine fuel levels.

### Pathway 1.2A
### Community 1.2 to 1.1

The driver for the community shift is fire. As fire burns through the understory, it encourages a diverse herbaceous layer while suppressing shrubs and tree seedlings.

### State 2
### Mixed Mid-story

The understory dominance state has crossed a threshold in which normal environmental events cannot transition the community back to the reference state (State 1). The mid-story canopy has become so thick, it has begun to limit the productivity of the grass/forb-ground layer. The limited ground layer does not provide enough fuel to harbor a burn with the intensity found in State 1.

### Community 2.1
### Mixed Mid-story

Encroachment by fire intolerant species like sweetgum (Liquidambar stryacifula), red maple (*Acer rubrum*), southern red oak (*Quercus falcata*), sassafras, and loblolly pine begin to grow in the mid-story. Added foliar cover and litter accumulation lessens the impact of the sandy soil. The shading reduces the harshness of the environment and helps retain water in the soil. The reducing severity allows vegetation to grow that normally does not tolerate the inhospitable environment. Longleaf woodoats (*Chasmanthium sessiliflorum*) and American beautyberry (*Callicarpa americana*) are becoming the most dominant understory vegetation. Tree seedlings have grown higher and are beginning to escape the effects of fire and will become part of the overstory given more time with lack of management. The species present in State 1 will still be found, only in lesser amounts because the canopy cover is creating a better environment for fire-intolerant and shade-loving species.

**Table 8. Ground cover**

| | |
|---|---|
| Tree foliar cover | 25-50% |
| Shrub/vine/liana foliar cover | 35-75% |
| Grass/grasslike foliar cover | 10-35% |
| Forb foliar cover | 5-15% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 25-75% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 0-10% |

## State 3
## Mixed Forest

A long-term lack of fire and management has caused the plant community to cross two major thresholds resulting in a closed canopy community. Fire intolerant hardwoods have become part of the overstory. The overstory trees are overstocked and limit the growth of neighboring species. The overstocking reduces the overall value of the timber stand. The value is decreased because of reduction in longleaf pine numbers and an increase less valueable hardwoods.

### Community 3.1
### Dense Mixed Forest

The understory plant layer only contains remnants of State 1 and possibly no indicator species. Shade tolerant grasses and forbs replace the reference species. The shrub-layer canopy cover will be lessened due to the increased shading of the overstory, as compared to State 2. Because the site lacks the diversity found in State 1, the wildlife diversity is reduced to only generalist species and those seeking refuge. Similar to State 2, this ecological state requires management to restore the reference community. Selective timber harvest to remove unwanted hardwood species is the first step to allow the understory to return. Frequent prescribed burns (1 to 2 years) will help suppress the hardwood regeneration. Intense summer fires may also be required. The suppression of overstory seedlings will allow grasses, forbs, and shrubs to reestablish.

**Table 9. Ground cover**

| | |
|---|---|
| Tree foliar cover | 50-95% |
| Shrub/vine/liana foliar cover | 25-65% |
| Grass/grasslike foliar cover | 0-5% |
| Forb foliar cover | 0-5% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 50-100% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 0-5% |

### Community 3.2
### No Overstory

The No Overstory (3.2) phase is a result of natural environmental disturbances or clearcutting the overstory trees. The plant communities from State 1 may return initially, but if the natural disturbance of fire, or overstory stand management do not occur, the site will transition into a Mixed Forest (3.1) community.

### Pathway 3.1A
### Community 3.1 to 3.2

The driver for the shift is a natural disaster or clearcut situation. Examples of natural disasters include hurricane, wind throw, severe ice storms, or severe fires. Following timber harvest by clearcut, little of the State 1 vegetation remains. Primary vegetative succession occurs post clearcut.

### Pathway 3.2A
### Community 3.2 to 3.1

The drivers for the community shift are time and lack of fire. Shrubs and tree saplings will not be suppressed without return fire intervals.

## State 4
## Plantation

The Plantation State is a result of conversion activities. The landowner has maximized silviculture production by planting a monoculture of tree species.

### Community 4.1
### Pine Plantation

In the immediate years following the initial plantation tree planting, the understory community will resemble State 1. During this early growth period, the landowner will typically remove unwanted hardwoods and herbaceous plants to reduce competition with the planted pine trees. As the overstory canopy closes, less understory management is required due to sunlight restrictions to the ground layer.

