# Ecological site PX137X00X080
# Dry Sandy Backslope Woodland

Accessed: 05/17/2024

## General information

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

**Figure 1. Mapped extent**

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

## MLRA notes

Major Land Resource Area (MLRA): 137X–Carolina and Georgia Sand Hills

MLRA 137 covers approximately 8,665 square miles (22,450 square kilometers) in the states of South Carolina (44 percent), Georgia (34 percent), and North Carolina (21 percent).

The Sand Hills region occurs below the "fall line", which delineates the older crystalline rocks of the Southern Piedmont (MLRA 136) from the younger sediments of the Southern Coastal Plain (MLRA 133A). The term "fall line" came about because the rivers of the Piedmont cut downward through hard bedrock to meet the lower Coastal Plain sediments. The elevational change is evident in the waterfalls and rapids that occur along this transitional line.

This region is composed of mainly of unconsolidated sediments deposited during the Cretaceous period. Overlying these sediments is the late Miocene to early Pliocene Pinehurst Formation. The Pinehurst Formation is of windblown or eolian origin. Soils in this formation are the subject of this ecological site. Deposits of kaolin and high-silica sands are found across the area and are often mined.

## Classification relationships

ATTENTION: This ecological site meets the requirements for PROVISIONAL. A provisional ecological site is established after ecological site concepts are developed and an initial state-and-transition model is drafted. A provisional ecological site typically will include literature reviews, land use history information, legacy data, and must include some soils data, ocular estimates for canopy and/or species composition by weight, and some line-point intercept information. A provisional ecological site provides the conceptual framework of soil-site correlation for the development of the ESD. For more information about this ecological site, please contact your local NRCS office.

## Ecological site concept

The concept for this ecological site is similar to that for F137XY001GA (Dry sandy Upland Woodland). The map unit components to be correlated to this ES occur on steeper slopes than F137XY001GA (representative slopes > 6 percent). The Ecological Site concept was developed and includes deep, sandy map units (Alaga, Alpin, Candor, Lakeland, and Wakulla) based on preliminary analyses of existing data pertaining to sandy uplands of MLRA 137. This ES concept is distinct because of its native condition (i.e. reference site vegetation), component soils, successional patterns, and wildlife habitat. Reference site vegetation of this ES is edaphically supported by deep, coated sands lacking evidence of a seasonal high water table. Candor and Wakulla soils were not considered when initial draft concepts were established for F137XY001GA. However, upon field observation and discussions with regional staff, it was agreed to include them. Therefore, these series are included in the Dry Sandy Backslope ES. Dominant reference site vegetation includes longleaf pine (Pinus palustris), wiregrass (*Aristida stricta* and *Aristida*

*beyrichiana*), turkey oak ( *Quercus laevis*), and an herb layer. Historically, fire was integral to the evolution and maintenance of the native condition in this region.
Proposed field investigations are designed to test the association of our initial Dry Sandy Backslope Woodland ES with soil series and specific soil properties.

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Pinus palustris*<br>(2) *Quercus laevis* |
| Shrub | Not specified |
| Herbaceous | (1) *Aristida stricta* |

## Legacy ID

F137XY080SC

## Physiographic features

The area is one of transition between the Southern Piedmont and Southern Coastal Plain. The majority of the area is located in the Sea Island Section of the Coastal Plain Province of the Atlantic Plain. The western part of the area in Georgia is located in the East Gulf Coastal Plain Section of the same province and division. Portions of the northern half of the MLRA are in the Piedmont Upland Section of the Piedmont Province of the Appalachian Highlands. The area is highly dissected and hilly, with elevations ranging from 165 to 660 feet. Local relief is typically 10 to 20 feet, but can range up to 165 feet.

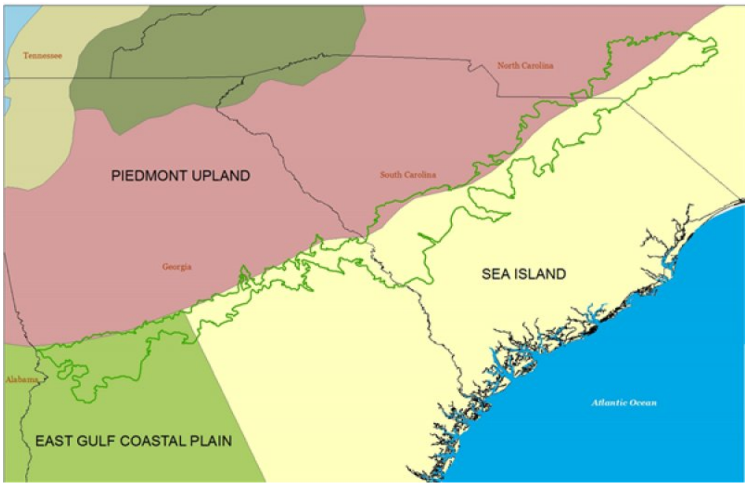


**Figure 2. Physiographic sections of MLRA 137**

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Hill<br>(2) Dune<br>(3) Marine terrace |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 50–201 m |
| Slope | 4–30% |
| Water table depth | 183 cm |
| Aspect | SE |

