USDA Natural Resources Conservation Service

Ecological site F133BY008TX
Northern Deep Sandy Upland

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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.

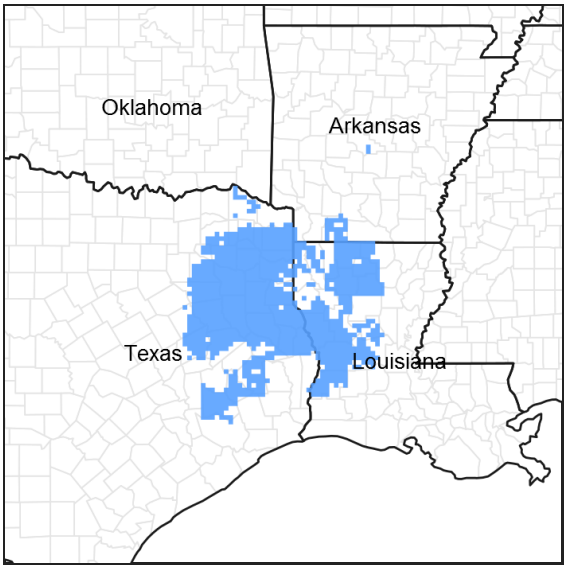


Figure 1. Mapped extent

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

NatureServe, 2002
- CEGL007507 – West Gulf Coastal Plain Xeric Shortleaf Pine – Oak Forest

Soil Survey Staff, 2011
- Woodland Suitability Group 2s3

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

Van Kley et. Al., 2007

- 231Eg.12.1.10 – Shortleaf Pine-Bluejack Oak/Tragia Grossarenic Dry Uplands

Ecological site concept

The Northern 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

F133BY006TX	**Northern 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.
F133BY011TX	**Deep Sandy Terrace** Site is on a lower terrace position.

Similar sites

F133BY010TX	**Very Deep Sandy Upland** Site is completely sand with no to imperceptible increases in clay. Site is very sparsely vegetated.
F133BY009TX	**Southern Deep Sandy Upland** Site is similar except occurs in southern geologies of MLRA. Longleaf pine is major component of overstory.
F133BY006TX	**Northern Sandy Loam Upland** Site has increased clay content closer to the surface and more robust vegetation.
F133BY007TX	**Southern Sandy Loam Upland** Site has increased clay content closer to the surface and more robust vegetation. Occurs on southern geologies of MLRA with longleaf pine as major overstory component.
F133BY011TX	**Deep Sandy Terrace** Site is on a lower terrace position.

Table 1. Dominant plant species

Tree	(1) *Pinus echinata* (2) *Quercus incana*
Shrub	(1) *Sassafras albidum*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Cnidoscolus texanus*

Physiographic features

The ecological site are on gently sloping to steep uplands. Slopes range from 1 to 25 percent. Elevation ranges from 400 to 700 feet. The topography of the area includes stream divides and sideslopes.

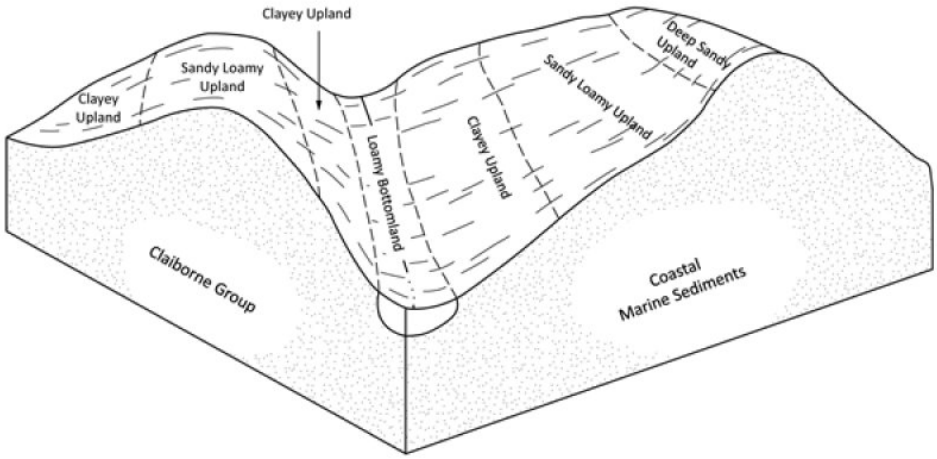


Figure 2. Deep Sandy Upland and associated sites.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Interfluve
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	400–700 ft
Slope	1–25%
Aspect	Aspect is not a significant factor

