USDA Natural Resources Conservation Service

Ecological site F152BY006TX
Well Drained Loamy Upland

Last updated: 9/22/2023
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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): 152B–Western Gulf Coast Flatwoods

Major Land Resource Area (MLRA) 152B, Western Gulf Coast Flatwoods, is in eastern Texas and western Louisiana. Locally termed the Flatwoods, the area is dominated by coniferous forest covering 5,681 square miles (14,714 square kilometers). The region is a hugely diverse transition zone between the northern and eastern mixed forests and southern and western coastal prairies and grasslands.

Classification relationships

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

Ecological site concept

The Well Drained Loamy Upland ecological site has very deep loamy, well to moderately well drained soils. These sites have the highest potential for producing biomass across the area. They support high quality stands of timber and dense stands of herbaceous vegetation.

Associated sites

F152BY001TX	**Depressional** Soils are on a lower landform and are ponded during portions of the year.
F152BY002TX	**Sodic Flats** Soils have high salt concentrations and bioturbation.
F152BY004TX	**Clayey Flat** Soils are comprised of shrink-swell clays.
F152BY005TX	**Seasonally Wet Loamy Upland** Soils have seasonally high water table.
F152BY007TX	**Poorly Drained Loamy Upland** Soils are poorly drained.
F152BY010TX	**Terrace** Soils on terraces.
F152BY014TX	**Poorly Drained Clayey Bottomland** Soils are clayey and on floodplains.

Similar sites

F152BY009TX	**Sandy Terrace** Soils have deep sands.
F152BY005TX	**Seasonally Wet Loamy Upland** Soils have seasonally high water table.
F152BY010TX	**Terrace** Soils are on terraces.

Table 1. Dominant plant species

Tree	(1) *Pinus palustris*
Shrub	(1) *Ilex vomitoria*
Herbaceous	(1) *Andropogon gerardii* (2) *Schizachyrium scoparium*

Physiographic features

The ecological site includes areas on uplands. Slope ranges from 0 to 12 percent, but are typically between 1 and 5 percent. Elevation ranges from 10 to 200 feet. The surfaces are typically convex, which allows for better overall drainage. The water table fluctuates throughout the year. From December to April the depth to the water table can be 15 to 60 inches from the surface. The water table deepens or disappears during the warmer seasons.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Flat (2) Coastal plain > Interfluve
Runoff class	High to low
Flooding frequency	None
Ponding frequency	None
Elevation	3–61 m
Slope	0–2%
Water table depth	38–152 cm
Aspect	Aspect is not a significant factor

Climatic features

The Western Gulf Coast Flatwoods (MLRA 152B) is within the humid subtropical climate zone. The region boasts one of the highest rainfall averages in the southern United States, over 60 inches (152 centimeters) annually. This is due to the gulf currents that carry humid air to the region, where it condenses and precipitates. Rainfall averages are fairly consistent month by month, ranging from the lowest of 3.5 inches (8.9 centimeters) in March and the highest of 5.6 inches (14.3 centimeters) in June.

The area is prone to severe thunderstorms and tornadoes when the proper conditions exist, generally in the springtime. Sometimes excessive rainfall occurs, leading to flooding. Hurricanes also strike the region, generally in late summer or early fall. These extreme weather events can be quite destructive, toppling trees, and serves to naturally reset the vegetation to primary succession. The higher humidity of the region amplifies the feeling of heat during the summer. Prolonged droughts and snowfall events are rare.

Table 3. Representative climatic features

Frost-free period (average)	249 days
Freeze-free period (average)	289 days
Precipitation total (average)	1,600 mm

Climate stations used

- (1) CLEVELAND [USC00411810], Cleveland, TX
- (2) LIBERTY [USC00415196], Liberty, TX
- (3) LUMBERTON [USC00415435], Silsbee, TX
- (4) TOWN BLUFF DAM [USC00419101], Jasper, TX
- (5) DE RIDDER [USC00162367], Deridder, LA
- (6) DE QUINCY [USC00162361], Dequincy, LA
- (7) ELIZABETH [USC00162800], Oakdale, LA
- (8) OBERLIN FIRE TWR [USC00166938], Oberlin, LA
- (9) ORANGE 9 N [USC00416680], Orange, TX
- (10) WILDWOOD [USC00419754], Kountze, TX

Influencing water features

Due to the well-drained nature of the soils, water is typically not a factor to the sites.

