USDA Natural Resources
Conservation Service

Ecological site F133BY009TX
Southern Deep Sandy Upland

Last updated: 12/13/2023
Accessed: 04/26/2024

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.

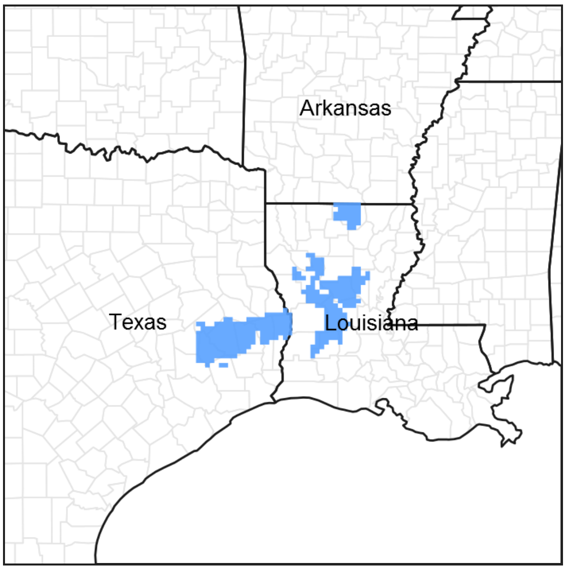


Figure 1. Mapped extent

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

NatureServe, 2002
- CEGL008566 – Xeric Post Oak Woodland

Soil Survey Staff, 2011
- Woodland Suitability Group – 2s3

Turner et al. 1999
- Longleaf Pine – Bluejack Oak/Tragia Grossarenic Dry Uplands

USDA-Natural Resources Conservation Service, 2006.

-Major Land Resource Area (MLRA) 133B

Van Kley et. al., 2007
- 232Fa.15.1.10 Longleaf Pine-Bluejack Oak/Tragia Grossarenic Dry Uplands Landtype Phase

Ecological site concept

The Southern Deep Sandy Upland site has deep, sandy-surfaced soils that gradually grade into sandy loams and sandy clay loams. The upland landscape coupled with properties associated with the depth of the sand form its unique plant community.

Associated sites

F133BY011TX	**Deep Sandy Terrace** Site is on a lower terrace position.
F133BY007TX	**Southern Sandy Loam Upland** Site has an increase in clay content closer to the surface. The vegetation is more robust.
F133BY010TX	**Very Deep Sandy Upland** Site is completely sand with no to imperceptible increases in clay. Site is very sparsely vegetated.

Similar sites

F133BY011TX	**Deep Sandy Terrace** Site is on a lower terrace position.
F133BY008TX	**Northern Deep Sandy Upland** Site is similar except occurs in northern geologies of MLRA. Shortleaf pine is major component of overstory.
F133BY010TX	**Very Deep Sandy Upland** Site is completely sand with no to imperceptible increases in clay. Site is very sparsely vegetated.
F133BY006TX	**Northern Sandy Loam Upland** Site has increased clay content closer to the surface and more robust vegetation. Occurs on northern geologies of MLRA with shortleaf pine as major overstory component.
F133BY007TX	**Southern Sandy Loam Upland** Site has increased clay content closer to the surface and more robust vegetation.

Table 1. Dominant plant species

Tree	(1) *Pinus palustris* (2) *Quercus incana*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium*

Physiographic features

Theses ecological sites are somewhat excessively drained and rapidly permeable. They are gently sloping to moderately steep on broad ridgetops and sideslopes of uplands. Slopes are dominantly 3 to 8 percent, but range from 1 to 20 percent.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Interfluve
Runoff class	Very low to low
Flooding frequency	None
Ponding frequency	None

Elevation	100–600 ft
Slope	1–20%
Aspect	Aspect is not a significant factor

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 3. Representative climatic features

Frost-free period (average)	236 days
Freeze-free period (average)	272 days
Precipitation total (average)	57 in

Climate stations used

- (1) OLLA [USC00166978], Olla, LA
- (2) HUNTSVILLE [USC00414382], Huntsville, TX
- (3) TOLEDO BEND DAM [USC00419068], Anacoco, TX
- (4) LEESVILLE [USC00165266], Leesville, LA
- (5) LIVINGSTON 2 NNE [USC00415271], Livingston, TX
- (6) GROVETON [USC00413778], Groveton, TX
- (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 excessive drainage and inability for the soil to hold moisture for long periods, water is not a factor on these sites. Rather, lack of water is the most influential factor.

