Ecological site PX133A00X006
Upland Longleaf Pine Woodland Moist

Accessed: 05/19/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 133A–Southern Coastal Plain

This MLRA (shown in orange in the figure above) is in Alabama (26 percent), Mississippi (24 percent), Georgia (21 percent), Florida (8 percent), North Carolina (7 percent), Virginia (5 percent), South Carolina (4 percent), Tennessee (4 percent), and Louisiana (1 percent). It makes up about 106,485 square miles (275,930 square kilometers). It is the largest MLRA in the U.S. The city of Alexandria, Virginia, is at the northernmost tip of the area. The MLRA also includes Fredericksburg, Richmond, and Petersburg, Virginia; Rocky Mount, Goldsboro, Fayetteville, and Lumberton, North Carolina; Florence, Sumter, and Orangeburg, South Carolina; Albany and Tifton, Georgia; Tallahassee, Florida; Tuskegee, Eufaula, Selma, and Tuscaloosa, Alabama; Savannah, Tennessee; Corinth, Starkville, Grenada, Meridian, Hattiesburg, and McComb, Mississippi; and Bogalusa, Louisiana. Interstates 95, 64, 85, 40, 20, 20/59, 26, 16, 75, 10, 65, 59, and 55 cross this area from north to south. This area extends from Virginia to Louisiana and Mississippi, but it is almost entirely within three sections of the Coastal Plain Province of the Atlantic Plain. The northern part is in the Embayed Section, the middle part is in the Sea Island Section, and the southern part is in the East Gulf Coastal Plain Section. This MLRA is strongly dissected into nearly level and gently undulating valleys and gently sloping to steep uplands. Stream valleys generally are narrow in their upper reaches but become broad and have widely meandering stream channels as they approach the coast. Elevation ranges from 80 to 655 feet (25 to 200 meters), increasing gradually from the lower Coastal Plain northward. Local relief is mainly 10 to 20 feet (3 to 6 meters), but it is 80 to 165 feet (25 to 50 meters) in some of the more deeply dissected areas.

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 summits and backslopes that have predominantly loamy textures. Representative slopes are <= 30 percent, and map unit slopes range from 0 to 35 percent. Available water is higher than F137XY001GA, Dry Sandy Upland Woodland. The Ecological Site concept was developed to include Butters, Dothan, Faceville, Goldsboro, Greenville, Nankin, Noboco, Norfolk, Orangeburg, and Red Bay map units based on preliminary analyses of existing data pertaining to sandy uplands of MLRA 137. Additional components were added that are hypothesized to support similar vegetation. 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 loamy subsoil . Dominant reference site vegetation includes longleaf pine (Pinus palustris), wiregrass (*Aristida stricta* and *Aristida beyrichiana*), bluejack and blackjack oak (*Quercus incana* and *Q. marilandica*), and an herb layer. Species richness is higher and herb cover is more dense than in the dry sandy or loamy ESs. 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 Moist Upland Woodland, moist phase ES with soil series and specific soil properties.

Steeper slopes and other areas protected from fire may support deciduous hardwood species such as oaks and hickories. Separating this community from the longleaf-dominated site will be difficult due to the scale of soil mapping and patchiness of fire-protected areas.

Table 1. Dominant plant species

Tree	(1) *Pinus palustris* (2) *Quercus marilandica*
Shrub	Not specified
Herbaceous	(1) *Aristida stricta*

Legacy ID

F133AY006NC

Physiographic features

This area extends from Virginia to Louisiana and Mississippi, but it is almost entirely within three sections of the Coastal Plain Province of the Atlantic Plain. The northern part is in the Embayed Section, the middle part is in the Sea Island Section, and the southern part is in the East Gulf Coastal Plain Section. This MLRA is strongly dissected into nearly level and gently undulating valleys and gently sloping to steep uplands. Stream valleys generally are narrow in their upper reaches but become broad and have widely meandering stream channels as they approach the coast. Elevation ranges from 80 to 655 feet (25 to 200 meters), increasing gradually from the lower Coastal Plain northward. Local relief is mainly 10 to 20 feet (3 to 6 meters), but it is 80 to 165 feet (25 to 50 meters) in some of the more deeply dissected areas.

Table 2. Representative physiographic features

Landforms	(1) Marine terrace (2) Hill (3) Interfluve
Flooding frequency	None
Ponding frequency	None
Elevation	37–201 m
Slope	0–30%
Water table depth	15–76 cm
Aspect	Aspect is not a significant factor