## Climatic features

The average annual precipitation in this area ranges from 41 to 53 inches (1,041 to 1,346 millimeters). Maxiumum precipitation occurs in midsummer, and the minimum occurs in autumn. High-intensity, convective thunderstorms account for summer rainfall. If snow occurs at all, it is in small amounts.

The average annual temperature ranges from 59 to 65 degrees F (15 to 18 degrees C).

Climate data is based on Normal PRISM data for the period 1981-2010.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 204 days |
| Freeze-free period (average) | 232 days |
| Precipitation total (average) | 1,270 mm |

## Climate stations used

- (1) HAMLET [USC00313784], Hamlet, NC
- (2) MACON MIDDLE GA RGNL AP [USW00003813], Macon, GA
- (3) POPE AFB [USW00013714], Fort Bragg, NC
- (4) JACKSON SPRINGS 5 WNW [USC00314464], Jackson Springs, NC
- (5) JOHNSTON 4 SW [USC00384607], Johnston, SC
- (6) PELION 4 NW [USC00386775], Pelion, SC
- (7) CHERAW [USC00381588], Cheraw, SC
- (8) AUGUSTA BUSH FLD AP [USW00003820], Augusta, GA
- (9) COLUMBIA [USW00013883], West Columbia, SC
- (10) BYRON EXP STN [USC00091448], Byron, GA
- (11) AIKEN 5SE [USC00380074], Aiken, SC
- (12) CAMDEN 3 W [USC00381310], Camden, SC
- (13) SANDHILL RSCH ELGIN [USC00387666], Elgin, SC

## Influencing water features

No water features significantly influence this site.

## Soil features

The site is represented by the components of the Alpin, Candor, Lakeland, and Wakulla series. These soils are very deep, sandy, excessively or somewhat excessively drained soils formed mainly from eolian and marine sediments. The dominant representative slope for the correlated soil components ranges from 7 to 21 percent. Map units with components correlated to this ecological site can range up to 30 percent slope, but the representative slope is greater than six percent. The extent of the ecological site is approximately 169,500 acres.

**Figure 7. Lakeland soils comprise over 115,000 acres of this**

**Table 4. Representative soil features**

| | |
|---|---|
| Surface texture | (1) Sand<br>(2) Coarse sand<br>(3) Loamy sand |
| Drainage class | Somewhat excessively drained to excessively drained |
| Permeability class | Moderate to rapid |
| Soil depth | 183–203 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 7.62–17.78 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 3.6–6.5 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–6% |
| Subsurface fragment volume >3" (Depth not specified) | 0–2% |

## Ecological dynamics

The Dry Sandy Backslope Woodland site is composed of woodland vegetation with a canopy dominated by longleaf pine found on deep sands of dry uplands in the Carolina and Georgia Sand Hills (MLRA 137). These sites are prone to wildland fire. The natural fire regime, ignited by lightning, was probably as frequent as every few years (fire return interval = 2-3 years). Other fires were ignited by humans. Prior to the construction of roads, wildland fires may have burned extensively (thousands of acres). While most lightning in this area is associated with rain, lightning combined with high winds can start wildland fires. Today, prescribed fire can be used by land management agencies to restore and/or maintain the site.

The ecological dynamics of the Dry Sandy Backslope Woodland are fire-dependent. There are two sources of fuel for the surface fires typical of the site. These are longleaf pine needles and the native herbaceous ground cover, especially native grasses such as wiregrass (*Aristida stricta* and *A. beyrichiana*). Naturally functioning sites need both fuel sources to adequately carry the frequent fires that are needed to maintain the site. The loss of either the longleaf pine trees or the native herbaceous ground cover can lead to less frequent surface fires, since fine fuels are reduced. Prolonged fire suppression alters the structure and composition of the site by driving succession toward hardwood dominated communities. Because of the steeper slopes associated with this ecological site, there may be instances of hardwood communities occurring on different aspects.