Wetland description

The soils associated with this site are considered non-hydric. Some sites have small areas of hydric soils. These small areas are typically small depressions that pond or low flats that remain wet for long periods. Onsite investigation is required to verify local conditions.

Soil features

The soils consist of very deep, well to moderately well drained soils formed in loamy fluviomarine deposits. The representative soils series are Atasco, Boy, Buna, Craigen, Dallardsville, Gist, Kountze, Messer, Niwana, Otanya, Segno, Silsbee, Tarkington, and Westcott. The soils range in taxonomic classification, but belong to the soil orders of alfisols and ultisols. The soils are expansive across the region and provide the best medium for growing plants with little to any restrictions.

Table 4. Representative soil features

Parent material	(1) Fluviomarine deposits–igneous, metamorphic and sedimentary rock
Surface texture	(1) Very fine sandy loam (2) Fine sandy loam (3) Silt loam

Family particle size	(1) Fine-loamy (2) Coarse-loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to very slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-152.4cm)	17.78–35.56 cm
Calcium carbonate equivalent (0-152.4cm)	0%
Electrical conductivity (0-152.4cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0–4
Soil reaction (1:1 water) (0-152.4cm)	3.5–7.3
Subsurface fragment volume <=3" (91.4-152.4cm)	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 – In southeastern Texas and southwestern Louisiana the transition from coastal grasslands to the large expanse of coniferous forest has been deemed the “Flatwoods”. As the name suggests, the region is relatively flat and, with many transitional areas, highly diverse in flora and fauna. Historically, the area was covered by pines with mixed hardwoods, sparse shrubs, and a diverse understory of grasses and forbs. Fire and drainage patterns play a significant role in shaping the plant communities and their development. Fire suppression, drainage alterations, 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 Well Drained Loamy Uplands were Longleaf Pine/Big Bluestem Woodlands. Remnants of this presumed historic plant community still exist where natural conditions are intact. 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 age of this woodland community varies, and has a diverse flora.

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 historic 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, federally-managed properties are the best place to view the remnant sites (National Park Service, U.S. Fish and Wildlife Service, etc.). 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

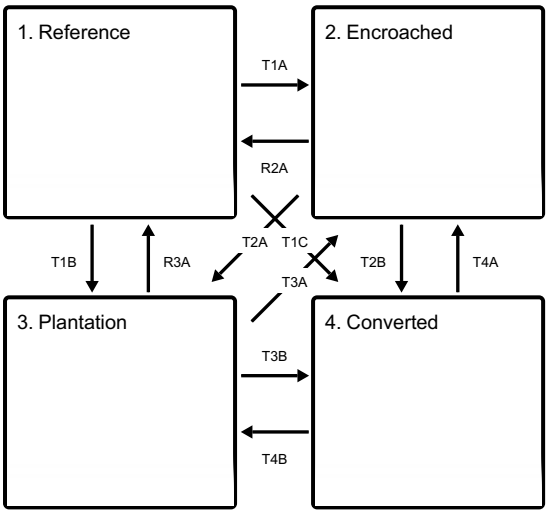
sites.

Fire Regimes – Fire was a natural and important disturbance throughout the region. Fire occurred naturally from lightning strikes, by Native Americans for game movement, and eventually early European settlers. Fires throughout the Flatwoods occurred at two different times. Early in the year, they would occur during late winter and early spring, removing senescent vegetation, recycling nutrients and minerals, and spurring new plant growth. Late summer and early fall 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 can 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.