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

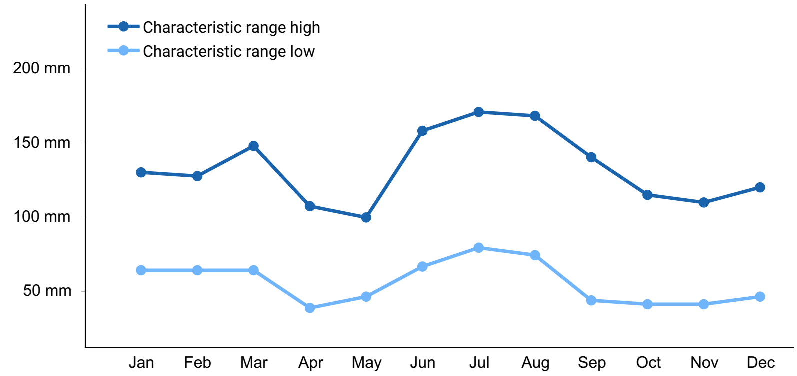

Figure 1. Monthly precipitation range

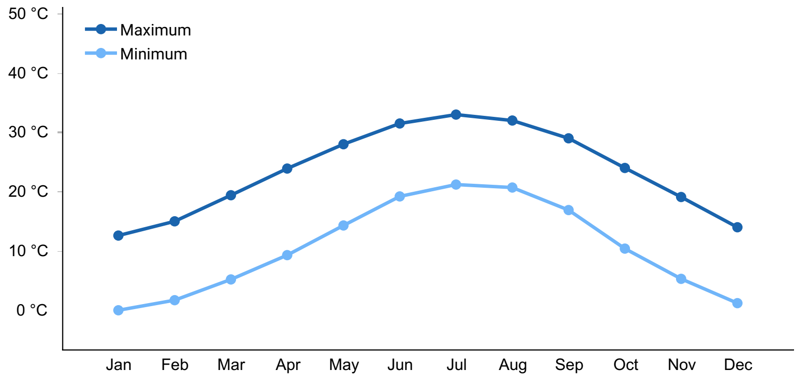

Figure 2. Monthly average minimum and maximum temperature

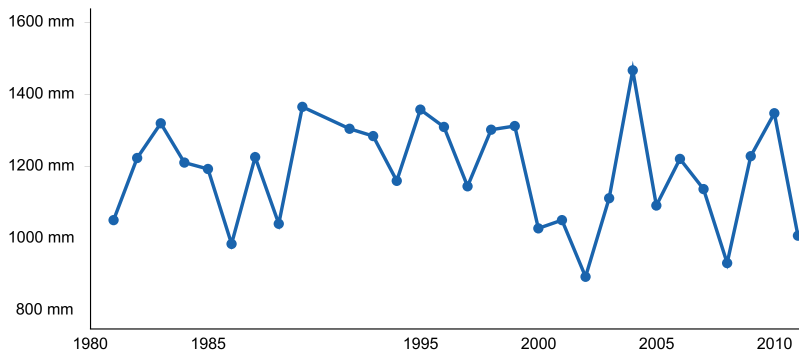

Figure 3. Annual precipitation pattern

Climate stations used

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

- (13) SANDHILL RSCH ELGIN [USC00387666], Elgin, SC

Influencing water features

This site is characterized by soils that have a perched water table for some part of the year. This water table occurs between the depths of 6 and 30 inches.

Soil features

Parent Material: 0 to 203 centimeters (0 to 80 inches) loamy marine sediments
Landscape: Coastal Plain
Landform: Interfluve
Hillslope Profile Position: Summit, shoulder, and backslope
Geomorphic Component: Sideslopes, and interfluves
Slopes: 0 to 8 percent
Elevation: 30 to 122 meters (98 to 400 feet)
Mean Annual Air Temperature: 13 to 21 degrees C (55 to 70 degrees F)
Mean Annual Precipitation: 1020 to 1740 millimeters (40 to 68 inches)
Frost Free Duration: 190 to 310 days

GEOGRAPHICALLY ASSOCIATED SOILS:
These are Dothan, Carnegie, Clarendon, Cowarts, Faceville, Fuquay, Irvington, Marlboro, Norfolk, Noboco, Orangeburg, Stilson, and Sunsweet soils.
Dothan soils are moderately well drained, are on similar positions and have less than 10 percent, by volume, ironstone nodules in the profile.
Carnegie soils are well drained, are on similar positions, have a particle size class of Fine and have plinthite beginning at a depths of 51 centimeters (20 inches).
Clarendon soils are moderately well drained, are on lower positions, the mineralogy is siliceous and have iron depletions of chroma 2 or less within 76 cm (30 inches) of the soil surface.
Cowarts soils are moderately well and well drained, are on higher and dissected positions, have less than 5 percent by volume plinthite in the subsoils, have a solum thickness less than 152 centimeters (60 inches) from the surface and are Typic subgroup.
Faceville soils are well drained on similar positions, have less than 5 percent ironstones nodules and plinthite in their profiles, have a particle size class of Fine, have redder subsoils and are Typic subgroup.
Fuquay soils are well drained on higher positions and are in an Arenic subgroup.
Irvington soils are well drained on slightly slower positions and have a fragipan.
Marlboro soils are well drained on similar positions, have less than 5 percent ironstones nodules and plinthite in their profiles, have a particle size class of Fine and are Typic subgroup.
Noboco soils are moderately well to well drained on lower positions, classified in the Oxyaquic subgroup, and do not have plinthite or ironstone nodules.
Norfolk soils are well drained on similar positions, have less than 5 percent ironstone nodules and plinthite in their profiles, have a particle size class of Fine-loamy, and are Typic subgroup.
Orangeburg soils are well drained on similar positions, have less than 5 percent ironstone nodules and plinthite in their profiles, have a particle size class of Fine-loamy, have redder subsoils and are in the Typic subgroup.
Stilson soils are moderately well drained on lower positions, and are in an Arenic subgroup.
Sunsweet soils are well drained soils and are on similar positions, have a particle size class of Fine and have plinthite beginning at a depth of 20 centimeters (8 inches).

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY:
Drainage class: Well drained
Saturated Hydraulic Conductivity (Ksat): moderately high to moderately low in the lower Btv, BCt, or C horizons, and moderately high to very high in the A and upper B horizons.
Permeability: rapid or moderately rapid to slow in the lower Btv, BCt or C horizons.
Water table: the perched water table is between depths of 129 to 152 centimeters (50 to 60 inches) during the wet season from January through March, but recedes to greater than 203 centimeters (80 inches) during the rest of the year when conditions are dry.
Flooding frequency and Duration: None.
Ponding frequency and Duration: None.

USE AND VEGETATION:
Most areas of Tifton soils are under cultivation with cotton, corn, peanuts, vegetable crops, and small grains. Some areas are in pasture and forestland. The forested areas consist largely of longleaf pine, loblolly pine, slash pine with some scattered hardwoods on cutover areas.
Tifton, Orangeburg, Dothan, Fuquay, Norfolk, Cowarts, Faceville, Goldsboro, Bonifay, Carnegie, Ailey, Autryville

Table 4. Representative soil features

Surface texture	(1) Loamy sand (2) Sandy loam
Drainage class	Well drained
Permeability class	Moderate to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–33.02 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)	3.5–6
Subsurface fragment volume <=3" (Depth not specified)	0–18%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

The Moist Upland Woodland, Moist 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) and MLRA 133. 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 site 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 Moist Upland Wodland ecological site 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.

