USDA Natural Resources Conservation Service

Ecological site F133BY003TX
Loamy Over Clayey Upland

Last updated: 12/13/2023
Accessed: 05/21/2025

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): 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

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

Ecological site concept

The Loamy Over Clayey Uplands have loamy-surfaced soils to about 10 inches and a thick layer of clay subsurface soils underneath. The properties associated with uplands and clayey soils form the unique plant community of these sites.

Associated sites

F133BY001TX	**Depression** Landform is lower and sites are wetter.
F133BY002TX	**Seasonally Wet Upland** Sites are wetter and have less developed drainage patterns.

F133BY005TX	**Loamy Upland** Sites have loamy textured soils.
F133BY006TX	**Northern Sandy Loam Upland** Sites have sandy and loamy textured soils.
F133BY007TX	**Southern Sandy Loam Upland** Sites have sandy and loamy textured soils.
F133BY012TX	**Wet Terrace** Sites are on a lower terrace position and drainage patterns are not as well developed.
F133BY013TX	**Terrace** Sites are on a lower terrace position.

Similar sites

F133BY005TX	**Loamy Upland** Soils have loamy textures.
F133BY004TX	**Loamy Claypan Upland** Sites are shallow to bedrock and/or have an abrupt texture change from loam to clay.

Table 1. Dominant plant species

Tree	(1) *Pinus echinata* (2) *Quercus stellata*
Shrub	(1) *Callicarpa americana*
Herbaceous	(1) *Chasmanthium sessiliflorum*

Physiographic features

The ecological site includes areas of gently sloping to steep soils on uplands. Slopes are dominantly 2 to 8 percent but range from 1 to 25 percent. Elevation ranges from 150 to 700 feet. The topography of the area includes convex ridges and knolls.

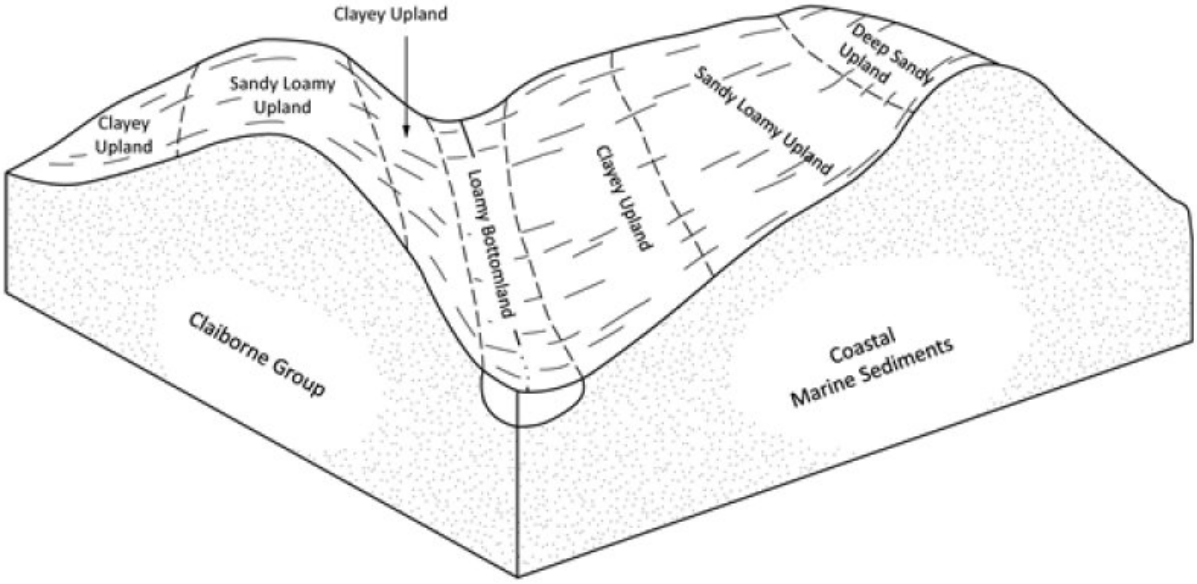


Figure 1. Clayey Upland with associated sites.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Interfluve
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	46–229 m
Slope	2–8%
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	1–25%

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)	219 days
Freeze-free period (average)	252 days
Precipitation total (average)	1,397 mm