State and transition model

Ecosystem states



T1A - Absence of disturbance, coupled with natural regeneration over time

T1B - Merchantable timber is harvested by clearcut and site is planted to a monoculture of pine trees

T1C - Removal of native vegetation and introduction of improved forage species or annual crops

R2A - Reduction of overstory canopy using fire and selective thinning

T2A - Merchantable timber is harvested by clearcut and site is planted to a monoculture of pine trees

T2B - Merchantable timber harvested by clearcut, followed by planting of improved forage species or annual crops

R3A - Selective harvest combined with reintroduction of natural disturbances and native species

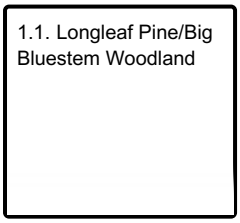
T3A - Lack of natural/anthropogenic disturbance and natural regeneration over time

T3B - Timber harvest by clearcut, followed by planting improved forage species or annual crops

T4A - Lack of natural/anthropogenic disturbance and natural regeneration over time

T4B - Site is planted to a monoculture of pine trees

State 1 submodel, plant communities



State 2 submodel, plant communities

2.1. Pine/Hardwood Forest

State 3 submodel, plant communities

3.1. Plantation

State 4 submodel, plant communities

4.1. Planted Pasture and Row Crop

State 1
Reference

The Well Drained Loamy Upland ecological site is a Longleaf Pine/Big Bluestem Woodland. The deep loamy soils provide an excellent growing medium for plants. The water holding capacity is greater than sandy sites and more available to plants than sites with heavy clays. Nutrients accumulate better in soils with higher clay content in their profile, so the sites have better nutrient availability than the sites with deep sands. The sites are characterized by the high amounts of plant growth. The amounts of fine-fuel litter accumulation allow fires to burn frequently (3 to 5 years). All of these factors contribute to the openness of the site, generally 60 to 80 percent canopy cover. In parallel, sites typically have basal areas of 85 to 105 square feet per acre.

Community 1.1
Longleaf Pine/Big Bluestem Woodland

The overstory canopy is dominated by longleaf pine. An occasional southern red oak (*Quercus falcata*) or post oak (*Quercus stellata*) may be seen, but not enough to be considered co-dominants. The midstory is dependent on time since last fire. Areas with recent burns will have less midstory shrubs present. Indicator shrubs are flameleaf sumac (*Rhus copallinum*) and farkleberry (*Vaccinium arboreum*). Other shrubs present will be American beautyberry (*Callicarpa americana*) and yaupon (*Ilex vomitoria*). Tall grass species are dominant on the site. Little bluestem

(*Schizachyrium scoparium*) will be the most common, but indicator species are big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*). The understory is diverse in forbs as well. Purple coneflower (Echinacea sp.), flowering spurge (*Euphorbia corollata*), gayfeathers (Liatris sp.), and Texas ironweed (Veronia texana) are common.

State 2
Encroached

A long-term lack of fire and management has caused the community to cross a threshold. The crossing of this threshold represents a closure in the overstory canopy, which limits the productivity of the ground layer. The limited ground layer does not provide enough fuel to harbor a burn with the intensity found in State 1. 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, making them vulnerable to attacks from insects and/or diseases. Longleaf recruitment may be nonexistent due to lack of light and bare ground. Loblolly pine will especially take advantage of the current conditions. The plant communities will stay in this constant state and continue to age without disturbance or intervention.

Community 2.1
Pine/Hardwood Forest

The understory plant layer only contains remnants of the reference community and possibly no reference community indicator species. Shade-tolerant grasses, such as longleaf woodoats (*Chasmanthium sessiliflorum*), forbs, and greenbriers (Smilax sp.) may be the only ground-layer species. Added litter accumulation lessens the impact of the droughty soil at the surface. Because the site lacks the diversity of the reference state, the wildlife diversity will be limited to generalist species, species requiring a closed canopy, and those seeking refuge.

State 3
Plantation

The Plantation State is a result of conversion activities. The landowner has maximized silviculture production by planting a monoculture of pine species, usually loblolly pine, but sometimes slash pine (Pinus ellioti) is planted.

Community 3.1
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 4
Converted

The Converted state is a result of pasture and/or cropping activities. The landowner has maximized agriculture production by planting a monoculture of introduced grass species or agricultural row crops.