DATA WILL NEED TO BE UPDATED AS FIELD WORK IS COMPLETED. DCP 2.13.2015

State and transition model

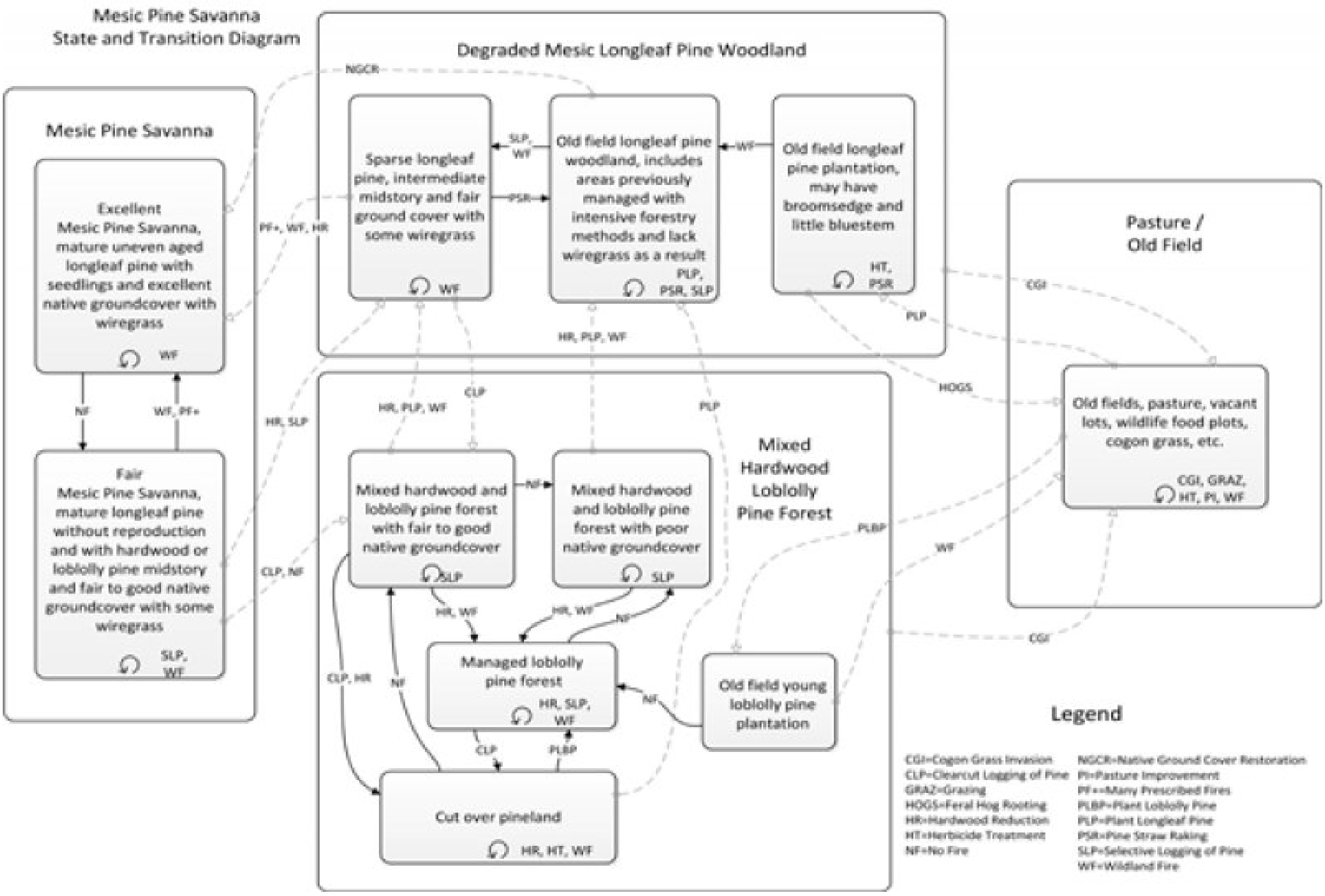

Figure 5. image

State 1
Reference State - Longleaf Pine/ Blackjack 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 oak understory, commonly *Quercus marilandica* (blackjack oak).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.

Community 1.1
Longleaf pine-wiregrass

The overstory of this community is dominated by widely-spaced mature longleaf pine. Typical pine canopy cover ranges from 5 to 40 percent. Canopies are open and trees are uneven-aged but the community also includes variably-sized openings with even-aged trees. These openings result from windstorms, timber harvest, hot fires, or insect-induced mortality. For longleaf pine seed germination to occur, abundant light and bare soil are needed. These conditions are found in canopy gaps immediately following fire events. Common mid-story vegetation cover is generally sparse and composed mainly of oak species. Blackjack oak (*Quercus marilandica*) is the most common, followed by bluejack (*Q. incana*). Some oaks can persist even though frequent fire discourages hardwood establishment. For most sites, a fire return interval of two to three years prevents hardwood invasion (Edwards et al., 2013). Species richness is high in the herbaceous understory of these communities (Peet and Allard, 1993). Wiregrass (Aristida species) is the dominant grass, but bluestems (Schizachrium and Andropogon species), and rosette grass (Dicanthelium sp.) can also be found. Georgia bear grass (*Nolina georgiana*), a rare species, is also found in dry longleaf pinelands (Sorrie, 2011). Grass-dominated groundcover provides necessary fine fuels for the spread of surface fires. Frequent low intensity fire is necessary for the perpetuation of this community phase. NOTE: DATA NEEDS TO BE UPDATED! 2.6.2014 DCP

Forest overstory. Pinus palustris (longleaf pine)

Forest understory. Quercus marilandica (blackjack oak)
Quercus incana (bluejack oak)
Diospyros virginiana (persimmon)
Sassafras albidum (sassafras)
Aristida beyrichiana (Beyrich threeawn)
Gaylusaccia dumosa (dwarf huckleberry)
Vaccinium stamineum (deerberry)
Tephrosia virginiana (Virginia tephrosia)
Baptisia perfoliata (catbells)