## State 5
## Pasture and Cropland

The Pasture and Cropland State is a result of conversion activities. The landowner has maximized agriculture production by planting a monoculture of introduced grass species or agricultural row crops.

### Community 5.1
### Pasture and Row Crop

Typical introduced pasture grass species include bahiagrass (*Paspalum notatum*) and different varieties of bermudagrass (*Cynodon dactylon*). The grasses are grown for livestock production through direct grazing or baling hay for later use. Agricultural row crops are grown for food and fiber production. Many farmers use herbicides to reduce unwanted plant competition which yields a plant community unrepresentative State 1 or subsequent vegetative states.

### Transition T1A
### State 1 to 2

The transition from a Woodland (State 1) to the Mixed Mid-story (State 2) is a result of time and long periods (greater than 10 years) of no fire. Without fire to suppress shrubs and tree seedlings, biomass and diversity is lost from the grass and forb layers of the system. The transition is also characterized by tree sapling’s bud zones escaping the height at which fire is effective at suppression.

### Transition T1B
### State 1 to 4

The transition is due to the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut, then the site is prepared and planted to a monoculture of trees.

### Transition T1C
### State 1 to 5

The transition is due to the land manager maximizing agricultural production. Merchantable timber is harvested by clearcut, then the site is prepared and planted to either an improved grass or row crops.

### Restoration pathway R2A

### State 2 to 1

The driver for restoration is fire. Enough fuel is still left in this community to carry a fire through the site. More frequent burns (1 to 2 years) may be required, initially, to suppress the woody vegetation. Some tree species may have escaped the effective fire height and will have to be selectively cut down to return to the reference state.

### Transition T2A
### State 2 to 3

The transition from a Mixed Mid-story (State 2) to the Mixed Forest (State 3) is a result of time and long periods (greater than 20 years) of no fire. Without fire to suppress fire intolerant trees, they become part of the overstory canopy. The overstory is so saturated that the understory herbaceous layer is almost non-existent. As the overstory canopy closes, the mid-story becomes well established with shade tolerant species.

### Transition T2B
### State 2 to 4

The transition is due to the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut, then the site is prepared and planted to a monoculture of trees.

### Transition T2C
### State 2 to 5

The transition is due to the land manager maximizing agricultural production. Merchantable timber is harvested by clearcut, then the site is prepared and planted to either an improved grass or row crops.

### Restoration pathway R3A
### State 3 to 1

Among all restoration pathways, the R3A path is the most energy intensive. Restoration of this community to the State 1 begins with a selective timber harvest. Removing unwanted trees (shade and fire intolerant) opens up the canopy, allowing sunlight penetration to the ground. Years of overstory growth have limited the fuel necessary to have an effective fire. Time will be needed to encourage an understory and, if possible, mowing the understory may help. Once the herbaceous layer has established, frequent burns (1 to 2 years) may be required to suppress the woody vegetation.

### Transition T3A
### State 3 to 4

The transition is due to the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut, prepared, and planted to a monoculture of trees.

### Transition T3B
### State 3 to 5

The transition is due to the land manager maximizing agricultural production. Merchantable timber is harvested by clearcut, then the site is prepared and planted to either an improved grass or row crops.

### Restoration pathway R4A
### State 4 to 1

This restoration pathway can be accomplished in different ways depending on goals. One option is to create canopy openings by reducing the number of overstory trees. Then, restore the resulting canopy gaps with species from the State 1's understory. Restoring the understory may include replanting longleaf pine. This method keeps the woodland structure intact and slowly changes the species composition. Another restoration method is to selectively harvest and remove brush (via mechanical or chemical means) followed by re-planting longleaf pine and oak species (using reduced planting rates.) The herbaceous understory will take time to develop, but this process can

be expedited if adapted plant material is available. Fire is the best option to maintain desired canopy cover for enhancement of the understory, and reduce undesirable woody species. Fire frequencies of 1 to 2 years during both growing and cool seasons may be desired in order to maintain an open canopy and reduce undesirable plant competition. If fire is not a viable option, management of woody encroachment could be controlled by mowing or the use of herbicides.

### Transition T4A
### State 4 to 3

This community transition is caused by neglecting the plantation understory. Without mowing or herbicides, the brush canopy becomes a dense thicket.

