USDA Natural Resources Conservation Service

Ecological site F133BY013TX
Terrace

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General information

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

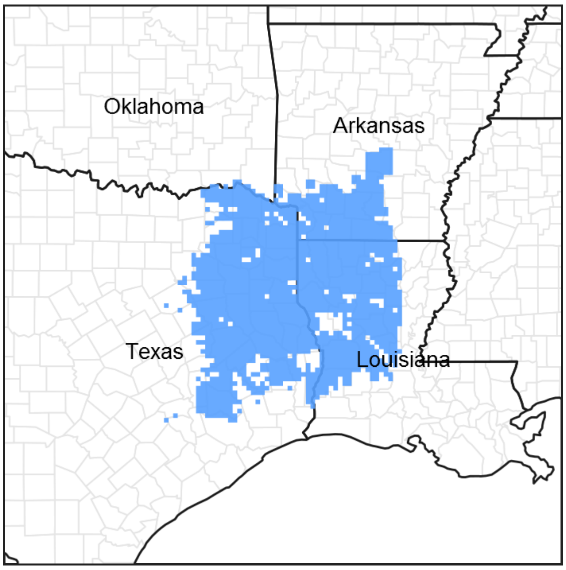


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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 Terrace ecological site has very deep soils on terrace landforms. These sites are located on a higher landform than bottomlands and are not as wet. The sites are situated on a lower landform than the uplands and are not as dry. The sites do not flood or pond. This unique position between the drier uplands and wetter bottomlands creates their plant community.

Associated sites

F133BY012TX	**Wet Terrace** Sites are on a similar landscape position by are characterized by wetter conditions with poor drainage patterns.
F133BY001TX	**Depression** Sites are located in depressions of uplands and terraces. Sites are typically wetter and ponded for portions of the year.
F133BY011TX	**Deep Sandy Terrace** Sites are on a similar landscape position by are characterized by deep sands with rapid drainage.
F133BY002TX	**Seasonally Wet Upland** Sites are on higher landscape of uplands.
F133BY014TX	**Creek Bottomland** Sites are located in a bottomland position and flood regularly.
F133BY015TX	**Swamp** Sites are on the lowest part of the landscape and are semi-permanently ponded.
F133BY016TX	**Sandy Bottomland** Sites are on a lower bottom landscape and flood regularly.
F133BY017TX	**Loamy Bottomland** Sites are on a lower bottom landscape and flood regularly.
F133BY018TX	**Clayey Bottomland** Sites are on a lower bottom landscape and flood regularly.
F133BY003TX	**Loamy Over Clayey Upland** Sites are on uplands and have clay textures throughout their horizons.
F133BY004TX	**Loamy Claypan Upland** Sites are on uplands and have an abrupt textural change from loam to clay. Sites are sometime shallow to bedrock.
F133BY005TX	**Loamy Upland** Sites are on uplands and have loamy textured soil throughout their profile.
F133BY006TX	**Northern Sandy Loam Upland** Sites are on uplands and do not have as much associated water.
F133BY007TX	**Southern Sandy Loam Upland** Sites are on uplands and do not have as much associated water.

Similar sites

F133BY012TX	**Wet Terrace** Sites are on similar landscape but have less developed drainage patterns.
F133BY007TX	**Southern Sandy Loam Upland** Sites are on uplands and do not have as much associated wetness.
F133BY011TX	**Deep Sandy Terrace** Site are on a similar site, but have deeper sands and more rapid drainage.
F133BY006TX	**Northern Sandy Loam Upland** Sites are on uplands and do not have as much associated wetness.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Pinus taeda*
Shrub	(1) *Callicarpa americana*
Herbaceous	(1) *Chasmanthium sessiliflorum*

Physiographic features

These sites are predominantly flat from 0 to 5 percent but can range up to 15 percent on slopes adjacent to drainage sites. The water table fluctuates, typically the highest from late fall to early winter.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Stream terrace
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	30–305 m
Slope	0–5%
Water table depth	61–183 cm
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	0–15%
Water table depth	Not specified

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 evenly 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

Climate stations used

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

Influencing water features

Due to their positioning between uplands and bottomlands, terraces can experience a seasonally high water table during later fall through early winter.