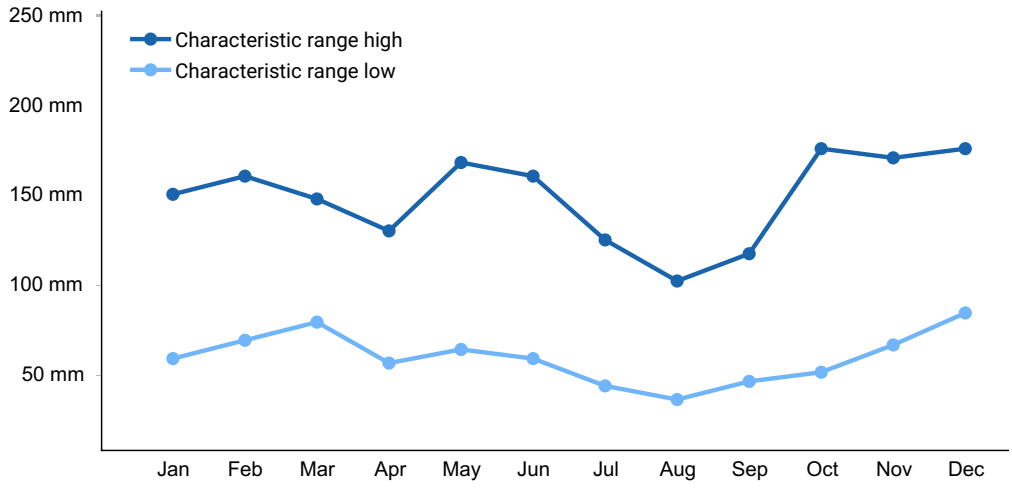


Figure 2. Monthly precipitation range

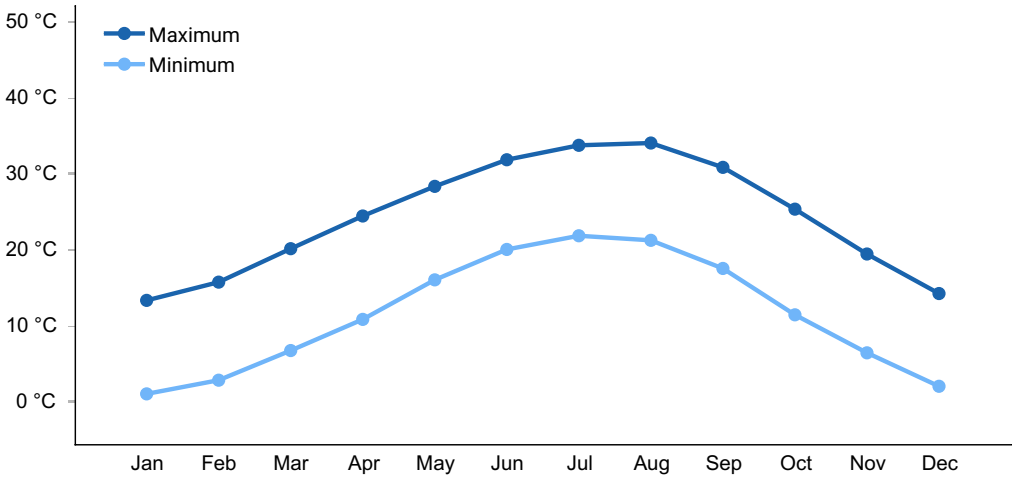


Figure 3. Monthly average minimum and maximum temperature

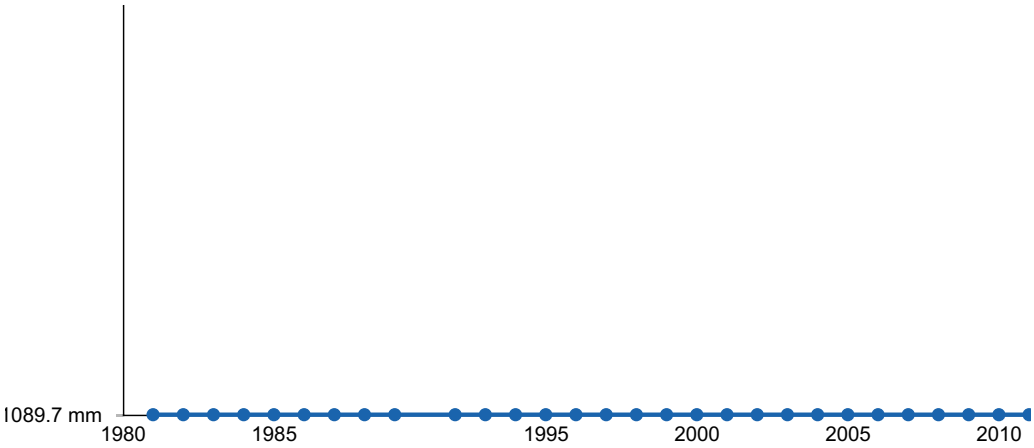


Figure 4. Annual precipitation pattern

Climate stations used

- (1) JENA 4 WSW [USC00164696], Trout, LA
- (2) DEKALB [USC00412352], Simms, TX
- (3) HUNTSVILLE [USC00414382], Huntsville, TX
- (4) CALHOUN RSCH STN [USC00161411], Calhoun, LA
- (5) MINDEN [USC00166244], Minden, LA
- (6) CARTHAGE [USC00411500], Carthage, TX
- (7) RUSK [USC00417841], Rusk, TX
- (8) TOLEDO BEND DAM [USC00419068], Anacoco, TX
- (9) MAGNOLIA [USC00034548], Magnolia, AR
- (10) CALION L&D [USC00031140], El Dorado, AR
- (11) SHERIDAN [USC00036562], Sheridan, AR
- (12) GILMER 4 WNW [USC00413546], Gilmer, TX

Influencing water features

There is moderate runoff on these sites due to the shallow loamy soils over a clayey subsurface. The loamy surface saturates until water cannot move as quickly through the

subsoil. Areas of this unit are sloping to steep, generally slightly convex and form the side slopes above drainageways.