### Transition T4B
### State 4 to 5

The transition is due to the land manager maximizing agricultural production. Merchantable timber is harvested by clearcut, then the site is prepared and planted to either an improved grass or row crops.

### Restoration pathway R5A
### State 5 to 1

This restoration path can be accomplished by planting a mix of longleaf pine and oak species to their natural frequencies (see State 1 Overstory Composition table); trying to attain a 40 to 70 percent mature overstory canopy. Management will be required to control unwanted species by burning, mowing, and/or herbicides. Controlling introduced pasture grasses is difficult, with complete control likely not attainable. The herbaceous understory will take time to develop, but this process can be expedited if adapted plant material seed is available.

### Transition T5A
### State 5 to 4

The transition is due to the land manager maximizing silviculture potential. The site is prepared and planted to a monoculture of trees.

## Additional community tables

**Table 10. Community 1.1 forest overstory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) | Diameter (Cm) | Basal Area (Square M/Hectare) |
|---|---|---|---|---|---|---|---|
| **Tree** | | | | | | | |
| longleaf pine | PIPA2 | *Pinus palustris* | – | – | 75–100 | – | – |
| blackjack oak | QUMA3 | *Quercus marilandica* | – | – | 0–10 | – | – |
| post oak | QUST | *Quercus stellata* | – | – | 0–10 | – | – |
| shortleaf pine | PIEC2 | *Pinus echinata* | – | – | 0–5 | – | – |

**Table 11. Community 1.1 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) |
|---|---|---|---|---|---|
| **Grass/grass-like (Graminoids)** | | | | | |
| little bluestem | SCSC | *Schizachyrium scoparium* | – | – | 25–75 |
| needleleaf rosette grass | DIAC | *Dichanthelium aciculare* | – | – | 10–35 |
| splitbeard bluestem | ANTE2 | *Andropogon ternarius* | – | – | 5–25 |
| big bluestem | ANGE | *Andropogon gerardii* | – | – | 0–15 |
| switchgrass | PAVI2 | *Panicum virgatum* | – | – | 0–15 |