Community 1.2
Mature longleaf pine overstory, mid- and understory oak encroachment, in need of fire

This community phase is generally the result of lower fire frequency. Either fire suppression or a change in fire regime (burning every 3 to 5 years, dormant season burns) allows woody vegetation growth in the mid- and understory. Species composition is similar to phase 1.1. The dominant overstory species is longleaf pine, which are widely spaced across the landscape. Because of the buildup of litter and resulting lack of bare mineral soil, longleaf pine regeneration is inhibited. If fire suppression continues, oaks and other hardwoods will thrive, eventually out-competing any young longleaf that have managed to become established. In addition, herbaceous groundcover is not as abundant as in phase 1.1, although species composition is similar. Changes in fire regime result in successful hardwood encroachment, litter accumulation, and a subsequent shift in herbaceous species abundances. Note: Data associated with this phase needs to be updated. 2.6.2014 DCP

Forest overstory. longleaf pine (Pinus palustris)
turkey oak (Quercus laevis)

Pathway 1.1A
Community 1.1 to 1.2

A fire frequency of two to three years controls encroaching hardwood trees and shrubs. Longleaf pine seed germination is promoted by eliminating thick litter layer development. Extended fire suppression or fire regime alteration will cause community phase 1.1 to transition to community phase 1.2. If the fire return interval persistently exceeds three years or fires occur during the dormant season, encroaching hardwoods will become well established. Longleaf pine seed germination will be severely inhibited due to litter accumulation and lack of bare soil.

Pathway 1.2A
Community 1.2 to 1.1

A return to a fire frequency of one to three years will revert community phase 1.2 to the reference community phase (1.1). This can be achieved by wildland fire or prescribed burning. In some areas, removal of hardwoods by mechanical or chemical means can speed up the restoration (Provencher et al., 2001; Brockway and Outcalt, 2000).

Conservation practices

Prescribed Burning
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement
Native Plant Community Restoration and Management

State 2
Longleaf Pine - Oak Woodland

The longleaf pine-hardwood forest state is characterized by a more closed canopy relative to the reference state. BLackjack oak (*Quercus marilandica*) cover begins to rival longleaf pine. Less fire-tolerant pines such as loblolly pine (*Pinus taeda*) begin to establish. Hardwood trees such as 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.

Community 2.1
Degraded longleaf pine with sparse regeneration, intermediate mid-story, and fair ground cover

More than five years of fire suppression crosses a threshold from state 1 to state 2. This state is characterized by scattered longleaf pine. Continued fire suppression allows oak seedlings to reach basal diameters greater than four inches, which allows the hardwoods to resist surface fires that may occur. Thus, blackjack oak cover begins to rival that of longleaf pine, and, due to lack of longleaf pine regeneration will become dominant. Loblolly pine (*Pinus taeda*) may also begin to encroach. Herbaceous species richness suffers from continued fire suppression. Increased shade negatively impacts native groundcover as hardwood coverage continues to expand. The result is degraded stand structure and reduction in fine fuels needed to carry a prescribed burn. This cycle continues to support hardwood dominance. NOTE: DATA NEEDS TO BE UPDATED! 2.6.2014 DCP

Forest overstory. Pinus palustris (longleaf pine)
Quercus laevis (turkey oak)
Quercus margarettae (dwarf post oak)
Quercus incana (bluejack oak)
Diospyros virginiana (persimmon)

State 3
Hardwood-Mixed Pine 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.

Community 3.1
Mixed hardwood- Pine forest

The canopy of this community phase is usually dominated by blackjack oak (*Quercus marilandica*) and can have scattered loblolly pine (*Pinus taeda*). Longleaf can still be present, but regeneration is not occurring. Other oaks (*Q. incana*, Q. margarettae), persimmon (*Diospyros virginiana*), and sweetgum (*Liquidambar styraciflua*) are also present. The absence of fuels from pine needles and herbaceous plants will further decrease the ability of the site to carry surface fires and perpetuate the scrub oak-dominated forest. NOTE: DATA NEEDS TO BE UPDATED!! 2.6.2014 DCP

Forest overstory. Pinus palustris (longleaf pine)
Pinus taeda (loblolly pine)
Quercus marilandica (blackjack oak)

Forest understory. Gaylussacia dumosa (dwarf huckleberry)
Vaccinium stamineum (deerberry)
Tephrosia virginiana (Virginia tephrosia)

State 4
Mixed Oak - Hardwood Forest

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 oak domination. Fine fuels typical for low intensity ground fires are absent, but coarser fuels such as branches and leaves are present. Brockway and Outcalt (2000) suggest that presecribed 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. NOTE: DATA NEEDS TO BE UPDATED!! 2.6.2014 DCP

Community 4.1
Mixed oak - Hardwood Forest

This could probably use some fleshing out... 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, long-term fire suppression or lack of forest management can lead to larger spatial coverage of this state (Sorrie, 2011). After continued encroachment of fire-tolerant oaks, longleaf pine reproduction eventually ceases. This leaves the site open for continued oak domination. Fine fuels needed to carry low intensity ground fires are absent, but coarser fuels such as branches and leaves are present.

Forest overstory. Quercus laevis (turkey oak)
Quercus incana (bluejack oak)
Pinus palustris (longleaf pine)
Pinus taeda (loblolly pine)
Sassafras albidum (sassafras)
Diospyros virginiana (persimmon)

Forest understory. Tephrosia virginiana (Virginia tephrosia)
Vaccinium stamineum (deerberry)

State 5
Planted Longleaf Pine with Native ground cover

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.