Wetland description

Most sites are not hydric but onsite field investigations are needed to determine if sites are classified as wetlands.

Soil features

Alazan, Attoyac, and Bernaldo are representative soils of the Terraces. The Terraces can have a wide range of textures and depths. The grouping factor is, all are located on the terrace landform position. Besides the previously listed soils, these are correlated as well: Addielou, Annona, Austonio, Bearhead, Besner, Bistineau, Cadeville, Cart, Chireno, Eastham, Elysian, Erno, Forbing, Freestone, Gallime, Garner, Glenmora, Hallsbluff, Keiffer, Landman, Latch, Mckamie, Moten, Multey, Raino, Shatta, Spurger, Timpson, Vesey, Waskom, and Woden.

Table 5. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Fine sandy loam (2) Loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24 cm
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–6.5
Subsurface fragment volume <=3" (Depth not specified)	0–3%

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 – The Terrace sites are possibly the most anthropogenically disturbed areas in the region. Terrace sites are close to water sources, but elevated from floodwaters, and have deep productive soils. For centuries, Native Americans, and settlers alike, used the sites for farming. Despite all the changes, the historic plant community for the Terraces is believed to be a White Oak/Loblolly Pine (*Quercus alba*/*Pinus taeda*) 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 – Differing from other ecological sites, human settlement on the Terraces occurred well before the arrival of Europeans. Historians believe the Caddo settled as early as AD 800. Their culture revolved around farming and cleared the overstory to make the areas more suitable. The Caddo used the timber found onsite in framing their dwellings and covered the frame with long grasses. The remaining deep, loamy-textured soils were excellent sites to farm crops, such as corn, beans, and squash.

The first Europeans discovered the area in 1542, but did not begin colonizing until the early 1700s. The early settlers would have probably kept the Terrace sites open and continued, and expanded, the same farming practices learned from the Caddo. The early colonizers from Alabama, Georgia, and Tennessee would have seen great value in the white oaks, even more so than the pines. White oaks were used for roofing boards, shakes, shingles, and staves. The early colonizers would have also preferred white oaks because they require less energy to split than some of the other native overstory trees.

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 forestry practices such as high-grading and diameter-limit cutting has also heavily contributed to an overall loss of remnant forest. The nature of white oaks also adds to the disappearance of historical sites. White oak, like other oaks, is dependent on advanced regeneration needing a seed source. Many seed sources have been cut out long ago and the notoriety of having bumper seed crops every four to ten years only complicates the problem. White oak is a comparatively slow-growing tree that can easily be out-competed by other species. The acorns are the preferred by livestock and wildlife, again, making regeneration difficult.

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 10 to 20 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.

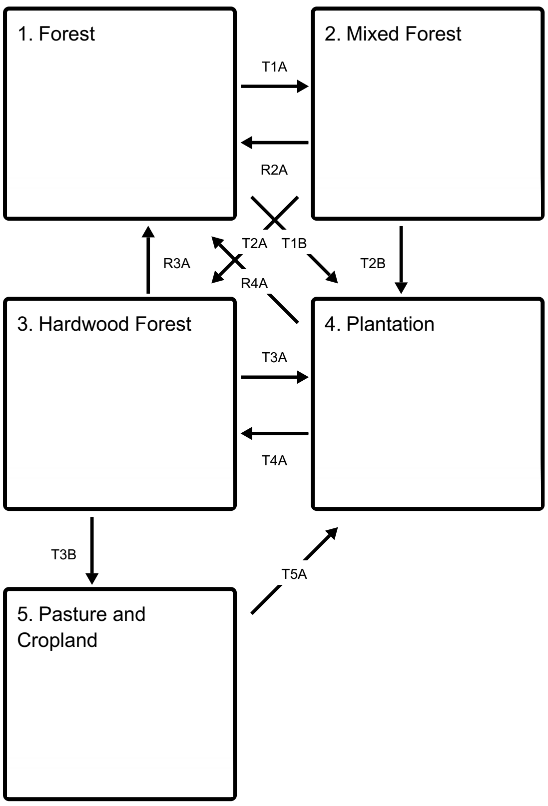
Disturbance Regimes – Extreme weather events occur occasionally throughout the region. Tornados uproot trees and open canopies in the spring months. In the late summer and early fall, hurricanes or tropical depressions often make landfall, dumping excessive amounts of rain and toppling trees with high 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 (70 to 90 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*), longleaf woodoats (Chasmanthium sessiflorum), and partridgeberry (*Mitchella repens*) are especially common in the understory. Yaupon (*Ilex vomitoria*) and possumhaw (*Ilex decidua*) are especially common shrubs in the mid-story (less than 13 feet).

