USDA Natural Resources Conservation Service

Ecological site F152BY003TX
Sloping Clayey 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 Sloping Clayey Upland ecological site has very deep, moderately well drained soils influenced by slope and clay content. The majority of the region has little to no slope, so the sloping nature of the sites (3 to 5 percent) make them different. Along with slope, the shrink-swell nature of the soils and a less acidic pH (6.6 to 8.8) than surrounding sites give rise to the unique plant community.

Associated sites

F152BY006TX	**Well Drained Loamy Upland** Soils have loamy textures.
F152BY004TX	**Clayey Flat** Soils are somewhat poorly drained and slopes are not as steep.

Similar sites

F152BY004TX	**Clayey Flat** Soils are somewhat poorly drained and slopes are not as steep.

Table 1. Dominant plant species

Tree	(1) *Pinus echinata* (2) *Quercus falcata*
Shrub	(1) *Ilex vomitoria*
Herbaceous	(1) *Elymus virginicus* (2) *Euphorbia marginata*

Physiographic features

The ecological site includes areas on sloping areas on uplands. Slopes range from 3 to 5 percent. Elevation ranges from 10 to 100 feet.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Terrace > Gilgai
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	3–30 m
Slope	3–5%
Water table depth	0 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) DE RIDDER [USC00162367], Deridder, LA
- (2) ELIZABETH [USC00162800], Oakdale, LA
- (3) OBERLIN FIRE TWR [USC00166938], Oberlin, LA
- (4) LIBERTY [USC00415196], Liberty, TX
- (5) LUMBERTON [USC00415435], Silsbee, TX
- (6) TOWN BLUFF DAM [USC00419101], Jasper, TX
- (7) CLEVELAND [USC00411810], Cleveland, TX
- (8) ORANGE 9 N [USC00416680], Orange, TX
- (9) WILDWOOD [USC00419754], Kountze, TX
- (10) DE QUINCY [USC00162361], Dequincy, LA

Influencing water features

The soils have very high runoff and are moderately well drained. Therefore, water is not an influencing factor to the Sloping Clayey Uplands.

Wetland description

The soils associated with this site are not hydric. A few areas may have small areas that are depressional at the foot or head of the slope that may be hydric. Onsite investigation is necessary to determine exact local conditions.

Soil features

The soils of this site consist of very deep, moderately well drained soils formed in clayey alluvium. The soils typically have clay-textured horizons through the entire profile. Soils within this ecological site include Dylan, which is a very-fine, smectitic, hyperthermic Chromic Hapludert. In the lower, subsurface profiles, the clays have shrink-swell properties. The soil shrinks and swells depending on moisture content.

Table 4. Representative soil features

Parent material	(1) Fluviomarine deposits–igneous and metamorphic rock
Surface texture	(1) Clay
Family particle size	(1) Clayey
Drainage class	Moderately well drained
Permeability class	Very slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-152.4cm)	10.16–12.7 cm
Calcium carbonate equivalent (88.9-152.4cm)	0–10%
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)	6.6–8.4

Subsurface fragment volume <=3" (101.6-152.4cm)	0–8%
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 Sloping Clayey Uplands were Shortleaf Pine/Red Oak Forests. Remnants of this presumed historic plant community still exist where natural conditions are still 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.

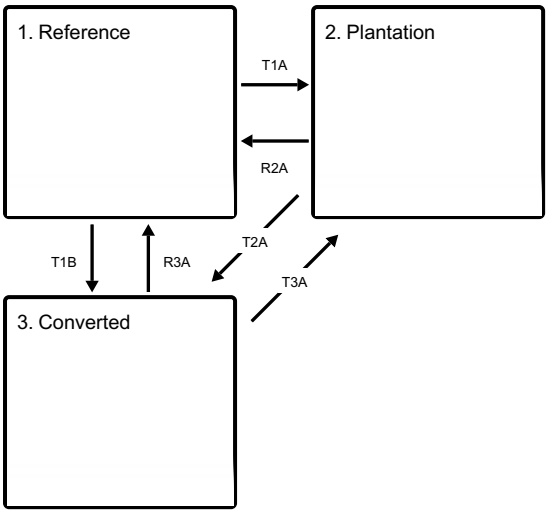
Current Management and State – Today much of the historic forest is gone, replaced by pine plantations, crops, and pastures. The areas that were not converted have been fire-suppressed so long that loblolly pine and fire intolerant hardwoods populate the overstory structure. Currently, federally-managed 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 - Merchantable timber is harvested by clearcut and site is planted to a monoculture of pine trees.

T1B - Merchantable timber is harvested by clearcut and site is planted with improved forage species or annual crops.

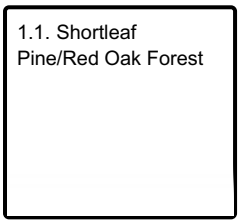
R2A - Reintroduction of desirable native species and natural regeneration overtime

T2A - Merchantable timber is harvested by clearcut and site is planted with improved forage species or annual crops.