During the 19th century, longleaf pine declined as a result of turpentine extraction methods which damaged the trees and left them more susceptible to further damage from fire. Longleaf pine timber was coveted for its strength and durability, and many areas were nearly completely depleted of longleaf pine in the early 20th century (Frost and Langley, 2008). The timber industry moved on to other areas where large longleaf pine trees remained, continuing the cycle of tree loss. Longleaf pine is slower growing than loblolly and slash pine and will not regenerate as easily without fire. Many areas once native to longleaf pine became dominated by loblolly pine and hardwood trees as wildland fires were controlled in the middle of the 20th century. In recent decades land managers have become skilled at managing longleaf pine woodlands, and the value of longleaf pine forest products has gained more attention. The special qualities of longleaf pine woodlands are now recognized for their beauty and high biological diversity. Numerous rare plants and animals persist in the Dry Sandy Upland Woodland habitat, especially on the larger public lands, such as military installations and gamelands.

Restoration

Of the remaining areas of longleaf pine ecosystems, only about half are managed, leading to substantial alterations in ecosystem structure and composition (Outcalt, 2000). Pre-settlement fire regimes were typified by short fire-return intervals (FRI = 2–3 years), low-intensity surface fires ignited by lightning, and late Holocene Native Americans (Christensen, 1981). Fire suppression transforms these once open savanna–woodland ecosystems into closed canopy forests, with reduced floral and faunal species richness, as well as heavy accumulations of surface fuels. In some cases, changes from one state to another are reversible, but the return path is different from the path taken in the original change. Therefore, a thorough evaluation of reversibility is necessary before adopting a program of rehabilitation. For instance, a case study by Groffman and others (2006) revealed re-introduction of fire to areas that were suppressed was not effective in reversing the loss of longleaf pine because changes in the distribution of the vegetation lost the ability to transmit fire. Therefore more aggressive management of fire and competing vegetation may be required. General techniques and strategies for restoring upland ecosystems for longleaf pine related to this ecological site are discussed in the individual state and pathway narratives. On- site evaluations are required in order to develop specific recommendations and management prescriptions for desired states.

Prescribed fire is the most common management practice for restoring and maintaining longleaf pine ecosystems. The longleaf pine canopy and wiregrass in the understory function together as keystone species that facilitate but are resistant to fire (Platt et. al., 1988). Growing season burns, especially if frequent, can top kill and remove invading hardwoods effectively while winter fires are best suited for the reduction of hazardous fuels. Seasonality of fires will have varying results, depending on the desired outcome (i.e., vegetation control, seed bed preparation, wildlife forage, etc.) and the specific set of environmental conditions that govern the site.

Chemical control of vegetation, such as the selective application of herbicides, can accelerate the restoration process, especially where the ecosystem is degraded by oak invasion. For instance, low rates of hexazinone application have shown to be very effective in decreasing midstory hardwoods with little or no short-term reduction of understory grasses and forbs on sandhills sites (Brockway et. al., 1998). Other herbicides used in forest management include Velpar L and Pronone 10G. However, the rate of restoration can be significantly more rapid when chemical application is combined with prescribed burning (Boyer, 1991).

Mechanical drum shredders can control large mid-story vegetation. This is a recommended method to accomplish restoration of severely degraded longleaf pine forests. However, the use of mechanical control methods are often expensive, and their effectiveness can be short-lived because brush recovers rapidly in the region (Haywood et al., 2004). In addition, mechanical methods can destroy residual native ground cover propagules. If the management goal is to maintain intact native ground cover, other management options may be more suitable. In most instances, a combination of management practices is recommended in addition to the planting and monitoring of native vegetation.

State and Transition Model

A State and Transition Model for the Dry Sandy Upland Woodland Ecological Site (DSUW) follows this narrative. Thorough descriptions of each state, plant community phase, and transition and restoration pathways are found in the appropriate State narratives. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The reference plant community (state 1) is not necessarily the management goal. Because landowners have different management goals, the STM outlines methods used to transition to or restore a specific community. Biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not complete botanical descriptions of all species occurring, or potentially occurring, on this site. The lists are not intended to cover the full range of botanical potential and site conditions or vegetative response to the conditions.