Wetland description

Wetlands are not associated with this site.

Soil features

Tehran is a representative soil of the Deep Sandy Uplands. This ecological site is associated with deep, grossarenic, excessively-drained, rapidly-permeable soils on uplands. Depth to clay increase is 45 inches or greater. The clay increase is gradual, typically a loamy-sand surface to a loamy or sandy-loam subsurface. Sites can range from gently sloping to moderately steep with percentages varying from 1 to 20. Sites are located on broad ridge tops and side slopes. Besides the Tehran series, Chambliss and Shankler are correlated to the site.

Table 4. 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 somewhat excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3–4 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	4.5–6
Subsurface fragment volume <=3" (Depth not specified)	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 Deep Sandy Uplands was a Longleaf Pine/Bluejack Oak (*Pinus palustris*/*Quercus incana*) 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.

Another cause for the large demise of longleaf pine in the region was due to the turpentine industry. Turpentiners debarked trees, then hacked V-shaped cuts down the lengths of the trunks to allow for sap flow. In combination with turpentining loss, the natural openness of the pine stands eased equipment hauling, making longleaf pine the prime timber species for logging. The above plus estimates that the red-cockaded woodpecker caused up to 10 percent mortality through nesting activities, has paid a large toll on the longleaf pine ecosystem.

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.

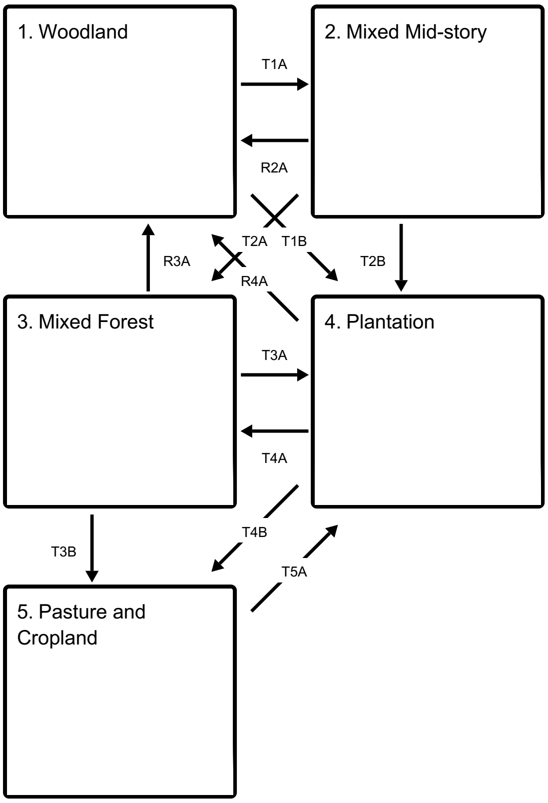
Fire Regimes – Fire was a natural and important disturbance throughout the Western Gulf Plain. Fire occurred naturally from lightning strikes and was started by Native Americans for game movement. The reference community developed with a frequency of fire every 3 to 5 years. Fires usually occurred in 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.