Wetland description

The soils correlated to this site are not generally hydric, though some may have a seasonally high water table.

Soil features

The soils of this site are moderate to deep and characterized by a thick Bt layer of clay just below a fine sandy loam surface. The Kirvin series is representative and consists of well drained soils. These gently sloping to moderately steep sites formed in weakly consolidated and stratified loamy, sandy, and clayey fluvial marine deposits on uplands of the Claiborne geological group. The series is classified as a fine, mixed, semiactive, thermic Typic Hapludult. Other soils are included with the ecological site and all are defined by a thick clay subsurface soil below the surface. Besides the Kirvin series, these soils are correlated: Angie, Arriola, Bayoudan, Bellwood, Bonwier, Bryarly, Bub, Burkeville, Conroe, Cuthbert, Darley, Eastwood, Etoile, Galilee, Gore, Hornbeck, Huntsburg, Lacerda, Maben, Mahan, Meth, Naclina, Nacogdoches, Natchitoches, Newco, Nikful, Oula, Raylake, Redco, Redsprings, Rosenwall, Ruple, Sacul, Sugartown, Tahoula, Trawick, and Woodtell.

Table 5. Representative soil features

Parent material	(1) Marine deposits–sandstone and shale
Surface texture	(1) Fine sandy loam
Family particle size	(1) Clayey
Drainage class	Well drained to moderately well drained
Permeability class	Slow to very slow
Soil depth	122–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	4–6%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1

Soil reaction (1:1 water) (0-101.6cm)	3.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–3%
Subsurface fragment volume >3" (Depth not specified)	0–25%

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 historic plant community for the Loamy Over Clayey Uplands was a Shortleaf Pine/Post Oak (*Pinus echinata*/*Quercus stellata*) Forest. Remnants of this presumed historic plant community still exist where the historic conditions are still in place. 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.

Settlement Management – As human settlement increased throughout the area, so did the increase in logging and grazing by domestic livestock. Oftentimes, an early settler would make camp by logging pines in the area for lodging. The accompanying livestock would graze the upland woodlands filled with warm-season forage during the summer. As the summer grazing season would end, the livestock would naturally begin grazing in the bottoms to forage on large cane breaks and other cool-season plants found in the area. With early settlement also came the arrival of the railroads, initially causing a mosaic effect (small areas being cut) across the landscape. Eventually, 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. The loblolly pines were commonly grown plantation style (e.g., site preparation, planting, long-term weed control). This, coupled with the advent of heavy site preparation machinery, made the conversion from low-grade hardwood possible.

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. Other bad forestry practices such as high-grading and diameter-limit cutting has also heavily contributed to an overall loss of remnant forest. Currently, United States Forest Service (USFS) properties are the best places to view the remnant historic loamy over clayey upland forest 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.

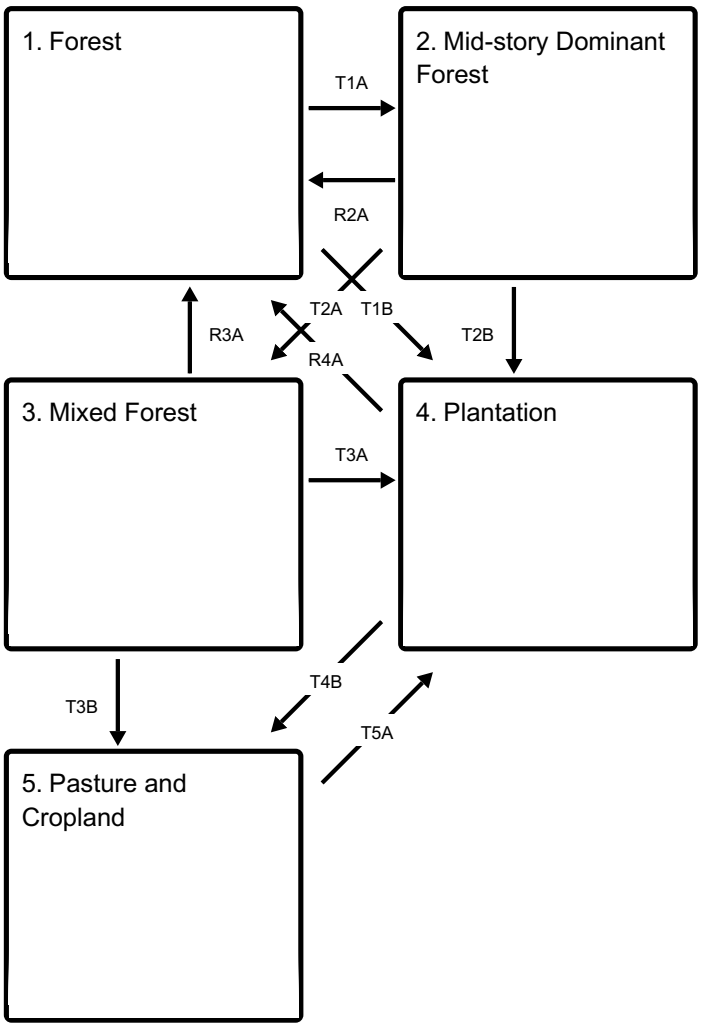
Fire Regimes – Fire was a natural and important disturbance throughout the Western Gulf Plain. Fire occurred naturally from lightning strikes and was started by Native Americans for game movement. The historic community developed with a frequency of fire every 5 to 10 years. Fires usually occurred in 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 decreased grass densities and increased 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). Since the Forest Service has been recording in the late 1950’s, beetle outbreaks have occurred every 6 to 9 years (although a major attack has not occurred in some time), usually when the trees are stressed because of multiple environmental factors.