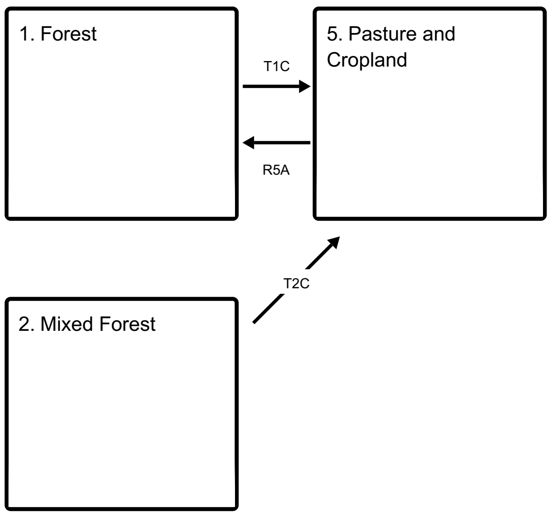
State and Transition Diagram -
The following diagram suggests some pathways the vegetative communities may take. Other states may exist that are not shown on the diagram. The information is intended to show what might happen through different circumstances; it does not mean that this would happen the same way in every instance. Changes to the community within a state move back-and-forth easily, but as thresholds are crossed the site changes from state to state. Meaning, changes have progressed to the point where some form of energy is necessary to return the site to the previous state.

State and transition model

Ecosystem states



States 1, 5 and 2 (additional transitions)



T1A - Fire suppression, no disturbance, high grading

T1B - Clearcut, site preparation, tree planting

T1C - Clearcut, grass/crop planting

R2A - Selective timber harvest, timber stand improvement, site preparation, prescribed burns

T2A - Fire suppression, no disturbance, high grading

T2B - Clearcut, site preparation, tree planting

T2C - Clearcut, grass/crop planting

R3A - Selective timber harvest, mid-story shrub control, site preparation, tree planting, prescribed burns

T3A - Clearcut, site preparation, tree planting

T3B - Clearcut, grass/crop planting

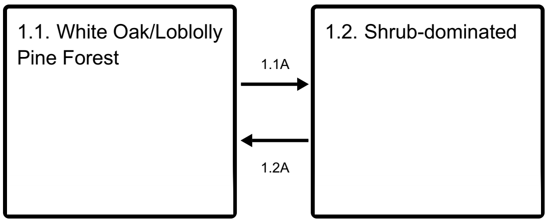
R4A - Gap-phase regeneration or clearcut with tree planting

T4A - Fire suppression, no disturbance, high grading

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

T5A - Clearcut, site preparation, tree planting

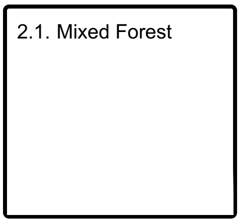
State 1 submodel, plant communities



1.1A - Natural development between fire intervals

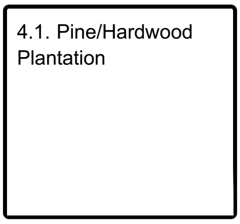
1.2A - Fire (10-20 year interval)