Climatic features

Climate feature narrative: 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)	226 days
Freeze-free period (average)	258 days
Precipitation total (average)	55 in

Climate stations used

- (1) ATLANTA [USC00410408], Atlanta, TX
- (2) NACOGDOCHES [USC00416177], Nacogdoches, TX
- (3) RUSTON LA TECH [USC00168067], Ruston, LA
- (4) ATHENS [USC00410404], Athens, TX
- (5) HENDERSON [USC00414081], Henderson, TX
- (6) BIENVILLE 3 NE [USC00160800], Bienville, LA
- (7) LEESVILLE [USC00165266], Leesville, LA
- (8) DAINGERFIELD 9 S [USC00412225], Daingerfield, TX
- (9) RUSK [USC00417841], Rusk, TX
- (10) HODGES GARDENS [USC00164288], Florien, LA
- (11) CENTERVILLE [USC00411596], Centerville, TX
- (12) SAN AUGUSTINE [USC00417951], San Augustine, 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

The soils of this site are deep and characterized by sands through the A and E profiles greater than 39.4 inches (100 centimeters). The Bt layer is generally a sandy clay loam continuing through the lower profiles of the soil. The Darco series is a representative soil and consists of very deep, somewhat excessively drained, moderately permeable soils that formed in sandy and loamy residuum from Southern Coastal Plain marine deposits of the Carizzo Sand, Queen City Sand, and Sparta Sand Formations. The series is classified as a loamy, siliceous, semiactive, thermic Grossarenic Paleudult. Other soils are included within the ecological site and all are defined by deep upper horizons of sands and presence of an argillic horizon deep in the soil profile. Besides the Darco series, Betis, Flo, Grapeland, and Pickton are correlated to this site.

Table 4. Representative soil features

Parent material	(1) Marine deposits–sandstone and shale
Surface texture	(1) Loamy fine 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)	0–1

Soil reaction (1:1 water) (0-40in)	4.5–6.5
Subsurface fragment volume <=3" (Depth not specified)	0%
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 Northern Deep Sandy Uplands was a Shortleaf Pine/Bluejack Oak (*Pinus echinata*/*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.

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.

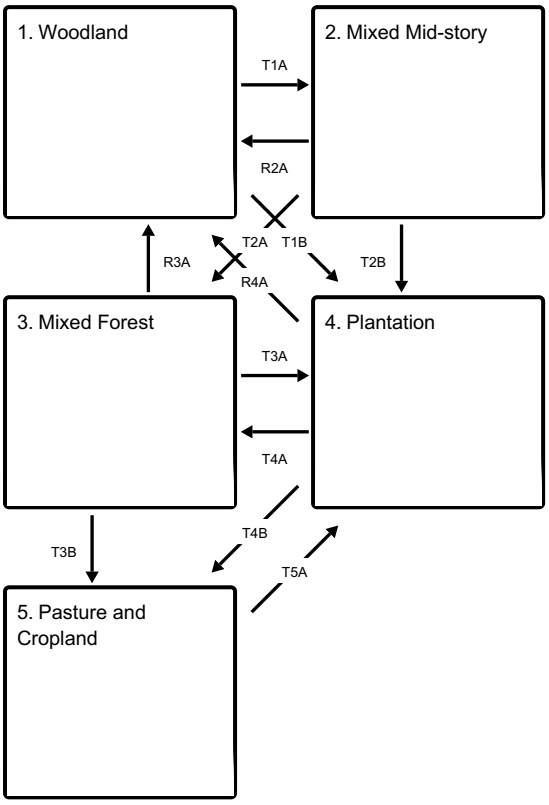
Fire Regimes – Fire was a natural and important disturbance throughout the Western Gulf Plain. Fire occurred naturally from lightning strikes and was started by Native Americans for game movement. The reference community developed with a frequency of fire every 3 to 5 years. Fires usually occurred in 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 (although a major attack has not occurred in some time), usually when the trees are stressed due to multiple environmental factors.