| | | | | | |
|---|---|---|---|---|---|
| eastern gamagrass | TRDA3 | *Tripsacum dactyloides* | – | – | 0–15 |
| threeawn | ARIST | *Aristida* | – | – | 1–10 |
| Ravenel's rosette grass | DIRA | *Dichanthelium ravenelii* | – | – | 0–10 |
| cylinder jointtail grass | COCY | *Coelorachis cylindrica* | – | – | 0–5 |
| Florida paspalum | PAFL4 | *Paspalum floridanum* | – | – | 0–5 |
| bearded skeletongrass | GYAM | *Gymnopogon ambiguus* | – | – | 1–5 |
| globe beaksedge | RHGL2 | *Rhynchospora globularis* | – | – | 0–3 |
| globe flatsedge | CYEC2 | *Cyperus echinatus* | – | – | 0–3 |
| yelloweyed grass | XYRIS | *Xyris* | – | – | 0–1 |
| littlehead nutrush | SCOL2 | *Scleria oligantha* | – | – | 0–1 |
| **Forb/Herb** | | | | | |
| eastern poison ivy | TORA2 | *Toxicodendron radicans* | – | – | 5–20 |
| anisescented goldenrod | SOOD | *Solidago odora* | – | – | 3–15 |
| Virginia tephrosia | TEVI | *Tephrosia virginiana* | – | – | 5–15 |
| fourvalve mimosa | MIQU2 | *Mimosa quadrivalvis* | – | – | 5–15 |
| healing croton | CRAR2 | *Croton argyranthemus* | – | – | 1–10 |
| queen's-delight | STSY | *Stillingia sylvatica* | – | – | 1–10 |
| flowering spurge | EUCO10 | *Euphorbia corollata* | – | – | 1–5 |
| narrowleaf silkgrass | PIGR4 | *Pityopsis graminifolia* | – | – | 1–5 |
| lanceleaf thoroughwort | EULA7 | *Eupatorium lancifolium* | – | – | 1–5 |
| Nuttall's wild indigo | BANU2 | *Baptisia nuttalliana* | – | – | 1–5 |
| prairie blazing star | LIPY | *Liatris pycnostachya* | – | – | 1–5 |
| multibloom hoarypea | TEON | *Tephrosia onobrychoides* | – | – | 0–5 |
| swamp sunflower | HEAN2 | *Helianthus angustifolius* | – | – | 0–5 |
| Texas bullnettle | CNTE | *Cnidoscolus texanus* | – | – | 0–5 |
| Cuman ragweed | AMPS | *Ambrosia psilostachya* | – | – | 0–5 |
| St. Andrew's cross | HYHY | *Hypericum hypericoides* | – | – | 3–5 |
| sidebeak pencilflower | STBI2 | *Stylosanthes biflora* | – | – | 1–3 |
| nettleleaf noseburn | TRUR2 | *Tragia urticifolia* | – | – | 1–3 |
| sharp blazing star | LIAC | *Liatris acidota* | – | – | 1–3 |
| Texas ironweed | VETE3 | *Vernonia texana* | – | – | 1–3 |
| Texas dutchman's pipe | ARRE3 | *Aristolochia reticulata* | – | – | 0–1 |
| Small's noseburn | TRSM | *Tragia smallii* | – | – | 0–1 |
| stiffstem flax | LIRI | *Linum rigidum* | – | – | 0–1 |
| pale purple coneflower | ECPA | *Echinacea pallida* | – | – | 0–1 |
| hairy lespedeza | LEHI2 | *Lespedeza hirta* | – | – | 0–1 |
| Gulf blazing star | LITE | *Liatris tenuis* | – | – | 0–1 |
| flaxleaf whitetop aster | IOLI2 | *Ionactis linariifolius* | – | – | 0–1 |
| eastern milkpea | GARE2 | *Galactia regularis* | – | – | 0–1 |
| prairie snoutbean | RHLA5 | *Rhynchosia latifolia* | – | – | 0–1 |
| dwarf groundcherry | PHPU8 | *Physalis pumila* | – | – | 0–1 |
| Virginia snakeroot | ARSE3 | *Aristolochia serpentaria* | – | – | 0–1 |
| biannual lettuce | LALU | *Lactuca ludoviciana* | – | – | 0–1 |
| button eryngo | ERYU | *Eryngium yuccifolium* | – | – | 0–1 |

| | | | | | |
|---|---|---|---|---|---|
| green comet milkweed | ASVI | *Asclepias viridiflora* | – | – | 0–1 |
| downy milkpea | GAVO | *Galactia volubilis* | – | – | 0–1 |
| longleaf buckwheat | ERLO5 | *Eriogonum longifolium* | – | – | 0–1 |
| queendevil | HIGR3 | *Hieracium gronovii* | – | – | 0–1 |
| dollarleaf | RHRE | *Rhynchosia reniformis* | – | – | 0–1 |
| Maryland meadowbeauty | RHMA | *Rhexia mariana* | – | – | 0–1 |
| soft greeneyes | BEPU2 | *Berlandiera pumila* | – | – | 0–1 |
| late purple aster | SYPAP2 | *Symphyotrichum patens var. patens* | – | – | 0–1 |
| shiny goldenrod | OLNI | *Oligoneuron nitidum* | – | – | 0–1 |
| **Fern/fern ally** | | | | | |
| western brackenfern | PTAQ | *Pteridium aquilinum* | – | – | 5–35 |
| **Shrub/Subshrub** | | | | | |
| farkleberry | VAAR | *Vaccinium arboreum* | – | – | 3–10 |
| yaupon | ILVO | *Ilex vomitoria* | – | – | 0–10 |
| American beautyberry | CAAM2 | *Callicarpa americana* | – | – | 0–5 |
| winged sumac | RHCO | *Rhus copallinum* | – | – | 0–5 |
| deerberry | VAST | *Vaccinium stamineum* | – | – | 0–3 |
| parsley hawthorn | CRMA5 | *Crataegus marshallii* | – | – | 0–1 |
| sawtooth blackberry | RUAR2 | *Rubus argutus* | – | – | 0–1 |
| dwarf palmetto | SAMI8 | *Sabal minor* | – | – | 0–1 |
| **Tree** | | | | | |
| blackjack oak | QUMA3 | *Quercus marilandica* | – | – | 0–10 |
| post oak | QUST | *Quercus stellata* | – | – | 0–10 |
| sassafras | SAAL5 | *Sassafras albidum* | – | – | 0–10 |
| longleaf pine | PIPA2 | *Pinus palustris* | – | – | 0–5 |
| bluejack oak | QUIN | *Quercus incana* | – | – | 0–5 |
| common persimmon | DIVI5 | *Diospyros virginiana* | – | – | 0–3 |
| southern red oak | QUFA | *Quercus falcata* | – | – | 0–3 |
| white oak | QUAL | *Quercus alba* | – | – | 0–3 |
| smallflower pawpaw | ASPA18 | *Asimina parviflora* | – | – | 0–3 |
| shortleaf pine | PIEC2 | *Pinus echinata* | – | – | 0–3 |
| **Vine/Liana** | | | | | |
| saw greenbrier | SMBO2 | *Smilax bona-nox* | – | – | 0–5 |
| evening trumpetflower | GESE | *Gelsemium sempervirens* | – | – | 0–5 |
| muscadine | VIRO3 | *Vitis rotundifolia* | – | – | 0–3 |
| Virginia creeper | PAQU2 | *Parthenocissus quinquefolia* | – | – | 0–1 |