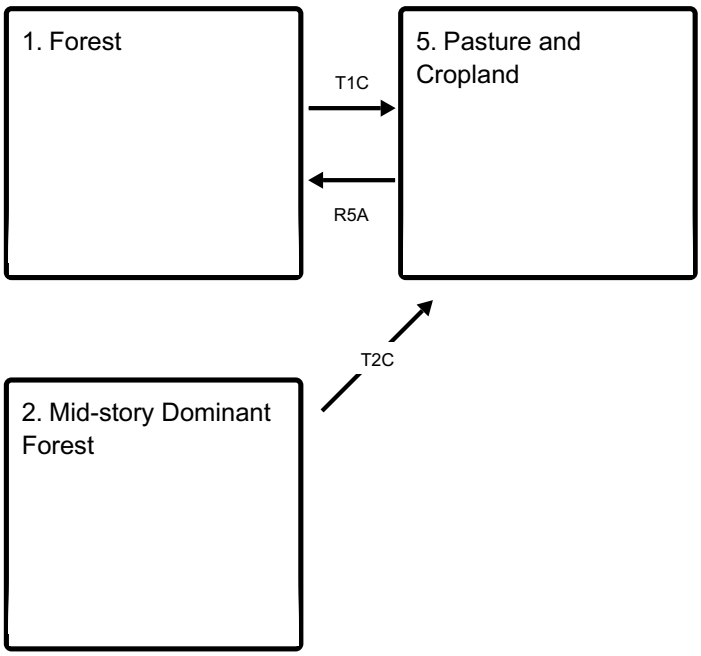
Plant Community Interactions – The length of fire intervals and position on the landscape create a moderate overstory-canopy cover (60 to 80 percent). The canopy cover is higher than the associated upland sandy sites with frequent fire, but lower than the bottomland/drain sites with infrequent fire. The understory consists of small shrubs and saplings with a mixed layer of grasses and forbs. American beautyberry (*Callicarpa americana*) and longleaf woodoats (Chasmanthium sessiflorum) are especially common in the understory. Members of the genus Vaccinium and Vibrunum are also common shrubs through the ecological site.

State and transition model

Ecosystem states



States 1, 5 and 2 (additional transitions)



T1A - Fire suppression, no disturbance

T1B - Clearcut, site preparation, tree planting

T1C - Clearcut, grass/crop planting

R2A - Selective timber harvest, prescribed burns

T2A - Fire suppression, no disturbance

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

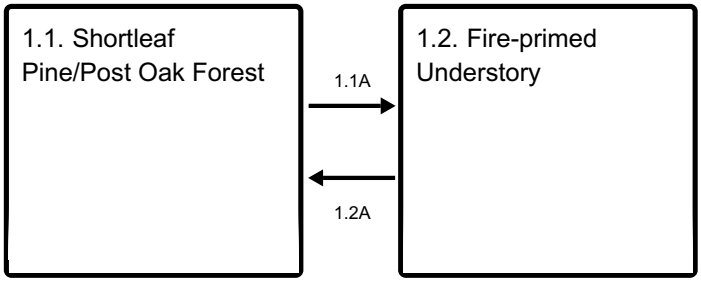
R4A - Gap-phase regeneration or clearcut with tree planting