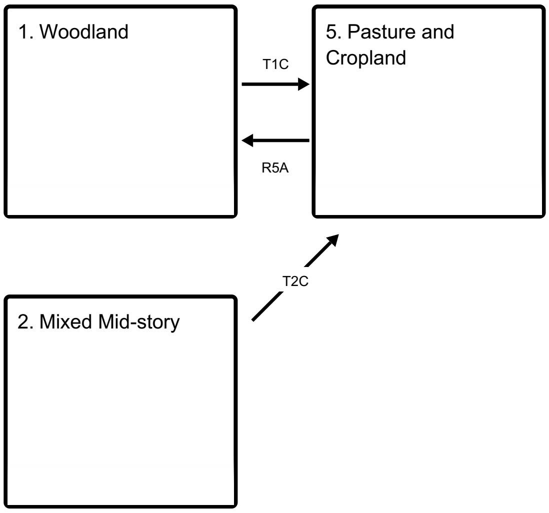
Plant Community Interactions – The lack of clay in the soil profile reduces the water-holding capacity of the site. The increased droughtiness lessens the biomass accumulation which causes the reoccurring fires to be of lower intensity and less frequent than the surrounding uplands. The length of fire intervals (3 to 5 years) coupled with the soil's inability to hold significant moisture creates an open canopy (30 to 60 percent). The understory is dominated by little bluestem with large patches of bare ground. Overstory-canopy trees are oftentimes stunted as a result of the soil conditions.

State and transition model

Ecosystem states



States 1, 5 and 2 (additional transitions)



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

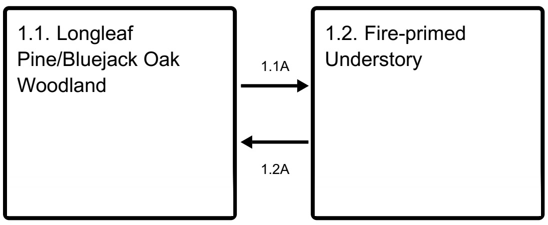
T4A - Fire suppression, no management

T4B - Clearcut, grass/crop planting

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

T5A - Clearcut, site preparation, tree planting

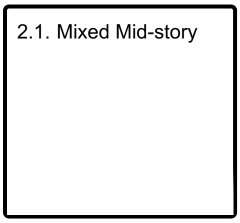
State 1 submodel, plant communities



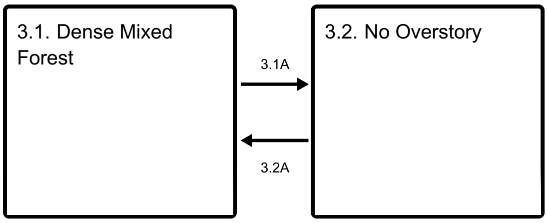
1.1A - Natural development between fire intervals

1.2A - Fire (1-3 year interval)

State 2 submodel, plant communities



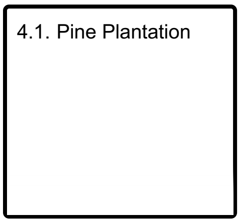
State 3 submodel, plant communities



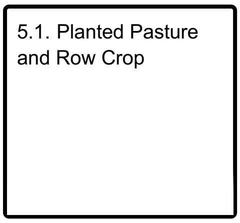
3.1A - Fire suppression, no management

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/Bluejack Oak Woodland Community (1.1) and the Fire-primed Understory Community (1.2). State 1 has a moderate overstory cover (30 to 60 percent) of longleaf pine and bluejack oak with an occasional upland oak mixed in (post oak and blackjack oak). The understory is diverse, but sparsely vegetated with grasses and forbs. Significant portions of the forest floor lack vegetation, and the sandy-bare ground is visible. 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 comprised of mature trees, saplings, and pine seedlings in the grass stage. Longleaf seeds are heavier than other southern pine species, so openings in the canopy where sunlight can reach the developing seedling are essential to regeneration. Natural disturbances of fires, lightning strikes, hurricanes (wind throw), ice events (rare), and beetle infestations aid in maintaining the uneven-age structure. The natural canopy spacing is kept intact by periodic fires ranging from 3 to 5 years. Representative basal areas range from 30 to 60 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 80 square feet per acre.