**Table 12. Community 4.1 forest overstory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) | Diameter (Cm) | Basal Area (Square M/Hectare) |
|---|---|---|---|---|---|---|---|
| **Tree** | | | | | | | |
| loblolly pine | PITA | *Pinus taeda* | – | – | – | – | – |

## Animal community

The historic animal community is relatively similar to the current community in the reference state. One major missing component is the black bear. Black bears were highly prevalent across the Western Coastal Plain. Their reduced numbers are directly correlated with the westward expansion of the European settlers. Like other mobile animals in the area, bears would have used multiple ecological sites. The Sandy Loamy Uplands would have provided the bears with nutrition/food in the form of hard mast (acorns). Other apex predators like the mountain lion and wolf have disappeared in a similar manner.

## Recreational uses

The most popular recreational use is hunting for white-tail deer and other game animals.

## Wood products

Pine trees are used for all types of wood products. Hardwoods are suitable for use as railroad ties, pulpwood, and pallet material. When harvested tracts are reforested, they are typically planted to loblolly pine.

## Other information

Migratory song birds and woodpeckers use the site as well. Locations with fire and snags will typically have a higher diversity of birds. The red-cockaded woodpecker utilizes longleaf pines throughout the site. They are especially common because of the continuous stands of longleaf pine.

Turkey and quail will utilize the site to some degree, but in combination with other sites. The grass layer is well-suited to provide nesting habitat, and the presence of mature oaks will provide roosting areas. As long as the canopy is open, favoring the reference site conditions, a diverse forb layer will create an abundance of insects. The insects provide high-quality protein in their diet, especially for the newly hatched chicks.

Deer will utilize the site as the community matures and browse the oak saplings. With the amount of bluestem, the sites are ideal to provide good bedding cover. As with most deer habitat, deer utilize a large array of ecological sites throughout their life. Well managed browse, cover, and natural foods sources provide the best habitat.

**Table 13. Representative site productivity**

| Common Name | Symbol | Site Index Low | Site Index High | CMAI Low | CMAI High | Age Of CMAI | Site Index Curve Code | Site Index Curve Basis | Citation |
|---|---|---|---|---|---|---|---|---|---|
| loblolly pine | *PITA* | 82 | 90 | 125 | 136 | 50 | – | – | |
| longleaf pine | *PIPA2* | 77 | 86 | 96 | 104 | 50 | – | – | |

## Inventory data references

These site descriptions were developed as part a Provisional Ecological Site project using historic soil survey manuscripts, available site descriptions, and low intensity field traverse sampling. Future work to validate the information is needed. This will include field activities to collect low, medium, and high-intensity sampling, soil correlations, and analysis of that data. A final field review, peer review, quality control, and quality assurance review of the will be needed to produce the final document.

## Type locality

| Location 1: Angelina County, TX | |
|---|---|
| UTM zone | N |
| UTM northing | 31.0770578 |
| UTM easting | -94.272292 |
| General legal description | Angelina National Forest - Boykin Springs |

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## Contributors

Tyson Hart

## Approval

Bryan Christensen, 12/13/2023

## 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 | 09/03/2021 |
| Approved by | Bryan Christensen |
| 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:**