The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances. It does not mean the pathway would proceed the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

## State and transition model

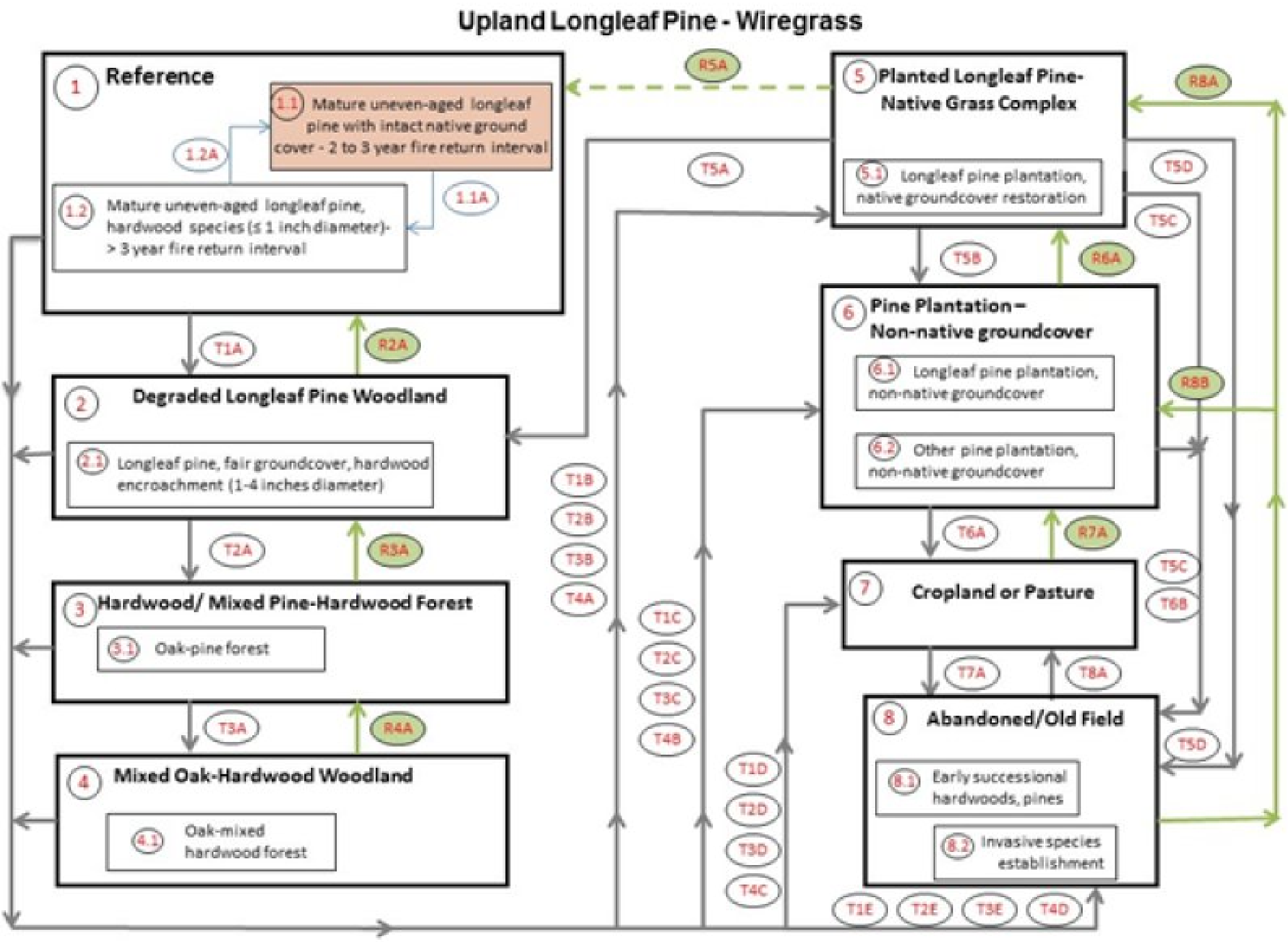


**Figure 8. State and transition model.**

**1.1A**: Lack of fire (> 3 year fire return interval).

**1.2A**: Return to the 2-3 year fire frequency; hardwood removal or herbicide if needed.

**T1A, T2A, T3A, T5A**: Continued lack of fire or infrequent burning (> 3 year fire return interval)

**R2A**: Reintroduction of 2-3 year fire frequency, hardwood removal and/or herbicide if necessary.

**R3A, R4A**: Mechanical and chemical removal of hardwoods and unwanted pines (loblolly, slash), planting longleaf pine if necessary, reintroduction of 3-5 year fire return interval.

**T4A:** Hardwood removal (clear-cut, herbicide), longleaf establishment, native groundcover restoration if needed, reintroduction of 2-3 year fire frequency.