Community 1.1
Longleaf Pine/Bluejack Oak Woodland

Longleaf pine and bluejack oak comprise the majority of the overstory. The occurrence of longleaf pine in the overstory at any given site is between 50 to 90 percent. Bluejacks have established on the sites at 10 to 50 percent of the overall canopy structure. Other overstory trees are sometimes found colonizing the areas in lesser amounts (less than 5 percnet), including shortleaf pine (*Pinus echinata*), hickory (Carya sp.) and upland oak species (Quercus sp.). Oak species typically only achieve half the height of pines leading to a two-layer canopy. Sassafras (*Sassafras albidum*) and bluejack saplings are extremely common in the mid-story layer (4.5 to 13 feet), although their overall canopy cover is quite low (less than 5 percent). Both communities are characterized by a diverse ground layer with large patches of bare ground and litter. Little bluestem and needleleaf rosette grass (*Dichanthelium aciculare*) are the most abundant grasses seen in the two communities. Indicator forbs include Pickering's dawnflower (Stylisma pickereringii), nettleleaf noseburn (Tragia urticioflia), healing croton (*Croton argyranthemus*), and Texas bullnettle (Cnidosolus texanus).

Table 5. Ground cover

Tree foliar cover	5-15%
Shrub/vine/liana foliar cover	0-5%
Grass/grasslike foliar cover	15-40%
Forb foliar cover	10-40%
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	20-40%

Table 6. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	0-2%	0-5%	5-10%	5-15%
>0.5 <= 1	0-5%	–	5-30%	5-15%
>1 <= 2	0-10%	–	5-40%	1-6%
>2 <= 4.5	0-10%	0-5%	0-10%	0-1%
>4.5 <= 13	0-5%	0-5%	–	–
>13 <= 40	5-15%	–	–	–
>40 <= 80	10-40%	–	–	–
>80 <= 120	10-60%	–	–	–
>120	–	–	–	–

Community 1.2
Fire-primed Understory

Phase 1.1 is the most representative community with fire recently traveling through the system. Litter accumulation is a minimum and understory vegetation is sparse. 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 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. An increased understory of shrubs and small trees heightens the possibility of crown fires during prolonged dry periods. Crown fires could kill overstory pines during high intensity fires and drought.

Community 2.1
Mixed Mid-story

Encroachment by fire intolerant species like sweetgum (Liquidambar stryacifula), red maple (*Acer rubrum*), and loblolly pine begin to occur in the mid-story. Added foliar cover and litter accumulation lessens the impact of the droughty 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. The dominance of the longleaf pine may be reduced due to unfavorable seeding conditions. 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 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 7. Ground cover

Tree foliar cover	25-50%
Shrub/vine/liana foliar cover	35-75%
Grass/grasslike foliar cover	5-20%
Forb foliar cover	0-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	30-80%
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 tree growth and causes stress in overstory trees making them vulnerable to attacks from insects and/or diseases. Longleaf recruitment may be nonexistent due to lack of light and bare ground. Shortleaf and loblolly pine can take advantage of the current conditions.

Community 3.1
Dense Mixed Forest

The understory plant layer only contains remnants of the reference community and possibly no reference community 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 the reference state the wildlife diversity is reduced to only generalist species, species requiring a closed canopy, 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 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. Longleaf seedlings may have difficulty regenerating and could need manual reseeding.

Table 8. Ground cover

Tree foliar cover	45-95%
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, 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 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 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 Woodland (State 1) to the Mixed Mid-story (State 2) is a result of time and long periods (greater than 15 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 (1 to 3 years) may be required 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 a Mixed Mid-story (State 2) to the Mixed Forest (State 3) is a result of time and long periods (greater than 30 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, this 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 (1 to 2 years) may be required to suppress the woody vegetation. If longleaf 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 longleaf pine and bluejack 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 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 fire, 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 30 to 60 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 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 9. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
longleaf pine	PIPA2	*Pinus palustris*	Native	–	50–90	–	–
bluejack oak	QUIN	*Quercus incana*	Native	–	10–50	–	–
post oak	QUST	*Quercus stellata*	Native	–	0–5	–	–
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	0–5	–	–
black hickory	CATE9	*Carya texana*	Native	–	0–5	–	–
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	0–5	–	–