T4B - Clearcut, grass/crop planting

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

T5A - Clearcut, site preparation, tree planting

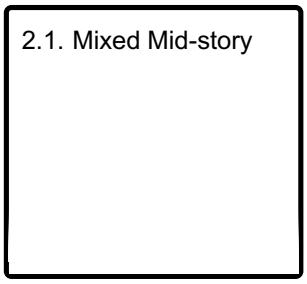
State 1 submodel, plant communities



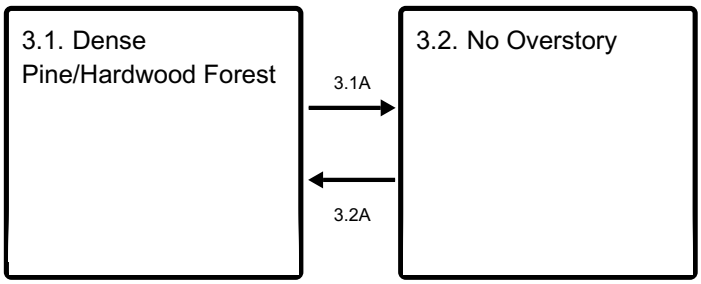
1.1A - Natural development between fire

1.2A - Fire (5-10 year interval)

State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities

4.1. Pine/Hardwood Plantation

State 5 submodel, plant communities

5.1. Planted Pasture and Row Crop

State 1
Forest

Two community phases exist in the Forest State (1): 1.1 Shortleaf Pine/Post Oak Forest Community and the 1.2 Fire-primed Community (fine fuel has accumulated and shrub densities have increased). State 1 has a moderate overstory cover (60 to 80 percent) of primarily shortleaf pine mixed with post oak. Other hardwoods can be common in the overstory as well. The understory is diverse, with many species of grasses, forbs, and shrubs. Significant portions of the forest floor are dominated by longleaf woodoats, sometimes up to 75 percent cover of the site. American beautyberry is the dominant shrub occupying the ground layer. The forest composition is uneven-aged with some 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 fires ranging from 5 to 10 years. Representative basal areas range from 60 to 90 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
Shortleaf Pine/Post Oak Forest

Shortleaf pines comprise the majority of the overstory. Shortleaf occurrence of the total overstory on any given site is between 75 and 100 percent. Post oaks are usually found on the site as well. Post oaks range from 0 to 25 percent of the total overstory canopy. Blackjack oak (*Quercus marilandica*), black hickory (*Carya texana*), and southern red oak (*Quercus falcata*) are occasionally seen in the overstory and add to the diversity of the site. Along with American beautyberry, yaupon (*Ilex vomitoria*), deerberry (*Vaccinium stamineum*) , and rusty blackhaw (Vibrunum rufidulum) are usually associated with the sites as well. The shrub-layer height and densities fluctuate with time since the last fire. Fire prunes their growth back and allows the understory grasses and forbs to stay diverse and abundant. The shrub-layer is the main driver between communities 1.1 and 1.2. As the shrubs begin to grow above 4.5 feet and become denser, the community moves along the pathway from 1.1 to 1.2.

Table 6. Ground cover

Tree foliar cover	0-15%
Shrub/vine/liana foliar cover	5-40%
Grass/grasslike foliar cover	30-65%
Forb foliar cover	5-20%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-35%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-5%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-5%	5-30%	5-35%	1-10%
>0.15 <= 0.3	0-15%	5-35%	5-35%	3-10%
>0.3 <= 0.6	0-15%	5-35%	5-75%	0-10%
>0.6 <= 1.4	0-5%	5-35%	0-25%	0-3%
>1.4 <= 4	0-5%	0-10%	–	–
>4 <= 12	0-10%	–	–	–
>12 <= 24	20-40%	–	–	–
>24 <= 37	20-80%	–	–	–
>37	–	–	–	–

Community 1.2
Fire-primed Understory

Both communities are characterized by a well-developed ground layer with patches of bare areas comprised of only needle and leaf litter. Both longleaf woodoats and needleleaf rosette grass (*Dichanthelium aciculare*) are highly associated with the site. If the site has enough light penetration to the ground layer and an active burn history, little bluestem (*Schizachyrium scoparium*) can be common. Other indicative understory species include hairy bedstraw (*Galium pilosum*), greenbriers (Smilax sp.), and Virginia creeper (*Parthenocissus quinquefolia*). 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 shrubs and standing litter from grasses and forbs. The fuel load for fire is at peak in Phase 1.2. Without fire to reduce competition from fire intolerant saplings, Phase 1.2 will transition into State 2.

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. The foliar cover increases immediately after fire, but the shrub layer begins to dominate 4 to 6 years post fire. 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
Mid-story Dominant Forest

The understory has developed into a dense mid-story layer (4.5 to 13 feet) and crossed a threshold in which historic environmental events (i.e., fire) cannot transition the community back to State 1. The mid-story canopy has become so thick it limits the productivity of the grass/forb-ground layer. The limited ground layer does not provide the same fine fuel to harbor a burn with the same effects as found in State 1.