Community 5.1
Planted longleaf pine-native grasses

A shift to a planted longleaf pine - native grass state could be made from any other forested state in the ecological site by clear cutting, preparing the site and establishing pines and native ground cover (Fox et al., 2004). On former cropland, pasture or old field states, scalping and subsoiling will probably be necessary when preparing the site for tree planting. A planted longleaf pine - native grass state can be managed with fire and utilized as wildlife habitat or livestock grazing land. If shifted from a hardwood forest state, clear cut hardwood trees will sprout from the roots and will have to be controlled, usually with herbicides. If not controlled when the longleaf seedlings are young, hardwood trees and shrubs will likely overcome the site, overtopping and out- competing the longleaf seedlings for light. If shifted from a pine plantation state, a large variety of species could occur in the understory including trees, shrubs, vines, grasses, and grass-like species, forbs, and ferns. Supplemental planting of native understory species may or may not be needed depending on condition of the seed bank and the goals and objectives of the land manager. If pine species other than longleaf were originally established, the plantation can be shifted to longleaf either gradually with selective cutting, prescribed burning and longleaf seedling planting, or all at once with a clearcut, site prep and longleaf plantation establishment. If shifted from a pasture, cropland, or abandoned field state, the understory vegetation will likely be determined by the existing vegetation prior to tree planting and the field preparation that took place. If no permanent vegetation was present (i.e. crop field) then annual species will likely dominate the understory. If perennial grasses were present (i.e. pasture or abandoned field) then these grasses may return along with other annual species occasionally accompanied by greenbriar and blackberry. All understory species will start to diminish as the tree canopy closes unless thinning is utilized to manage for understory vegetation. More desirable native grasses and forbs will not be likely to appear from the seedbank if there is any history of cultivation. Supplemental planting will be necessary if native understory species restoration is a goal for the property. Planted longleaf pine - native grass states will need to be seeded or plugged to native warm season grasses such as wiregrass, little bluestem, and other native species that are commonly utilized as wildlife habitat. In these cases, tree canopy closure must be managed to allow for adequate light for understory vegetation to thrive. NOTE: DATA NEEDS TO BE UPDATED! 2.6.2014 DCP

State 6
Pine Plantation - Non-native ground cover

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.

Community 6.1
Longleaf pine plantation with non-native groundcover

In recent years, longleaf pine planting has increased. However, not all tree planting is accompanied by native ground cover restoration. In the case of having non-native ground cover, the ecological functionality of the ecosystem does not mirror that of a complete longleaf pine-wiregrass ecosystem. Subsequent management should be planned with long term and interim objectives and may include vegetation management with prescribed burning and periodic stand thinning.

Forest overstory. Pinus palustris (longleaf pine)

Community 6.2
Loblolly or slash pine plantation

Southern pines can be managed in a variety of different ways and for a variety of different purposes including timber production, wildlife habitat, recreation, carbon sequestration, biomass production, pine straw production, silvopasture, or a combination of purposes. Pine plantations in this area are primarily managed for pulpwood or higher value products such as saw and veneer logs or utility poles. These products require using even-aged management that ultimately calls for clear-cutting and re-planting at the end of a specified rotation age. Precommercial thinning may occur as early as 5-10 years after stand establishment, and commercial thinning may occur at approximately 10 year intervals, usually producing pulpwood. Pine plantations usually undergo a final harvest between 25 and 45 years of age, but shorter rotation crops of 15 to 18 years are also considered. Silviculture practices include but are not limited to: site preparation, prescribed burning, tree planting, weed control, fertilization, and thinning (Alig et al., 2002). Alternative management prescriptions have been developed to allow for increased plant diversity, especially in the understory; improved wildlife habitat; and uneven-aged and mixed species overstories. Essentially these management prescriptions call for heavier thinning, more frequent prescribed burning and either planting or allowing natural regeneration of native grasses, forbs, shrubs and pine and/or hardwood trees. A proportion of the mature trees are allowed to reach much greater age than typical rotation ages for timber management purposes, creating greater variety of tree sizes and canopy structure. This state can be managed in a way to restore either the planted longleaf pine-native grass state (state 5) or the degraded longleaf pine woodland state (state 2). The pine plantation state can be maintained indefinitely unless a major disturbance such as a crown fire, inclement weather condition, pest, or disease contributes to eliminating the stand. Hardwood tree species will encroach after any thinning operation and must be controlled with prescribed fire, herbicides or a combination of both if a pure pine stand is desired.

Forest overstory. Pinus taeda
Pinus elliottii

State 7
Crop or Pasture land

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.

Restoration pathway R2A
State 2 to 1

Restoration from state 2 to state 1: Reintroduction of 2-3 year fire frequency, hardwood removal and/or herbicide if necessary A return to the 2-3 year fire frequency can restore state 2 to state 1. Longleaf forests accumulate high levels of litter due to the large size and decay resistance of the needles. Care should be exercised when re-introducing fire to this community. Fuel treatments such as raking and/or wetting the area around existing trees and mowing to remove standing fuels might be necessary to prevent mortality of the overstory. In some areas, removal of hardwoods by mechanical or chemical means can hasten restoration (Provencher et al., 2001; Brockway and Outcalt, 2000).

Conservation practices

Brush Management
Prescribed Burning
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement

Transition T2A
State 2 to 3

Transition from state 2 to state 3: Continued lack of fire or infrequent burning Continued fire suppression (> 5 year fire return interval) can affect significant changes in vegetation structure and composition in this ecological site. Hardwood encroachment and establishment is outcompeting the remaining longleaf pine. Furthermore, natural regeneration of longleaf pine and the native herbaceous groundcover species is retarded.

Transition T2B
State 2 to 5

Transition from state 2 to state 5: Remove existing hardwoods (and pines if desired), plant longleaf, re-establish native groundcover if necessary, reintroduction of 2-3 year fire frequency After timber removal, site preparation should occur. 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. Care should be taken when using herbicides, as further disturbance and herbicide application can be detrimental to any remaining native ground cover. The site should be monitored for the 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.

Transition T2C
State 2 to 6

Transition from state 2 to state 6: Clear cut (or hardwood removal), plant pines (longleaf, loblolly, slash), reintroduction of 2-3 year fire frequency After timber removal, site preparation should occur. 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. If transitioning to community phase 6.1, longleaf pine should be planted if necessary. If transitioning to community phase 6.2, other pine species should be planted.