**T1B, T2B, T3B:** Clear cut, plant longleaf, re-establish native groundcover, 2-3 year fire frequency.

**T1C, T2C, T3C, T4B**: Clear cut and/or hardwood removal, plant pines (longleaf, loblolly, slash), 2-3 year fire frequency.

**T1D, T2D, T3D, T4C, T5C, T6A**: Clear-cut, stump and brush removal, establish crop or pasture.

**R5A:** This will require very long-term management (century-scale) in order to achieve an uneven-aged stand. This option is not viable for one generation to accomplish. In order to achieve the reference state, the stand must be managed to be uneven-aged.

**T5B:** Although it is not recommended to transition from a system that contains native ground cover, it is possible if tree density is too high and shades out the native heliophytic vegetation. If transitioning to community phase 6.1, native ground cover is lost. If transitioning to community phase 6.2, longleaf pine is removed, and native groundcover is lost.

**R6A:** If transitioning from phase 6.1, native groundcover restoration should occur: mechanical/chemical groundcover removal, site prep, establishment of native grasses. If transitioning from phase 6.2, longleaf pine needs to be established in addition to native groundcover establishment: other pine removal, site prep, tree establishment.

**R7A**: Site preparation, longleaf or other pine planting, and reintroduction of 2-3 year fire frequency.

**T1E, T2E, T3E, T4D, T5D, T6B, T7B**: Clear-cut, abandonment.

**R7B, R8B:** pH analysis since limed cropland/pastureland has higher pH, herbicide, potential scalping, subsoiling, tree establishment.

**Figure 9. Simplified STM legend.**

## State 1
## Reference State - Longleaf Pine/ Turkey Oak - Southern wiregrass upland

This is the historic climax plant community for this ecological site. An open canopy of longleaf pine exists with a minimal scrub oak understory, commonly turkey oak (*Quercus laevis*) with some bluejack oak (*Q. incana*). Fire is the most important process in maintaining the natural vegetation of this ecological site. The amount of canopy closure in this community depends on the fire regime. Lack of fire tends to lead to the degradation of the natural vegetation by causing canopy closure by hardwoods and loss of longleaf pine and native grasses.

## State 2
## Degraded Longleaf Pine Woodland

The longleaf pine-hardwood forest state is characterized by a more closed canopy relative to the reference state. Turkey oak (*Quercus laevis*) cover begins to rival longleaf pine. Less fire-tolerant pines such as loblolly pine (*Pinus taeda*) begin to establish. Hardwood trees such as dwarf post oak (Q. margarettae), bluejack oak ( *Q. incana*), and persimmon (*Diospyros virginiana*) compete with the remaining longleaf for canopy space. Shrub density and mass is increased relative to the reference state. Herbaceous species richness and productivity will continue to decline with canopy closure and the resulting decrease in sunlight penetration. Species richness is the number of different species present.

## State 3
## Mixed Pine - Hardwood Forest

Lack of a favorable environment for regeneration and competition from hardwoods and other pines have resulted in either longleaf being lost from the site, or remaining individual trees being widely dispersed. Pines such as loblolly pine may have become established due to lack of fire. Canopy closure approaches 100 percent, dominated by oaks with some hickory, sweetgum, and persimmon. Because of lack of sunlight penetration to the understory, shrub size and numbers are reduced relative to state 2, and herbaceous species characteristic of the reference state are very sparse or no longer present.

## State 4
## Mixed oak - Hardwood Woodland

The Mixed Oak - Hardwood state is the product of long-term lack of fire management (century scale?). This community phase is naturally present in patches within the larger ecological site, most often on microsites that are protected from fire (Frost and Langley, 2008; Edwards et al., 2013). However, large-scale fire suppression allows continued encroachment of fire-tolerant oaks, and longleaf pine reproduction eventually ceases. This leaves the site open for continued scrub oak domination. Fine fuels typical for low intensity ground fires are absent, but coarser fuels such as branches and leaves are present. At Fort Gordon near Augusta, GA, this state has resulted from annual dormant season burns after hardwood establishment (Michael Juhan, personal communication). The timing and frequency of the prescribed fire have not been favorable for longleaf regeneration. Brockway and Outcalt (2000) suggest that prescribed fire alone is not effective at enhancing natural longleaf establishment after a major disturbance event such as wildfire. Hardwood removal (chemical or mechanical) in combination with prescribed fire is much more effective.