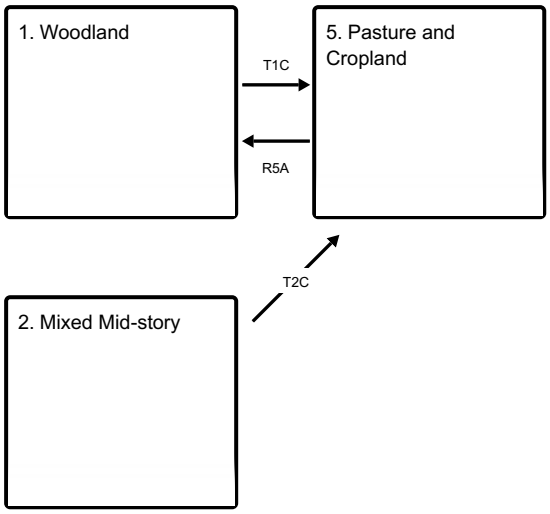
Plant Community Interactions – The lack of clay in the soil profile reduces the water-holding capacity of the site. The increased droughtiness lessens the biomass accumulation which causes the reoccurring fires to be of lower intensity and less frequent than the surrounding uplands. The length of fire intervals (3 to 5 years) coupled with the soils inability to hold significant moisture creates an open canopy (50 to 75 percent). The understory is dominated by little bluestem with 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 - Gap-phase regeneration or clearcut with tree planting

T3B - Clearcut, grass/crop planting

R4A - Gap-phase regeneration or clearcut with tree planting

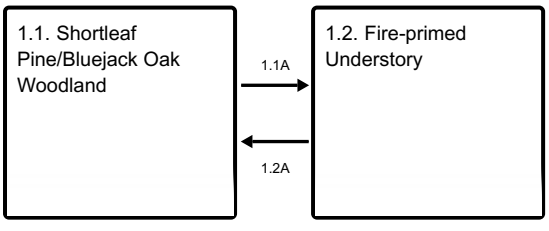
T4A - Fire suppression, no management

T4B - Clearcut, grass/crop planting

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

T5A - Clearcut, site preparation, tree planting

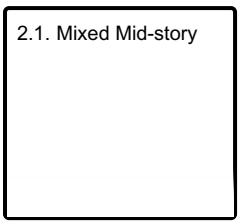
State 1 submodel, plant communities



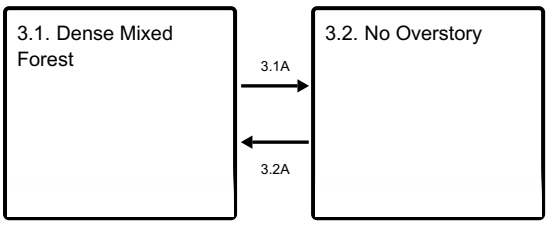
1.1A - Natural development between fire intervals

1.2A - Fire (1-3 year interval)

State 2 submodel, plant communities



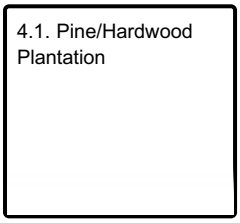
State 3 submodel, plant communities



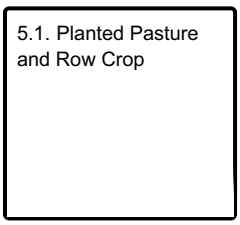
3.1A - Fire suppression, no management

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: Shortleaf Pine/Blujack Oak Woodland Community (1.1) and the Fire-primed Community (1.2). State 1 has a moderate overstory cover (50 to 75 percent) of shortleaf pine and bluejack oak with an occasional upland oak mixed in (post oak and blackjack oak). The understory is diverse and vegetated with grasses and forbs. Portions of the forest floor naturally lack vegetation, and the sandy-bare ground is usually 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. 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 50 to 80 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 100 square feet per acre.

Community 1.1

Shortleaf Pine/Bluejack Oak Woodland

Figure 7. Shortleaf Pine/Bluejack Oak Woodland on the Darco series. Photo by Tyson Hart-NRCS-2014

Shortleaf pine and bluejack oak comprise the majority of the overstory. The occurrence of shortleaf pine in the overstory at any given site is between 50 and 90 percent. Bluejacks have established on the sites at 10 to 30 percent of the overall canopy structure. Other overstory trees are sometimes found colonizing the areas in lesser amounts (less than 10 percent), including hickory (Carya sp.) and upland oaks (Quercus sp.). Oak species typically only achieve half the height of pines leading to a two-layer canopy. Sassafras (*Sassafras albidum*), winged sumac (*Rhus copallinum*) and bluejack saplings are extremely common in the mid-story layer. 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 plants include Texas bullnettle (Cnidosolus texanus) Gulf Coast yucca (Yucca louisianesis), Pickering's dawnflower (Stylisma pickereringii), and nettleleaf noseburn (Tragia urticioflia).