Community 2.1
Mixed Mid-story

Yaupon is especially dominant in the mid-story and a major indicator of State 2. Large percentages of the understory and mid-story are occupied by fire intolerant species like sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and loblolly pine. As their heights begin to grow above 13 feet, their fire intolerance is increased and burning is also not as effective at setting back their growth. At this point, the threshold to State 3 has been crossed. The species present in the reference community 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	25-75%
Shrub/vine/liana foliar cover	35-85%
Grass/grasslike foliar cover	10-35%

Forb foliar cover	0-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	25-80%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-3%

Table 9. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	1-10%	10-35%	1-5%	1-5%
>0.15 <= 0.3	5-10%	10-50%	1-15%	3-15%
>0.3 <= 0.6	5-15%	10-40%	5-35%	1-5%
>0.6 <= 1.4	10-20%	10-35%	1-5%	0-1%
>1.4 <= 4	25-50%	0-15%	–	–
>4 <= 12	20-50%	–	–	–
>12 <= 24	25-50%	–	–	–
>24 <= 37	20-80%	–	–	–
>37	–	–	–	–

State 3
Mixed Forest

A long-term lack of fire and management has now caused the plant community to cross two major thresholds from State 1, resulting in a very-closed canopy community. Fire intolerant hardwoods have become part of the overstory. The overstocking reduces the overall value of the timber stand as competition reduces production and quality. The value is decreased because of reduction of shortleaf pine numbers and an increase of less valuable hardwoods.

Community 3.1
Dense Pine/Hardwood Forest

The understory plant layer only contains remnants of longleaf woodoats and possibly a few forb species. The shrub layer is dominated by large, dense patches of yaupon. Because the site lacks the diversity found in the reference state 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 (2 to 3 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 10. Ground cover

Tree foliar cover	3-20%
Shrub/vine/liana foliar cover	5-30%
Grass/grasslike foliar cover	1-10%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	80-95%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-3%

Table 11. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	1-3%	1-25%	1-5%	1-5%
>0.15 <= 0.3	3-10%	5-60%	3-10%	3-10%
>0.3 <= 0.6	5-15%	5-30%	3-25%	1-3%
>0.6 <= 1.4	5-20%	3-25%	3-10%	–
>1.4 <= 4	20-65%	5-20%	–	–
>4 <= 12	20-40%	–	–	–
>12 <= 24	40-65%	–	–	–
>24 <= 37	50-90%	–	–	–
>37	–	–	–	–

Community 3.2
No Overstory

The No Overstory community is the result of a natural disaster or clearcutting in which the entire overstory has been removed. Immediately after the event, the understory may begin to resemble State 1. Although given enough time without fire or management, the area will return to a Dense Pine/Hardwood Community (3.1).

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, tornadoes, severe ice storms, or severe fires. Following timber harvest by clearcut, little of the reference state vegetation remains. Primary vegetative succession occurs post clearcut.

Pathway 3.2A
Community 3.2 to 3.1

The driver for the community shift is 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/Hardwood Plantation

In the immediate years following the initial plantation tree planting, the understory community will resemble the reference state (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
Planted 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 of State 1 or subsequent vegetative states.

Transition T1A
State 1 to 2

The transition from a Shortleaf/Post Oak Forest (State 1) to the Mixed Mid-story (State 2) is a result of time and long periods (greater than 10 years) of no fire and/or forest management practices. 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 (2 to 3 years) may be required, initially, to suppress the woody vegetation. Timber stand improvement practices should be used on undesirables and some 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 State 2 to State 3 is a result of time and long periods (greater than 25 years) of no fire and/or no forest management. 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 reference state 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 (2 to 3 years) may be required to suppress the woody vegetation. If shortleaf pine does not exist in the overstory, the site will have to be prepared and replanted.

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 planting shortleaf pine and post oak. 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 shortleaf 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 seed 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 2 to 3 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 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 pine and oak species to their natural frequencies (see State 1 Overstory Composition table); trying to attain a 60 to 80 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 agricultural production. The site is prepared and planted to either an improved grass or row crops.

Additional community tables

Table 12. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	75–100	–	–
post oak	QUST	*Quercus stellata*	Native	–	0–20	–	–
black cherry	PRSE2	*Prunus serotina*	–	–	0–10	–	–
black hickory	CATE9	*Carya texana*	Native	–	0–10	–	–
southern red oak	QUFA	*Quercus falcata*	Native	–	0–10	–	–
loblolly pine	PITA	*Pinus taeda*	Native	–	0–10	–	–
sweetgum	LIST2	*Liquidambar styraciflua*	Native	–	0–10	–	–
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	0–10	–	–
white ash	FRAM2	*Fraxinus americana*	–	–	0–5	–	–

Table 13. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)