Table 10. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
little bluestem	SCSC	*Schizachyrium scoparium*	–	–	15–40

needleleaf rosette grass	DIAC	*Dichanthelium aciculare*	–	–	10–25
big bluestem	ANGE	*Andropogon gerardii*	–	–	5–10
splitbeard bluestem	ANTE2	*Andropogon ternarius*	–	–	0–10
brownseed paspalum	PAPL3	*Paspalum plicatulum*	–	–	0–5
cylinder jointtail grass	COCY	*Coelorachis cylindrica*	–	–	0–5
switchgrass	PAVI2	*Panicum virgatum*	–	–	0–5
littlehead nutrush	SCOL2	*Scleria oligantha*	–	–	1–3
bearded skeletongrass	GYAM	*Gymnopogon ambiguus*	–	–	0–3
bristly flatsedge	CYHY	*Cyperus hystricinus*	–	–	0–1
Plukenet's flatsedge	CYPL3	*Cyperus plukenetii*	–	–	0–1
Forb/Herb					
eastern poison ivy	TORA2	*Toxicodendron radicans*	–	–	5–25
Pickering's dawnflower	STPI3	*Stylisma pickeringii*	–	–	1–20
healing croton	CRAR2	*Croton argyranthemus*	–	–	1–10
Cuman ragweed	AMPS	*Ambrosia psilostachya*	–	–	1–10
Virginia tephrosia	TEVI	*Tephrosia virginiana*	–	–	1–10
Texas bullnettle	CNTE	*Cnidoscolus texanus*	–	–	1–5
fourvalve mimosa	MIQU2	*Mimosa quadrivalvis*	–	–	1–5
Texas ironweed	VETE3	*Vernonia texana*	–	–	1–3
longleaf buckwheat	ERLO5	*Eriogonum longifolium*	–	–	1–3
St. Andrew's cross	HYHY	*Hypericum hypericoides*	–	–	1–3
partridge pea	CHFA2	*Chamaecrista fasciculata*	–	–	1–3
Nuttall's wild indigo	BANU2	*Baptisia nuttalliana*	–	–	1–3
sharp blazing star	LIAC	*Liatris acidota*	–	–	1–3
queen's-delight	STSY	*Stillingia sylvatica*	–	–	1–3
nettleleaf noseburn	TRUR2	*Tragia urticifolia*	–	–	1–3
hairyflower spiderwort	TRHI	*Tradescantia hirsutiflora*	–	–	1–3
sidebeak pencilflower	STBI2	*Stylosanthes biflora*	–	–	1–3
whitemouth dayflower	COER	*Commelina erecta*	–	–	1–3
soft greeneyes	BEPU2	*Berlandiera pumila*	–	–	0–1
multibloom hoarypea	TEON	*Tephrosia onobrychoides*	–	–	0–1
anisescented goldenrod	SOOD	*Solidago odora*	–	–	0–1
spurred butterfly pea	CEVI2	*Centrosema virginianum*	–	–	0–1
oldplainsman	HYAR3	*Hymenopappus artemisiifolius*	–	–	0–1
slender scratchdaisy	CRDI17	*Croptilon divaricatum*	–	–	0–1
blackeyed Susan	RUHI2	*Rudbeckia hirta*	–	–	0–1
hairy lespedeza	LEHI2	*Lespedeza hirta*	–	–	0–1
Canadian blacksnakeroot	SACA15	*Sanicula canadensis*	–	–	0–1
lanceleaf blanketflower	GAAE	*Gaillardia aestivalis*	–	–	0–1
Virginia snakeroot	ARSE3	*Aristolochia serpentaria*	–	–	0–1
green comet milkweed	ASVI	*Asclepias viridiflora*	–	–	0–1
biannual lettuce	LALU	*Lactuca ludoviciana*	–	–	0–1
downy milkpea	GAVO	*Galactia volubilis*	–	–	0–1
pale purple coneflower	ECPA	*Echinacea pallida*	–	–	0–1