State 2 submodel, plant communities

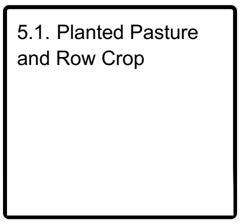


State 3 submodel, plant communities

State 4 submodel, plant communities



State 5 submodel, plant communities



State 1
Forest

Two community phases exist in the Forest State (1): White Oak/Loblolly Pine Forest Community (1.1) and the Shrub-dominated Community (1.2). State 1 has a moderate overstory cover (70 to 90 percent) of primarily mixed hardwood and pine species with white oak and loblolly pine being the most dominant. The landscape position of the Terraces cause an intermixed plant community to form. Terraces are regularly a transition between uplands and bottomland. Therefore, species occurring on both uplands and bottomlands exist on terraces. Also, micro-lows commonly develop on the flattest parts of the terrace supporting a slightly wetter plant community. 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 10 to 20 years. Representative basal areas range from 70 to 100 square feet per acre. As the basal area of the site increases, canopy cover generally increases as well. Growth competition can be seen in the outer rings on trees in locations where the basal area exceeds 100 square feet per acre. With more trees occupying one site, the competition for light, water, and nutrients will cause the tree rings to be less thick (for example, ten rings per inch in a competitive environment compared to six rings per inch on a lower basal area site).

Community 1.1
White Oak/Loblolly Pine Forest

Terrace sites are highly variable in their overstory composition. While white oak and loblolly pine are the dominant species, the overstory frequently has southern red oak, (*Quercus falcata*), sweetgum (*Liquidambar styraciflua*), and shortleaf pine (*Pinus echinata*) intermingled. Longleaf pine (*Pinus palustris*) may occur in the southern portions of the region. White oaks and/or loblolly pine may make up 75 percent of the overstory at any given time. The other hardwood and pine species make up the rest of the overstory. Shrubs are an important component in the ecological site. American beautyberry, yaupon, and possumhaw are dominant. Sassafras (*Sassafras albidum*), parsley hawthorn (Crataegus marshalii), and farkleberry (*Vaccinium arboreum*) are common, but seen in lesser densities. 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 more dense, the community moves along the pathway from 1.1 to 1.2. The infrequency of fire causes an accumulation of litter throughout the sites and bare ground is uncommon. The most dominant gramanoids are longleaf woodoats, slender woodoats (*Chasmanthium laxum*), and cypress swamp sedge (*Carex joorii*). The micro-lows are often colonized by broomsedge bluestem (*Andropogon virginicus*). Partridgeberry and Carolina elephanstfoot (*Elephantopus carolinianus*) are highly associated to the site.

Table 6. Ground cover

Tree foliar cover	0-10%
Shrub/vine/liana foliar cover	10-40%
Grass/grasslike foliar cover	25-65%
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	0-10%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-5%	3-15%	5-40%	3-10%
>0.15 <= 0.3	0-5%	5-15%	5-20%	3-10%
>0.3 <= 0.6	0-5%	10-20%	5-50%	0-20%
>0.6 <= 1.4	0-5%	3-35%	0-25%	0-3%
>1.4 <= 4	0-5%	–	0-25%	–
>4 <= 12	5-20%	–	–	–
>12 <= 24	10-50%	–	–	–
>24 <= 37	65-75%	–	–	–
>37	–	–	–	–

Community 1.2
Shrub-dominated

Phase 1.1 is the most representative community. Litter accumulation is minimal and understory vegetation is occupied with grasses, forbs, and shrubs. 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, Phase 1.2 will transition into State 2.

Pathway 1.1A
Community 1.1 to 1.2

White Oak/Loblolly Pine Forest

Shrub-dominated

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 affect the other vegetation 8 to 12 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

Shrub-dominated

White Oak/Loblolly Pine Forest

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. In areas where fire is difficult, timber stand improvement such as mechanical and chemical controls can act as a surrogate.

State 2
Mixed 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 the reference state (State 1). The mid-story canopy has become so thick, it greatly 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 Forest

Yaupon and wax myrtle (*Morella cerifera*) are especially dominant in the mid-story and are major indicators of State 2. Reduction in pine recruitment begins as hardwood species like sweetgum, red maple (*Acer rubrum*), and water oak (*Quercus nigra*) dominate. When their heights grow above 13 feet, their fire tolerance is increased and burning is also not as effective because of lack of fine fuels. If the site is allowed to develop without interruption, the pine component will be greatly reduced, if not lost, as the hardwood species are able to out compete. 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 more suitable environment for fire-intolerant and shade-loving species.