Community 4.1
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 the reference (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 10 years) of no fire and/or forest management practices. Without fire to suppress tree seedlings, biomass and diversity is lost from the grass and forb layers of the system.

Transition T1B
State 1 to 3

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 pine trees.

Transition T1C
State 1 to 4

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

Restoration of this community to the reference state begins with a selective timber harvest. Removing unwanted trees 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 understory growth. Once the herbaceous layer has established, more frequent than natural burns (1 to 2 years) may be required to suppress the woody vegetation.

Transition T2A
State 2 to 3

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 pine trees.

Transition T2B
State 2 to 4

The transition is due to the land manager maximizing agricultural potential. 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

When restoring a plantation, the land manager can either clearcut the timber, prepare the site, and plant trees.

Otherwise, gap-phase regeneration is possible through selective timber harvests. This involves replanting the desired overstory species in small openings within the current structure of the forest. The benefit is a slow progression of restoration instead of starting from primary succession.

Transition T3A
State 3 to 2

This community transition is caused by neglecting the plantation understory. Without fire, mowing, or herbicides, unwanted understory saplings can begin to grow into the overstory.

Transition T3B
State 3 to 4

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.

Transition T4A
State 4 to 2

This community transition is caused by neglecting crop or pasture. Without continuation of agricultural management, first-successional herbaceous plants will occupy the ground layer, followed by shrubs, and eventually shade-loving, fire-intolerant overstory species.

Transition T4B
State 4 to 3

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

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
longleaf pine	PIPA2	*Pinus palustris*	Native	–	–	–	–
southern red oak	QUFA	*Quercus falcata*	Native	–	–	–	–
post oak	QUST	*Quercus stellata*	Native	–	–	–	–
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
big bluestem	ANGE	*Andropogon gerardii*	Native	–	–
needleleaf rosette grass	DIAC	*Dichanthelium aciculare*	Native	–	–
switchgrass	PAVI2	*Panicum virgatum*	Native	–	–
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	–
Forb/Herb					
purple coneflower	ECHIN	*Echinacea*	Native	–	–
flowering spurge	EUCO10	*Euphorbia corollata*	Native	–	–
blazing star	LIATR	*Liatris*	Native	–	–
anisescented goldenrod	SOOD	*Solidago odora*	Native	–	–
sidebeak pencilflower	STBI2	*Stylosanthes biflora*	Native	–	–
Texas ironweed	VETE3	*Vernonia texana*	Native	–	–
Fern/fern ally					
western brackenfern	PTAQ	*Pteridium aquilinum*	Native	–	–
Shrub/Subshrub					
American beautyberry	CAAM2	*Callicarpa americana*	Native	–	–
yaupon	ILVO	*Ilex vomitoria*	Native	–	–
winged sumac	RHCO	*Rhus copallinum*	Native	–	–
farkleberry	VAAR	*Vaccinium arboreum*	Native	–	–
Tree					
southern red oak	QUFA	*Quercus falcata*	Native	–	–
post oak	QUST	*Quercus stellata*	Native	–	–
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	–
longleaf pine	PIPA2	*Pinus palustris*	Native	–	–
Vine/Liana					
greenbrier	SMILA2	*Smilax*	Native	–	–

Wood products

These soils occur in the Woodland Suitability Group 2o7 and have a high potential for woodland management, both pine and hardwood. The 50-year site index for loblolly pine averages 90 feet (60 feet on a 25-year curve), but ranges from 85 to 100 feet. The yield from an unmanaged, natural 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. The only problem associated with these soils is the somewhat limited access and equipment operability during wet periods when rutting can be a moderate concern. Short term restrictions may be necessary at these times.

Type locality

Location 1: Newton County, TX	
UTM zone	N
UTM northing	30.639205
UTM easting	-93.832603
General legal description	E.O. Siecke State Forest

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Contributors

Tyson Hart

Approval

Bryan Christensen, 9/22/2023

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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	09/21/2021
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):**

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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:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