Grass/grass-like (Graminoids)					
longleaf woodoats	CHSE2	*Chasmanthium sessiliflorum*	Native	–	10–75
Ravenel's rosette grass	DIRA	*Dichanthelium ravenelii*	Native	–	5–35
needleleaf rosette grass	DIAC	*Dichanthelium aciculare*	Native	–	5–20
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	5–20
twisted spikerush	ELTO	*Eleocharis tortilis*	Native	–	0–15
purpletop tridens	TRFL2	*Tridens flavus*	Native	–	0–10
littlehead nutrush	SCOL2	*Scleria oligantha*	Native	–	0–5
Forb/Herb					
hairy bedstraw	GAPI2	*Galium pilosum*	Native	–	5–25
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	–	5–25
Canadian horseweed	COCA5	*Conyza canadensis*	Native	–	5–20
St. Andrew's cross	HYHY	*Hypericum hypericoides*	Native	–	1–10
slender yellow woodsorrel	OXDI2	*Oxalis dillenii*	Native	–	1–5
devil's grandmother	ELTO2	*Elephantopus tomentosus*	Native	–	1–5
parsley hawthorn	CRMA5	*Crataegus marshallii*	Native	–	0–5
Canadian blacksnakeroot	SACA15	*Sanicula canadensis*	Native	–	0–5
Nuttall's wild indigo	BANU2	*Baptisia nuttalliana*	Native	–	0–5
slender lespedeza	LEVI7	*Lespedeza virginica*	Native	–	1–5
Texas ironweed	VETE3	*Vernonia texana*	Native	–	0–3
spurred butterfly pea	CEVI2	*Centrosema virginianum*	Native	–	1–3
doubleform snoutbean	RHDI2	*Rhynchosia difformis*	Native	–	1–3
Virginia snakeroot	ARSE3	*Aristolochia serpentaria*	Native	–	0–3
helmet flower	SCIN2	*Scutellaria integrifolia*	Native	–	0–1
sidebeak pencilflower	STBI2	*Stylosanthes biflora*	Native	–	0–1
flowering spurge	EUCO10	*Euphorbia corollata*	Native	–	0–1
Fern/fern ally					
western brackenfern	PTAQ	*Pteridium aquilinum*	Native	–	0–5
resurrection fern	PLPO2	*Pleopeltis polypodioides*	Native	–	0–3
Shrub/Subshrub					
American beautyberry	CAAM2	*Callicarpa americana*	Native	–	5–40

yaupon	ILVO	*Ilex vomitoria*	Native	–	5–20
sawtooth blackberry	RUAR2	*Rubus argutus*	Native	–	5–20
deerberry	VAST	*Vaccinium stamineum*	Native	–	0–10
rusty blackhaw	VIRU	*Viburnum rufidulum*	Native	–	0–10
possumhaw	ILDE	*Ilex decidua*	Native	–	0–5
farkleberry	VAAR	*Vaccinium arboreum*	Native	–	0–5
Tree					
post oak	QUST	*Quercus stellata*	Native	–	0–10
winged elm	ULAL	*Ulmus alata*	Native	–	0–10
sweetgum	LIST2	*Liquidambar styraciflua*	Native	–	0–10
loblolly pine	PITA	*Pinus taeda*	Native	–	0–5
white fringetree	CHVI3	*Chionanthus virginicus*	Native	–	0–5
hophornbeam	OSVI	*Ostrya virginiana*	Native	–	0–5
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	0–5
southern red oak	QUFA	*Quercus falcata*	Native	–	0–3
white ash	FRAM2	*Fraxinus americana*	Native	–	0–3
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	0–3
black hickory	CATE9	*Carya texana*	Native	–	0–3
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	5–15
saw greenbrier	SMBO2	*Smilax bona-nox*	Native	–	1–10
cat greenbrier	SMGL	*Smilax glauca*	Native	–	1–10
roundleaf greenbrier	SMRO	*Smilax rotundifolia*	Native	–	1–10
lanceleaf greenbrier	SMSM	*Smilax smallii*	Native	–	1–10
summer grape	VIAE	*Vitis aestivalis*	Native	–	0–10
evening trumpetflower	GESE	*Gelsemium sempervirens*	Native	–	0–5
trumpet creeper	CARA2	*Campsis radicans*	Native	–	0–5

Animal community

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 if bunch grasses exist, and the presence of mature oaks will provide roosting areas. As long as the canopy is open, such as those found in the reference conditions, a diverse forb layer will create an abundance of insects. The insects provide high-quality protein in their diet, especially for newly

hatched chicks.

Deer will utilize the site as the community matures and browse the saplings and desired shrubs. With the amount of understory development, 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 food sources provide the best habitat.

Migratory song birds and woodpeckers use the site as well. Locations with fire and snags will typically have a higher diversity of birds. Fruits from the shrub species (American beautyberry and yaupon) are readily consumed by birds as well.

Grazing animals primarily use grasses as their food source. While grasses can be in abundance on the Loamy Over Clayey Uplands, the sites will have to be specifically managed for grazing to produce enough biomass. Reduction of basal area, below 60 square feet per acre, will create more openings for light to penetrate to the ground layer, therefore allowing more biomass to be produced.

Hydrological functions

There is moderate runoff on these sites due to the shallow loamy soils over a clayey subsurface. The loamy surface saturates until water cannot move as quickly through the subsoil. Areas of this unit are sloping to steep, generally slightly convex and form the side slopes above drainageways.