Transition T2D
State 2 to 7

Transition from state 2 to state 7: Clear-cut, stump and brush removal, establish crop or pasture

Transition T2E
State 2 to 8

Transition from state 2 to state 8: Although not recommended, it is possible to transition from this state to the Abandoned/Old field state. This would occur upon clear-cutting and abandonment.

Restoration pathway R3A
State 3 to 2

Restoration from state 3 to state 2: Mechanical and chemical removal of hardwoods and unwanted pines (loblolly, slash), planting longleaf pine if necessary, reintroduction of 3-5 year fire return interval. Longleaf forests accumulate high levels of litter because needles are large and decay resistant. High residual fuel loads may be present where longleaf pine occur. If desired longleaf pine trees are still present on the site, care should be exercised when re-introducing fire to this community. Fuel treatments such as raking and/or wetting the area around existing trees and mowing to remove standing fuels might be necessary to prevent mortality of the overstory. Site preparation is important after timber removal. 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. 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 the appearance of native grasses. If herbaceous species do not naturally regenerate, the seed source may have been lost. If native grasses must be planted becuase no seed source is present, the system cannot be restored to state 2, but will resemble the functioning ecosystem of state 5.

Conservation practices

Brush Management
Prescribed Burning
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement

Transition T3A
State 3 to 4

Transition from state 3 to state 4: Continued lack of fire or infrequent burning Continued fire suppression results in further significant changes in vegetation structure and composition in this ecological site. Hardwood species, particularly scrub oaks, now dominate the forest mid-story, and herbaceous ground cover is largely absent. This community is unable to carry low intensity fires without drastic chemical or mechanical treatments, or catastrophic fires.

Transition T3B
State 3 to 5

Transition from state 3 to state 5: Remove oaks and other hardwoods, plant longleaf, re-establish native groundcover if necessary, reintroduction of 2-3 year fire frequency After timber removal, site preparation should occur. 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. 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 the 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.

Transition T3C
State 3 to 6

Transition from state 3 to state 6: Clear cut (or hardwood removal), plant pines (longleaf, loblolly, slash), re-establish native groundcover if necessary, reintroduction of 2-3 year fire frequency After timber removal, site preparation should occur. 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.

Transition T3D
State 3 to 7

Transition from state 3 to state 7: Clear-cut, stump and brush removal, establish crop or pasture

Transition T3E
State 3 to 8

Transition from state 3 to state 8: Although not recommended, it is possible to transition from this state to the Abandoned/Old field State. This would occur upon clear-cutting and abandonment.

Restoration pathway R4A
State 4 to 3

Restoration from state 4 to state 3: Mechanical and chemical removal of hardwoods, establishment of pines if necessary, reintroduction of 3-5 year fire return interval. Site preparation is important after timber removal. 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. Care should be taken when using herbicides, as disturbance and herbicide application can be detrimental to any remaining native ground cover. The site should be monitored for the 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.

Conservation practices

Brush Management
Prescribed Burning
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement

Transition T4A
State 4 to 5

Transition from state 4 to state 5: Hardwood removal (clear-cut, herbicide), longleaf establishment, native groundcover restoration if needed, reintroduction of 2-3 year fire frequency Site preparation is important after timber removal. 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. Care should be taken when using herbicides, as disturbance and herbicide application can be detrimental to any remaining native ground cover.

Transition T4B
State 4 to 6

Transition from state 4 to state 6: Hardwood removal (clear-cut, herbicide), plant pines (longleaf, loblolly, slash), reintroduction of 2-3 year fire frequency After timber removal, site preparation should occur. 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.

Transition T4C
State 4 to 7

Transition from state 4 to state 7: Clear-cut, stump and brush removal, establish crop or pasture

Transition T4D
State 4 to 8

Transition from state 4 to state 8: Clear cut and abandonment or lack of management

Restoration pathway R5A
State 5 to 1

Restoration from state 5 to state 1: 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 of ownership to accomplish. In order to achieve the reference state, the stand must be managed to be uneven-aged.

Conservation practices

Prescribed Burning
Restoration and Management of Rare and Declining Habitats

Forest Stand Improvement

Transition T5A
State 5 to 2

Transition from state 5 to state 2: Lack of fire (fire return interval > 3 years) Fire suppression can significantly change the vegetation structure and composition of this ecological site. Hardwood encroachment results from fire suppression. Furthermore, natural regeneration of longleaf pine and the native herbaceous groundcover species is retarded as fuels build up. However, this transition would be different in that state 2 describes natural longleaf stands. The transition from a planted stand would have different age structure, but the trigger (lack of fire) would be the same. This would cause the result to be most like state 2 except the pines would be even-aged.

Transition T5B
State 5 to 6

Transition from state 5 to state 6: 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.

Transition T5C
State 5 to 7

Transition from state 5 to state 7: Clear-cut, stump and brush removal, crop/pasture establishment

Transition T5D
State 5 to 8

Transition from state 5 to state 8: Clear-cut, abandonment

Restoration pathway R6A
State 6 to 5

Restoration from state 6 to state 5: If transitioning from phase 6.1, native ground cover restoration should occur. If transitioning from phase 6.2, longleaf pine needs to be established in addition to native ground cover establishment. This requires removal of other pine species. Site preparation should occur after timber removal. 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. Care should be taken when using herbicides to avoid unwanted disturbance and herbicide application to any remaining native ground cover.

Conservation practices

Brush Management
Prescribed Burning
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement

Transition T6A
State 6 to 7

Transition from state 6 to state 7: Clear-cut, stump and brush removal, crop/pasture establishment

Transition T6B
State 6 to 8

Transition from State 6 to State 8: Clear-cut, abandonment

Restoration pathway R7B
State 7 to 5

Restoration from State 7 to State 5: Assess site suitability (pH requirements for longleaf pine), specific site preparation (scalping, subsoiling), plant longleaf pine, establish native groundcover This restoration pathway requires specific management. First, many agricultural fields and pastures have received lime applications, which, over time have increased the pH of the soil. It is difficult to successfully establish longleaf pine on sites with a pH higher than 7.0. If pH is not an issue, the pasture grasses and agricultural weed complex will be. Aggressive control of these herbaceous species can be achieved using appropriate herbicides. A technique called scalping has also proved to be beneficial on agricultural lands, particularly pastures. Scalping essentially forms a shallow (2-4”) but wide (30-36”) furrow by peeling the soil back. Scalping is not recommended for wet areas or soils with high clay content because the scalped rows may hold too much water and drown the seedlings. Highly compacted crop land may require sub-soiling prior to planting to break up any overly compacted soil that will inhibit seedling establishment.