Table 8. Ground cover

Tree foliar cover	25-95%
Shrub/vine/liana foliar cover	35-85%
Grass/grasslike foliar cover	5-25%
Forb foliar cover	0-10%
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	0-3%

State 3
Hardwood Forest

A long-term lack of fire has now caused the plant community to cross two major thresholds from State 1, resulting in a very-closed canopy state. Fire intolerant hardwoods dominate the overstory. The overstory composition will be dominated by red oak, water oak, sweetgum, and hickory (Carya sp.).

Community 3.1
Hardwood Forest

The understory plant layer only contains remnants of longleaf woodoats and possibly a few forb species. The shrub layer has changed in composition substantially with species of deerberry (*Vaccinium stamineum*), southern arrowwood (*Viburnum dentatum*), hophornbeam (*Ostrya virginiana*), American hornbeam (*Carpinus caroliniana*), and yaupon occurring. The shrub densities are less than State 1 and 2 because of the closing of the overstory canopy and restriction of light to the ground. 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 (3 to 5 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. The other restoration option is to clearcut the entire area and prepare the site to be replanted with white oak and loblolly in desired frequencies.

Table 9. Ground cover

Tree foliar cover	50-95%
Shrub/vine/liana foliar cover	25-50%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-3%
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 Community is the result of natural disaster or clearcutting. After the initial event, the understory will resemble State 1. But, if fire and/or management do not return, the overstory species will develop back into a Hardwood Forest 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 reference state 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 or herbicides.

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 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 State 1 to State 2 is a result of time and long periods (greater than 20 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 effectively suppresses shade-tolerant, fire-intolerant species. High-grading of timber will also cause a shift.

Transition T1B
State 1 to 4

The transition is because of 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 because of the land manager converting to agricultural production. Merchantable timber is harvested by clearcut, then the site is prepared and planted to either a planted grass for grazing livestock or row crops for food and fiber.

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 with intensity to kill young saplings. More frequent burns (3 to 5 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 State 1. Herbicides can assist in deterring some hardwoods/unwanted species from growing. Care must be taken that non-target plants are not affected by the chemicals.

Transition T2A
State 2 to 3

The transition from a State 2 to State 3 is a result of time and long periods (greater than 20 years) of no fire. Without fire to maintain the open spacing, the overstory becomes densely populated. The overstory is so saturated that the understory herbaceous layer is almost non-existent because of a lack of sunlight. As the overstory canopy closes, the established mid-story lessens in density. This begins to occur at overstory canopies greater than 90 percent. High-grading of timber will also cause a shift.

Transition T2B
State 2 to 4

The transition is because of 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 because of the land manager converting to agricultural production. Merchantable timber is harvested by clearcut, then the site is prepared and planted to either a planted grass for grazing livestock or row crops for food and fiber.

Restoration pathway R3A
State 3 to 1

Among all restoration pathways, this path is the most energy intensive. Restoration of this community to 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 (3 to 5 years) may be required to suppress the woody vegetation. If no white oak or loblolly pine seed source is available on nearby ecological sites, planting will be needed.

Transition T3A
State 3 to 4

The transition is because of 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 because of 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 State 1's understory. Restoring the understory may include replanting trees. 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 loblolly 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. Initially, fire frequencies of 3 to 5 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 can 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.

Restoration pathway R5A
State 5 to 1

This restoration path can be accomplished by planting a mix of loblolly pine and white 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 because of the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut, 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							
white oak	QUAL	*Quercus alba*	–	–	25–75	–	–
loblolly pine	PITA	*Pinus taeda*	–	–	25–50	–	–
southern red oak	QUFA	*Quercus falcata*	–	–	10–35	–	–
sweetgum	LIST2	*Liquidambar styraciflua*	–	–	10–35	–	–
shortleaf pine	PIEC2	*Pinus echinata*	–	–	5–25	–	–
white ash	FRAM2	*Fraxinus americana*	–	–	0–25	–	–
longleaf pine	PIPA2	*Pinus palustris*	–	–	0–20	–	–
blackgum	NYSY	*Nyssa sylvatica*	–	–	0–10	–	–