Recreational uses

Much of this land is leased for deer hunting purposes.

Wood products

These soils are on uplands and have a moderate potential for woodland management. The 50-year site index for loblolly pine averages 85 feet (approximately 57 feet on a 25-year curve) and ranges from 75 to 90 feet, depending on slope and slope position. The yield from an unmanaged natural stand of loblolly pine, over a 50-year period, is approximately 280 board feet (Doyle Rule), 2.24 tons, or 80 cubic feet per acre per year. Management can substantially increase this yield. Access and equipment operability is poor during wet periods. Wet weather limitations may be necessary to prevent rutting and excessive erosion.

Low strength and stickiness makes these soils only moderately suited for roads and log landings. As slopes increase, the potential for erosion increases. On steeper slopes, site disturbance should be minimized and control devises for roads such as water bars will be necessary. Revegetating roads and log landings may also be necessary. Site preparation and tree planting operations will be affected by the sticky nature of these soils when they

are wet. Tree planting should be planned for the drier early part of the planting season. Also, because clay occurs within 10 inches of the surface, care must be taken to ensure proper planting depth. Subsoiling, or ripping on the flatter slopes, prior to planting may be needed. On steep slopes, mechanical tree planting should be done on the contour. The moderate level of runoff on these soils means precautions will need to be made to prevent contamination of surface waters when using herbicides for site preparation and release.

Other products

Fruits, nuts, acorns, and seeds of the trees, shrubs, vines, and herbaceous plants are used for food, jellies, and jam. The surface soils can be mined for gravels.

Table 14. 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*	64	83	95	280	35	–	–	
shortleaf pine	*PIEC2*	56	75	60	210	40	–	–	

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: Houston County, TX	
Latitude	31° 29′ 54″
Longitude	95° 11′ 33″
General legal description	Davy Crockett National Forest

Other references

Ajilvsgi, G. 2003. Wildflowers of Texas. Revised edition. Shearer Publishing, Fredericksburg, TX.

Ajilvsgi, G. 1979. Wildflowers of the Big Thicket. Texas A&M University Press, College

Station, TX.

Allen, J. A., B. D. Keeland, J. A. Stanturf, and A. F. Kennedy Jr. 2001. A guide to bottomland hardwood restoration. Technical report, USGS/BRD/ITR-2000-0011.

Bray, W. L. 1904. Forest resources of Texas. Bureau of Forestry Bulletin 47, Government Printing Office, Washington D.C.

Diggs, G. M., B. L. Lipscomb, M. D. Reed, and R. J. O'Kennon. 2006. Illustrated flora of East Texas. Second edition. Botanical Research Institute of Texas & Austin College, Fort Worth, TX.

Jones, S. D., J. K. Wipff, and P. M. Montgomery. 1997. Vascular plants of Texas: a comprehensive checklist including synonymy, bibliography, and index. University of Texas Press, Austin.

NatureServe. 2002. International classification of ecological communities: Terrestrial vegetation of the United States. National forests in Texas final report. NatureServe, Arlington, VA.

Nixon, E. S. 2000. Trees, shrubs & woody vines of East Texas. Second edition. Bruce Lyndon Cunningham Productions, Nacogdoches, TX.

Picket, S. T. and P. S. White. 1985. The ecology of natural disturbance and patch dynamics. Academic Press, Orlando, FL.

Randall, J. M., and J. Marinelli. 1996. Invasive plants: weeds of the global garden. Volume 149. Brooklyn Botanic Garden, Brooklyn, NY.

Roberts, O. M. 1881. A description of Texas, its advantages and resources with some account of their development past, present and future. Gilbert Book Company, Saint Louis, MO.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database.

Stanturf, J. A., S. H. Schoenholtz, C. J. Schweitzer, and J. P. Shepard. 2001. Achieving restoration success: Myths in bottomland hardwood forests. Restoration Ecology, 9:189-200.

Stringham, T. K., W. C. Krueger, and P. L. Shaver. 2003. State and transition modeling: An ecological process approach. Journal of Range Management 56:106-113.

Truett, J. C. 1984. Land of bears and honey: A natural history of East Texas. The University of Texas Press, Austin, TX.

U.S. Army Corps of Engineers. 2010. Regional supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0). U.S. Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory ERDC/EL TR-10-20.

USDA-NRCS Ag Handbook 296 (2006).

Van Kley, J. E., R. L. Turner, L. S. Smith, and R. E. Evans. 2007. Ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain. Second approximation. Stephen F. Austin University and The Nature Conservancy, Nacogdoches, TX.

Vines, R. A. 1960. Trees, shrubs, and woody vines of the Southwest. University of Texas Press, Austin, TX.

Watson, G. E. 2006. Big Thicket Plant Ecology. Third Edition. University of North Texas Press, Denton, TX.

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:**