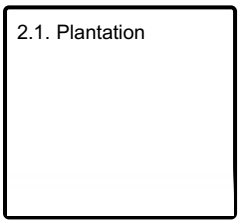
R3A - Reintroduction of desirable native species and natural regeneration overtime

T3A - Site is planted to a monoculture of pine trees

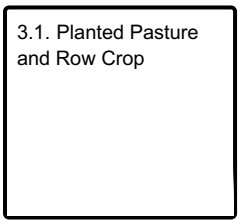
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference

The Sloping Clayey ecological site is a Shortleaf Pine/Red Oak Forest. The entirety of MLRA 152B is typically flat, 0 to 1 percent slopes, so the sloping nature of these sites are unique. The soils are comprised of deep clays with shrink-swell properties. The shifting clays cause some tree trunks to grow crooked as they adjust and grow towards the sunlight. Nutrients accumulate well in the soils and produce a moderate to heavy overstory canopy from 75 to 95 percent. Basal areas can be high, ranging from 70 to over 90 square feet per acre. A moderate fire regime is probable, occurring every 5 to 10 years when herbaceous biomass has accumulated.

Community 1.1
Shortleaf Pine/Red Oak Forest

The overstory canopy is dominated by shortleaf pine and southern red oak, although other overstory trees are common. Mockernut hickory (*Carya tomentosa*) is oftentimes found. Hackberry (*Celtis occidentalis*), persimmon (*Diospyros virginiana*), and eastern redcedar (*Juniperus virginiana*) are mainly found in the understory as young trees but may reach into the overstory if fire intervals are lengthy. The understory shrub and herbaceous species can be dense or sparse depending on time since last fire and overstory canopy cover. American beautyberry (*Callicarpa americana*) and yaupon (*Ilex vomitoria*) are especially prolific, while Virginia wildrye (*Elymus virginicus*) and snow-on-the mountain (*Euphorbia marginata*) serve as herbaceous indicators of the Sloping Clayey Uplands.

State 2
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 2.1
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 3
Converted

This 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 3.1
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 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 T1B
State 1 to 3

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

When restoring a plantation, the land manager can either clearcut, 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 woodland. The benefit is a slow progression of restoration instead of starting from primary succession.

Transition T2A
State 2 to 3

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

This restoration path can be accomplished by planting a mix of oak and pine species to their natural frequencies (see State 1 – Overstory Composition table); trying to attain a representative mature overstory canopy. Management will be required to control unwanted species by burning, mowing, and/or herbicides. Controlling introduced pasture grasses is difficult, with complete control likely not attainable. The herbaceous understory will take time to develop, but this process can be expedited if adapted plant material seed is available.

Transition T3A
State 3 to 2

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							
mockernut hickory	CATO6	*Carya tomentosa*	Native	–	–	–	–
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	–	–	–
southern red oak	QUFA	*Quercus falcata*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
common carpetgrass	AXFI	*Axonopus fissifolius*	Native	–	–
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	–
Forb/Herb					
cultivated garlic	ALSA2	*Allium sativum*	Native	–	–
snow on the mountain	EUMA8	*Euphorbia marginata*	Native	–	–
common boneset	EUPE3	*Eupatorium perfoliatum*	Native	–	–
nightshade	SOLAN	*Solanum*	Native	–	–
Shrub/Subshrub					
possumhaw	ILDE	*Ilex decidua*	Native	–	–
possumhaw	ILDE	*Ilex decidua*	Native	–	–
American beautyberry	CAAM2	*Callicarpa americana*	Native	–	–
Tree					
eastern redcedar	JUVI	*Juniperus virginiana*	Native	–	–
common persimmon	DIVI5	*Diospyros virginiana*	Native	–	–
common hackberry	CEOC	*Celtis occidentalis*	Native	–	–
Vine/Liana					
peppervine	NEAR5	*Nekemias arborea*	Native	–	–
southern dewberry	RUTR	*Rubus trivialis*	Native	–	–
greenbrier	SMILA2	*Smilax*	Native	–	–

Wood products

This site occurs in the Woodland Suitability Group 3c3. The soils have a moderate potential for woodland pine management, but the high pH may make establishment difficult. The 50-year site index for loblolly pine averages 80 feet (approximately 55 feet on a 25-year curve). The yield from an unmanaged natural stand of loblolly pine, over a 50-year period, is approximately 230 board feet (Doyle Rule), 1.84 tons, or 75 cubic feet per acre per year. Although management can substantially increase this yield, trees on these soils tend to have poor form. Therefore a short rotation management scheme may be considered. Access and equipment operability is poor during wet periods. Wet weather limitations may be necessary to prevent rutting and excessive erosion. Low strength and stickiness makes these soils only moderately suited for roads and log landings. As slopes increase, the potential for erosion increases. On steeper slopes, site disturbance should be minimized and control devices on roads such as water bars will be necessary. Re-vegetating roads and log landings may also be necessary. Site preparation and tree planting operations will be affected by the sticky nature of these soils when they are wet. Site preparation should be planned for the drier part of the year. Tree planting should be planned for the drier early part of the planting season. Mechanical tree planting on steeper slopes should be done on the contour. Also, because clay occurs within 10 inches of the surface, care must be taken to ensure proper planting depth. The very slow permeability of these soils means precautions should be taken to prevent contamination of surface waters when using herbicides for site preparation and release. This slow permeability and slightly high pH may also cause a moderate amount of mortality to planted seedlings.

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Contributors

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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	09/20/2021
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:

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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:**