Conservation practices

Prescribed Burning
Firebreak
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement

Restoration pathway R7A
State 7 to 6

Restoration from State 7 to State 6: Site preparation, longleaf or other pine planting, and reintroduction of 2-3 year fire frequency This restoration pathway requires specific management. First, many agricultural fields and pastures have received lime applications, which, over time have increased the pH of the soil. It is difficult to successfully establish longleaf pine on sites with a pH higher than 7.0. If pH is not an issue, the pasture grasses and agricultural weed complex will be. Aggressive control of these herbaceous species can be achieved using appropriate herbicides. A technique called scalping has also proved to be beneficial on agricultural lands, particularly pastures. Scalping essentially forms a shallow (2-4”) but wide (30-36”) furrow by peeling the soil back. Scalping is not recommended for wet areas or soils with high clay content because the scalped rows may hold too much water and drown the seedlings. Highly compacted crop land may require sub-soiling prior to planting to break up any overly compacted soil that will inhibit seedling establishment.

Conservation practices

Brush Management
Prescribed Burning
Firebreak
Tree/Shrub Site Preparation
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement

Transition from Irrigation to Dry-land Plan - Applied

Transition T7A
State 7 to 8

Transition from State 7 to State 8: Clear-cut, abandonment

Restoration pathway R8A
State 8 to 5

Restoration from State 8 to State 5: Longleaf pine establishment and native groundcover restoration should occur. This requires removal of other pine species. After timber removal, site preparation should occur. 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 herbicide target woody plants, while others kill grasses or legumes. Care should be taken when using herbicides, as further disturbance and herbicide application can be detrimental to any remaining native ground cover.

Conservation practices

Brush Management
Prescribed Burning
Firebreak
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Forest Stand Improvement

Restoration pathway R8B
State 8 to 6

Restoration from State 8 to State 6: Land must be cleared, brush removed, and pines established This requires removal of hardwood and other undesirable species. After timber removal, site preparation should occur. 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 herbicide target woody plants, while others kill grasses or legumes. Care should be taken when using herbicides, as further disturbance and herbicide application can be detrimental to any remaining native ground cover.

Conservation practices

Brush Management
Prescribed Burning
Firebreak
Tree/Shrub Site Preparation
Tree/Shrub Establishment

Transition T8A
State 8 to 7

Transition from State 8 to State 7: Land should be cleared and stumped, and crop or pasture established

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	–	5–40	45.7–121.9	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Beyrich threeawn	ARBE7	*Aristida beyrichiana*	Native	–	15–40
pineland threeawn	ARST5	*Aristida stricta*	Native	–	3.5–40
purple bluestem	ANGL10	*Andropogon glaucopsis*	Native	–	0.5–2
capillary hairsedge	BUCIC	*Bulbostylis ciliatifolia var. coarctata*	Native	–	0.5–2
pineywoods dropseed	SPJU	*Sporobolus junceus*	Native	–	0.1–0.5
Gray's beaksedge	RHGR2	*Rhynchospora grayi*	Native	–	0.1–0.5
Addison's rosette grass	DIOVA	*Dichanthelium ovale var. addisonii*	Native	–	0.1–0.5
blood panicgrass	DICO4	*Dichanthelium consanguineum*	Native	–	0.1–0.5
Forb/Herb					
catbells	BAPE3	*Baptisia perfoliata*	Native	–	0.5–3
combleaf yellow false foxglove	AUPE	*Aureolaria pectinata*	Native	–	0.5–2
Virginia groundcherry	PHVIV3	*Physalis virginiana var. virginiana*	Native	–	0.5–2
narrowleaf silkgrass	PIGR4	*Pityopsis graminifolia*	Native	–	0.1–2
anisescented goldenrod	SOODO	*Solidago odora var. odora*	Native	–	0.5–2
Atlantic poison oak	TOPU2	*Toxicodendron pubescens*	Native	–	0.5–2
pine barren stitchwort	MICA8	*Minuartia caroliniana*	Native	–	0.5–2
Carolina indigo	INCA	*Indigofera caroliniana*	Native	–	0.5–2
hairy lespedeza	LEHI2	*Lespedeza hirta*	Native	–	0.5–2
pineland pinweed	LESE7	*Lechea sessiliflora*	Native	–	0.5–2
waxy thoroughwort	EUGL7	*Eupatorium glaucescens*	Native	–	0.5–2
Virginia tephrosia	TEVI	*Tephrosia virginiana*	Native	–	0.5–1.5
grassleaf lettuce	LAGRG	*Lactuca graminifolia var. graminifolia*	Native	–	0.1–1
orangegrass	HYGE	*Hypericum gentianoides*	Native	–	0.1–1
slenderstalk beeblossom	GAFI2	*Gaura filipes*	Native	–	0.1–1
cottony goldenaster	CHGOG	*Chrysopsis gossypina ssp. gossypina*	Native	–	0.1–1
kidneyleaf rosinweed	SICO5	*Silphium compositum*	Native	–	0.1–0.5
butterfly milkweed	ASTU	*Asclepias tuberosa*	Native	–	0.1–0.5
grayhairy wild indigo	BACI	*Baptisia cinerea*	Native	–	0.1–0.5
sandywoods chaffhead	CABE4	*Carphephorus bellidifolius*	Native	–	0.1–0.5
tall ironweed	VEAN	*Vernonia angustifolia*	Native	–	0.1–0.5
sandhill thistle	CIRE2	*Cirsium repandum*	Native	–	0.1–0.5
finger rot	CNURS	*Cnidoscolus urens var. stimulosus*	Native	–	0.1–0.5
pine barren stitchwort	MICA8	*Minuartia caroliniana*	Native	–	0.1–0.5
coastal plain dawnflower	STPA8	*Stylisma patens*	Native	–	0.1–0.5