Table 11. 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*	–	–	20–50
giant cane	ARGI	*Arundinaria gigantea*	–	–	0–25
broomsedge bluestem	ANVI2	*Andropogon virginicus*	–	–	0–20
variable panicgrass	DICO2	*Dichanthelium commutatum*	–	–	5–20
slender woodoats	CHLA6	*Chasmanthium laxum*	–	–	5–20
cypress swamp sedge	CAJO2	*Carex joorii*	–	–	1–15
Forb/Herb					
eastern poison ivy	TORA2	*Toxicodendron radicans*	–	–	5–20
partridgeberry	MIRE	*Mitchella repens*	–	–	3–10
St. Andrew's cross	HYHY	*Hypericum hypericoides*	–	–	1–5
Carolina elephantsfoot	ELCA3	*Elephantopus carolinianus*	–	–	0–5
Missouri violet	VIMI3	*Viola missouriensis*	–	–	0–3
slender yellow woodsorrel	OXDI2	*Oxalis dillenii*	–	–	0–3
Fern/fern ally					
ebony spleenwort	ASPL	*Asplenium platyneuron*	–	–	0–5
resurrection fern	PLPO2	*Pleopeltis polypodioides*	–	–	0–5
Shrub/Subshrub					
American beautyberry	CAAM2	*Callicarpa americana*	–	–	5–40
possumhaw	ILDE	*Ilex decidua*	–	–	5–20
yaupon	ILVO	*Ilex vomitoria*	–	–	5–20
sassafras	SAAL5	*Sassafras albidum*	–	–	5–15
muscadine	VIRO3	*Vitis rotundifolia*	–	–	3–15
parsley hawthorn	CRMA5	*Crataegus marshallii*	–	–	5–10
farkleberry	VAAR	*Vaccinium arboreum*	–	–	0–10
wax myrtle	MOCE2	*Morella cerifera*	–	–	0–10
American hornbeam	CACA18	*Carpinus caroliniana*	–	–	0–10
southern arrowwood	VIDE	*Viburnum dentatum*	–	–	0–10
Tree					
sweetgum	LIST2	*Liquidambar styraciflua*	–	–	1–5
white oak	QUAL	*Quercus alba*	–	–	1–5
loblolly pine	PITA	*Pinus taeda*	–	–	1–5
common persimmon	DIVI5	*Diospyros virginiana*	–	–	0–3
American holly	ILOP	*Ilex opaca*	–	–	0–3
blackgum	NYSY	*Nyssa sylvatica*	–	–	0–3
bitternut hickory	CACO15	*Carya cordiformis*	–	–	0–3
Vine/Liana					
greenbrier	SMILA2	*Smilax*	–	–	1–5
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	–	–	0–5
Alabama supplejack	BESC	*Berchemia scandens*	–	–	0–5
crossvine	BICA	*Bignonia capreolata*	–	–	0–3
climbing dogbane	TRDI	*Trachelospermum difforme*	–	–	0–3

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 Terraces would have provided the bears with nutrition/food in the form of soft and hard mast (American beautyberries and acorns). Other apex predators like the mountain lion and wolf have disappeared in a similar manner.

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, such as those found in the natural 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, yaupon, and possumhaw) are readily consumed by birds as well.

Grazing animals primarily use grasses as their food source. While grasses can be in abundance on the Terraces, the sites will have to be specifically managed for grazing to produce enough biomass. Reduction of basal area, below 70 square feet per acre, will create more openings for light to penetrate to the ground layer, therefore allowing more biomass to be produced.

Recreational uses

The most popular recreational use is hunting for white-tail deer, squirrels, and other upland game animals. Bird watching is also becoming increasingly popular.

Wood products

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

Table 12. 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*	88	96	129	143	–	–	–	
shortleaf pine	*PIEC2*	82	88	119	133	–	–	–	

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: Shelby County, TX	
Latitude	31° 42′ 59″
Longitude	93° 49′ 30″

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Contributors

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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:**