## State 5
## Planted Longleaf Pine - Native Grass Complex

Longleaf pine are planted to grow trees to a marketable size or to attempt to restore a system that would be similar to the reference plant community and in the interim sell pine straw as an urban landscape mulch (Alig et al., 2002). However, the richness of herbaceous species and associated animals are unlikely to completely mimic the reference state. However, this state is a functioning ecosystem with strong similarities to the reference plant community. Planted pines are generally even-aged and evenly spaced. If longleaf pine planting density is too high, the trees will shade out heliophytic native ground cover. In dense even-aged stands needle fall may be high, which can contribute to hotter fires. Consultation with a professional forester is recommended before establishing a longleaf pine plantation. Grasses commonly planted in this state are wiregrass, little bluestem, Indiangrass and switchgrass.

## State 6
## Pine Plantation - Non-native groundcover

Loblolly and slash are the pine species most often planted in the region to produce a marketable wood product. Establishment of these pines has resulted in longleaf stands lacking native ground cover. Subsequent management will be in keeping with long-term and interim objectives and may include vegetation management with prescribed burning, and periodic stand thinning.

## State 7
## Cropland or pasture

If a pine plantation is not established, the most common agricultural use of the site is pasture or hay production. Fruit and vegetable production, and row crops can be regionally important. Agricultural yield information is available through Web Soil Survey (WSS) and can accessed here: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

### State 8
### Abandoned/Old Field

When management or regular disturbances cease on cut-over forest, row crop or forage land, weedy and woody species become established. The abandoned field state is recognized by secondary plant community succession. Invasive species such as Chinese privet (*Ligustrum sinense*), silktree (Albiziz julibrissin), and cogon grass (*Imperata cylindrica*l) can invade and dominate southern pine sites and prevent many uses. Cogon grass is particularly difficult and costly to control.

### Transition T1A
### State 1 to 2

Continued infrequent or lack of fire will lead to a transition from state 1 to state 2. Increased hardwood and shrub development will occur, and these species will become more fire-tolerant as basal diameters increase. Lack of fire allows the accumulation of a thick litter layer, which inhibits longleaf pine seed germination. Lack of longleaf regeneration further enhances the success of hardwood species. The threshold from state 1 to state 2 is crossed when the natural fire frequency is removed for more than 5 years. Without persistent and costly management, reversal (restoring state 1) is extremely difficult (Walker and Silletti, 2006).

### Transition T1B
### State 1 to 5

Transition from state 1 to state 5: Clear cut, plant longleaf, re-establish native groundcover if necessary Although not recommended, it is possible to convert from state 1 to state 5. Site preparation should occur after an area is clear cut. Coarse woody debris can impede tree planters. Concentrating debris in windrows and piles and burning it is recommended. Unwanted vegetation should be controlled prior to planting to reduce competition for the new stand. This can be accomplished by mechanical and/or chemical methods. Herbicide prescriptions can be developed to target specific species or groups of unwanted vegetation. For example, some herbicides target woody plants; others kill grasses or legumes. Care should be taken when using herbicides to avoid unwanted disturbance and herbicide application to any remaining native ground cover. The site should be monitored for appearance of native groundcover. If herbaceous species do not naturally regenerate, the seed source may have been lost. Native groundcover should be established by planting. Selective cutting can perpetuate stand integrity while providing monetary gain to the landowner. Professional foresters should be consulted on this type of management goal.

### Transition T1C
### State 1 to 6

Transition from state 1 to state 6: Clear cut, plant pines (longleaf, loblolly, slash), maintain 2-3 year fire frequency Although not recommended, it is possible to convert from State 1 to State 6. Site preparation should occur after an area is clear cut. Coarse woody debris can impede tree planters. Concentrating debris in windrows and piles and burning it is recommended. Unwanted vegetation should be controlled prior to planting to reduce competition for the new stand. This can be accomplished by mechanical and/or chemical methods. Herbicide prescriptions can be developed to target specific species or groups of unwanted vegetation. For example, some herbicides target woody plants, while others kill grasses or legumes. Selective cutting can perpetuate stand integrity while providing monetary gain to the landowner. Professional foresters should be consulted on this type of management goal.

### Transition T1D
### State 1 to 7

Transition from State 1 to State 7: Clear-cut, stump and brush removal, establish crop or pasture

### Transition T1E

### State 1 to 8

Transition from State 1 to State 8: Although not recommended, it is possible to transition from the reference state to the Abandoned/Old Field State. This would occur upon clear-cutting and abandonment.

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### Contributors

Dee Pederson

### 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 | |
| Approved by | |
| 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:**