Small's noseburn	TRSM	*Tragia smallii*	–	–	0–1
helmet flower	SCIN2	*Scutellaria integrifolia*	–	–	0–1
queendevil	HIGR3	*Hieracium gronovii*	–	–	0–1
dogfennel	EUCA5	*Eupatorium capillifolium*	–	–	0–1
hairy bedstraw	GAPI2	*Galium pilosum*	–	–	0–1
hoary ticktrefoil	DECA8	*Desmodium canescens*	–	–	0–1
Louisiana nerveray	TELU	*Tetragonotheca ludoviciana*	–	–	0–1
eastern milkpea	GARE2	*Galactia regularis*	–	–	0–1
sessileleaf ticktrefoil	DESE	*Desmodium sessilifolium*	–	–	0–1
narrowleaf silkgrass	PIGR4	*Pityopsis graminifolia*	–	–	0–1
Texas dutchman's pipe	ARRE3	*Aristolochia reticulata*	–	–	0–1
Fern/fern ally					
western brackenfern	PTAQ	*Pteridium aquilinum*	–	–	5–30
Shrub/Subshrub					
deerberry	VAST	*Vaccinium stamineum*	–	–	0–5
American beautyberry	CAAM2	*Callicarpa americana*	–	–	0–5
redcardinal	ERHE4	*Erythrina herbacea*	–	–	0–1
sawtooth blackberry	RUAR2	*Rubus argutus*	–	–	0–1
yaupon	ILVO	*Ilex vomitoria*	–	–	0–1
Tree					
bluejack oak	QUIN	*Quercus incana*	–	–	5–25
sassafras	SAAL5	*Sassafras albidum*	–	–	5–25
winged sumac	RHCO	*Rhus copallinum*	–	–	0–10
blackjack oak	QUMA3	*Quercus marilandica*	–	–	0–5
post oak	QUST	*Quercus stellata*	–	–	0–5
longleaf pine	PIPA2	*Pinus palustris*	–	–	0–5
black hickory	CATE9	*Carya texana*	–	–	0–3
smallflower pawpaw	ASPA18	*Asimina parviflora*	–	–	0–3
Vine/Liana					
evening trumpetflower	GESE	*Gelsemium sempervirens*	–	–	0–5
summer grape	VIAE	*Vitis aestivalis*	–	–	0–3
cat greenbrier	SMGL	*Smilax glauca*	–	–	0–3
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	–	–	0–1

Table 11. Community 4.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
loblolly pine	PITA	*Pinus taeda*	–	–	–	–	–
slash pine	PIEL	*Pinus elliottii*	–	–	–	–	–
longleaf pine	PIPA2	*Pinus palustris*	–	–	–	–	–
shortleaf pine	PIEC2	*Pinus echinata*	–	–	–	–	–

Animal community

The historic animal community is relatively similar to the first community in State 1. 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 Southern Deep Sandy 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.

Red-cockaded woodpeckers, once common throughout the longleaf ecosystem, have severely declined in numbers. The birds inhabited the open pine forests of the throughout the southeastern United States. Early European settlement, widespread longleaf harvesting, naval stores, the turpentine industry, commercial tree farming, urbanization, and agriculture have contributed to the species decline. Today they occupy niches in the open longleaf areas maintained with appropriate forestry management techniques.

Recreational uses

The most popular recreational use is hunting for white-tail deer and other game animals. Bird watching is popular, especially in areas where the red-cockaded woodpecker is present.

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

Leaf-cutter ants (Atta texana) are common in the Southern Deep Sandy Uplands. Their mounds add to the already numerous bare-ground patches throughout the site. It is not uncommon to see colonies of mounds 30 feet across.

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. Many species of woodpeckers like to use dead snags to create their cavities but red-cockaded woodpeckers prefer live trees to create their cavities as they like to have the sap flow to ward off potential predators. Red-cockaded woodpeckers also prefer an open understory found in State 1 of the Southern Deep Sandy Uplands.

Turkey and quail will utilize the site to some degree, but in combination with other sites. The grass layer is not always thick enough to provide nesting habitat, but the presence of mature oaks will provide roosting areas. After hatching, chicks may utilize the site more because of the natural lack of an overly-dense ground layer. As long as the canopy is open, favoring the reference site conditions, a more 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 for the abundance of bluejack oaks and the diversity of forbs, although sites are too sparsely vegetated 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 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*	80	90	114	114	50	–	–	
longleaf pine	*PIPA2*	75	85	100	100	0	–	–	
slash pine	*PIEL*	78	88	0	0	0	–	–	
shortleaf pine	*PIEC2*	70	80	0	0	0	–	–	

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.

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:**