pineland scalypink	STSES	*Stipulicida setacea var. setacea*	Native	–	0.1–0.5
wavyleaf noseburn	TRUR	*Tragia urens*	Native	–	0.1–0.5
eastern milkpea	GARE2	*Galactia regularis*	Native	–	0.1–0.5
cottony goldenaster	CHGOG	*Chrysopsis gossypina ssp. gossypina*	Native	–	0–0.1
Shrub/Subshrub					
dwarf huckleberry	GADU	*Gaylussacia dumosa*	Native	–	0.5–17.5
deerberry	VAST	*Vaccinium stamineum*	Native	–	3.5–7.5
Georgia beargrass	NOGE	*Nolina georgiana*	Native	–	1.5–3
St. Andrew's cross	HYHY	*Hypericum hypericoides*	Native	–	0.1–2
St. Andrew's cross	HYHY	*Hypericum hypericoides*	Native	–	0.1–0.5
farkleberry	VAAR	*Vaccinium arboreum*	Native	–	0.1–0.5
Tree					
turkey oak	QULA2	*Quercus laevis*	Native	–	5–20
sassafras	SAAL5	*Sassafras albidum*	Native	–	0.1–5
bluejack oak	QUIN	*Quercus incana*	Native	–	0.1–5
violet crabgrass	DIVI2	*Digitaria violascens*	Native	–	1.5–4
common persimmon	DIVI5	*Diospyros virginiana*	Native	–	0.1–3.5
Vine/Liana					
evening trumpetflower	GESE	*Gelsemium sempervirens*	Native	–	0.5–2

Table 7. Community 1.2 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	–	5–35	–	–
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	10–30	–	–

Table 8. Community 1.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
pineland threeawn	ARST5	*Aristida stricta*	Native	–	5–20
pineywoods dropseed	SPJU	*Sporobolus junceus*	Native	–	0.1–0.5
Gray's beaksedge	RHGR2	*Rhynchospora grayi*	Native	–	0.1–0.5
Addison's rosette grass	DIOVA	*Dichanthelium ovale var. addisonii*	Native	–	0.1–0.5
dwarf huckleberry	GADU	*Gaylussacia dumosa*	Native	–	0.1–0.5
Forb/Herb					
pine barren stitchwort	MICA8	*Minuartia caroliniana*	Native	–	0.1–0.5
St. Andrew's cross	HYHY	*Hypericum hypericoides*	Native	–	0.1–0.5
grayhairy wild indigo	BACI	*Baptisia cinerea*	Native	–	0.1–0.5
coastal plain dawnflower	STPAP8	*Stylisma patens ssp. patens*	Native	–	0.1–0.5
wavyleaf noseburn	TRUR	*Tragia urens*	Native	–	0.1–0.5
tall ironweed	VEAN	*Vernonia angustifolia*	Native	–	0.1–0.5
kidneyleaf rosinweed	SICO5	*Silphium compositum*	Native	–	0.1–0.5
anisescented goldenrod	SOODO	*Solidago odora var. odora*	Native	–	0.1–0.5
narrowleaf silkgrass	PIGR4	*Pityopsis graminifolia*	Native	–	0.1–0.5
dwarf huckleberry	GADU	*Gaylussacia dumosa*	Native	–	0.1–0.5
capillary hairsedge	BUCIC	*Bulbostylis ciliatifolia var. coarctata*	Native	–	0.1–0.5
Shrub/Subshrub					
Atlantic poison oak	TOPU2	*Toxicodendron pubescens*	Native	–	0.1–0.5
Tree					
turkey oak	QULA2	*Quercus laevis*	Native	0.3–3	5–15
bluejack oak	QUIN	*Quercus incana*	Native	–	1–5
sassafras	SAAL5	*Sassafras albidum*	Native	–	0–5
common persimmon	DIVI5	*Diospyros virginiana*	Native	–	0.5–5
bluejack oak	QUIN	*Quercus incana*	Native	–	0.1–3.5

Table 9. Community 2.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	10–30	–	–
longleaf pine	PIPA2	*Pinus palustris*	Native	–	5–20	–	–
bluejack oak	QUIN	*Quercus incana*	Native	–	0–5	–	–
common persimmon	DIVI5	*Diospyros virginiana*	Native	–	0–3	–	–

Table 10. Community 3.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	20–40	–	–
longleaf pine	PIPA2	*Pinus palustris*	Native	–	1–20	–	–
loblolly pine	PITA	*Pinus taeda*	Native	–	5–20	–	–

Table 11. Community 3.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Forb/Herb					
Virginia tephrosia	TEVI	*Tephrosia virginiana*	Native	–	0–5
Shrub/Subshrub					
deerberry	VAST	*Vaccinium stamineum*	–	–	1–10
dwarf huckleberry	GADU	*Gaylussacia dumosa*	Native	–	0.5–10

Table 12. Community 4.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	20–40	–	–
loblolly pine	PITA	*Pinus taeda*	Native	–	0–10	–	–
bluejack oak	QUIN	*Quercus incana*	Native	–	1–5	–	–
longleaf pine	PIPA2	*Pinus palustris*	Native	–	0–5	–	–
common persimmon	DIVI5	*Diospyros virginiana*	Native	–	0.5–3	–	–
sassafras	SAAL5	*Sassafras albidum*	Native	–	0.5–3	–	–

Table 13. Community 4.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Forb/Herb					
Virginia tephrosia	TEVI	*Tephrosia virginiana*	Native	–	1–3
Shrub/Subshrub					
deerberry	VAST	*Vaccinium stamineum*	Native	–	1–5

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:

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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:**