Table 5. Ground cover

Tree foliar cover	0-20%
Shrub/vine/liana foliar cover	0-10%
Grass/grasslike foliar cover	35-60%
Forb foliar cover	0-20%
Non-vascular plants	0%
Biological crusts	0%
Litter	15-35%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-20%

Table 6. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	1-5%	5-15%	5-15%	5-20%
>0.5 <= 1	3-25%	5-10%	15-35%	3-15%
>1 <= 2	3-20%	3-10%	20-75%	1-5%
>2 <= 4.5	1-3%	3-15%	5-35%	–
>4.5 <= 13	1-5%	1-5%	–	–
>13 <= 40	5-15%	–	–	–
>40 <= 80	10-40%	–	–	–
>80 <= 120	30-75%	–	–	–
>120	–	–	–	–

Community 1.2
Fire-primed Understory

Figure 8. Fire-primed Understory on the Grapeland series. Photo by Tyson Hart-NRCS-2014

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, forbs and shrubs, 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

Shortleaf Pine/Bluejack Oak Woodland

Fire-primed Understory

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

Fire-primed Understory

Shortleaf Pine/Bluejack Oak Woodland

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

State 2
Mixed Mid-story

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

Figure 9. Mixed Mid-story Community on the Betis series. Photo by Tyson Hart-NRCS-2014

Encroachment by fire intolerant species like sweetgum (Liquidambar stryacifula), water oak (*Quercus nigra*), 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. 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	10-30%
Shrub/vine/liana foliar cover	10-40%
Grass/grasslike foliar cover	10-30%
Forb foliar cover	1-10%
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	5-10%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	1-5%	10-30%	5-15%	3-15%
>0.5 <= 1	1-10%	10-25%	5-15%	1-10%
>1 <= 2	3-15%	10-25%	1-10%	1-5%
>2 <= 4.5	25-50%	10-35%	1-10%	–
>4.5 <= 13	15-40%	5-20%	–	–
>13 <= 40	15-40%	–	–	–
>40 <= 80	25-50%	–	–	–
>80 <= 120	20-75%	–	–	–
>120	–	–	–	–

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, sweetgums, and lowland oaks, 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. Shortleaf recruitment may be nonexistent due to lack of light to the forest understory. Loblolly pine may take advantage of the current conditions, but hardwood species will usually outcompete.

Community 3.1
Dense Mixed Forest

Figure 10. Dense Mixed Forest Community on the Betis series. Photo by Tyson Hart-NRCS-2014

The understory plant layer only contains remnants of State 1 and possibly no indicator species. Shade tolerant grasses, such as longleaf woodoats (*Chasmanthium sessiliflorum*), and forbs, greenbriers (Smilax sp.), 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. American beautyberry (*Callicarpa americana*) may be the only shrub on site. Because the site lacks the diversity found in the State 1 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 State 1. 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, but only after understory fuel levels are adequate. Intense summer fires may also be required. The suppression of overstory seedlings will allow grasses, forbs, and shrubs to reestablish. Shortleaf pine seedlings may have difficulty regenerating and could need manual reseeding.

Table 9. Ground cover

Tree foliar cover	0-15%
Shrub/vine/liana foliar cover	0-20%
Grass/grasslike foliar cover	0-10%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	65-95%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-5%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	1-5%	0-10%	0-3%	0-1%
>0.5 <= 1	1-5%	0-5%	1-5%	0-3%
>1 <= 2	3-10%	5-20%	0-3%	0-1%
>2 <= 4.5	5-20%	10-35%	–	–
>4.5 <= 13	10-40%	0-10%	–	–
>13 <= 40	30-60%	–	–	–
>40 <= 80	60-95%	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

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 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 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 State 2 to 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, 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 (1 to 2 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 pine 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 reference state’s (State 1) understory. Restoring the understory may include planting shortleaf 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 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 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 pine and oak species to their natural frequencies (see State 1 Overstory Composition table), trying to attain a 50 to 75 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 silvicultural production. The site is prepared and planted to either a monoculture of pine or hardwood trees.

Additional community tables

Table 11. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	60–100	–	–
bluejack oak	QUIN	*Quercus incana*	Native	–	10–30	–	–
black hickory	CATE9	*Carya texana*	Native	–	0–10	–	–
post oak	QUST	*Quercus stellata*	Native	–	0–10	–	–
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	0–10	–	–
southern red oak	QUFA	*Quercus falcata*	Native	–	0–5	–	–

Table 12. 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*	Native	–	15–75
needleleaf rosette grass	DIAC	*Dichanthelium aciculare*	Native	–	15–35
variable panicgrass	DICO2	*Dichanthelium commutatum*	Native	–	5–20
splitbeard bluestem	ANTE2	*Andropogon ternarius*	Native	–	0–10
Forb/Herb					
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	–	5–25
Texas bullnettle	CNTE	*Cnidoscolus texanus*	Native	–	5–20
Gulf Coast yucca	YULO	*Yucca louisianensis*	Native	–	1–5
Louisiana nerveray	TELU	*Tetragonotheca ludoviciana*	Native	–	0–5
farkleberry	VAAR	*Vaccinium arboreum*	Native	–	0–5
Nuttall's wild indigo	BANU2	*Baptisia nuttalliana*	Native	–	0–5
whitemouth dayflower	COER	*Commelina erecta*	Native	–	1–5
nettleleaf noseburn	TRUR2	*Tragia urticifolia*	Native	–	0–3
soft greeneyes	BEPU2	*Berlandiera pumila*	Native	–	0–3
healing croton	CRAR2	*Croton argyranthemus*	Native	–	0–3
hoary ticktrefoil	DECA8	*Desmodium canescens*	Native	–	0–3
sessileleaf ticktrefoil	DESE	*Desmodium sessilifolium*	Native	–	0–3
St. Andrew's cross	HYHY	*Hypericum hypericoides*	Native	–	0–3
blackeyed Susan	RUHI2	*Rudbeckia hirta*	Native	–	0–1
sidebeak pencilflower	STBI2	*Stylosanthes biflora*	Native	–	0–1
butterfly milkweed	ASTU	*Asclepias tuberosa*	Native	–	0–1
Fern/fern ally					
western brackenfern	PTAQ	*Pteridium aquilinum*	Native	–	1–15
Shrub/Subshrub					
American beautyberry	CAAM2	*Callicarpa americana*	Native	–	5–20
yaupon	ILVO	*Ilex vomitoria*	Native	–	0–15
winged sumac	RHCO	*Rhus copallinum*	Native	–	3–15
sassafras	SAAL5	*Sassafras albidum*	Native	–	3–15
Tree					
bluejack oak	QUIN	*Quercus incana*	Native	–	3–15
post oak	QUST	*Quercus stellata*	Native	–	1–5
black hickory	CATE9	*Carya texana*	Native	–	1–5
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	1–5
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	1–3
Vine/Liana					
muscadine	VIRO3	*Vitis rotundifolia*	Native	–	3–15
summer grape	VIAE	*Vitis aestivalis*	Native	–	1–10
cat greenbrier	SMGL	*Smilax glauca*	Native	–	1–5

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, 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 Northern Deep Sandy 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

Due to the sandy surface layer this soil absorbs most rainfall and under normal conditions there is little runoff. Areas of this unit are sloping to steep, generally slightly convex and form the side slopes above drainage ways.

Recreational uses

Much of this land is leased for deer hunting purposes.

Wood products

These sandy soils are on uplands and have a high potential for pine management. The 50-year site index for loblolly pine averages 90 feet (approximately 60 feet on a 25-year curve), but ranges from 85 feet to 95 feet depending on slope position. The yield from a natural, unmanaged stand of loblolly pine, over a 50-year period, is approximately 330 board feet (Doyle Rule), 2.64 tons, or 90 cubic feet per acre per year. Management can substantially increase this yield. Because these soils are loose when dry, access and equipment operability is poor during such periods when rutting is possible.

They are, however, well suited for access and equipment operability during wet periods. These soils are well suited for roads and log landings but can have erosion problems as slopes increase. Adequate water control devises for roads such as wing ditches and water bars should be installed on the steeper slopes. Seedling mortality may be slight to moderate. Proper planting depth and compaction will be important. Herbaceous weed control may be needed. Attention should be given to the possible leaching of fertilizers and of chemicals when herbicides are used for site preparation. Choose appropriate chemicals and application methods to reduce the possibility of contaminating ground water.

Other products

Fruits, nuts, acorns, and seeds of the trees, shrubs, vines and herbaceous plants are used for food, jellies and jam. Sand may be used for construction purposes.

Table 13. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
loblolly pine	*PITA*	75	95	280	330	35	–	–	
shortleaf pine	*PIEC2*	66	86	210	270	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° 33′ 12″
Longitude	-95° 10′ 7″
General legal description	Davy Crockett National Forest

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Contributors

Tyson Hart

Approval

Bryan Christensen, 12/13/2023

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	04/26/2024
Approved by	David Kraft
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:**