Ecological site F136XY900AL
Talladega Upland and Pine Mountain Acidic High Hills and Ridges, Dry, Metasedimentary

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 136X–Southern Piedmont

This MLRA is on a large piedmont underlain by metamorphic and igneous bedrock. It stretches from north-central Virginia to east-central Alabama, running parallel to the Appalachian highlands to the northwest and the Atlantic coast to the southeast. MLRA 136 has only subtle climatic differences with MLRA 148 (Northern Piedmont), with which it shares a common geologic origin. This adjacent MLRA sits to the north. Along the fall line, it shares a boundary with MLRA 133A (Southern Coastal Plain), MLRA 137 (Carolina and Georgia Sand Hills), and 133C (Gulf Coastal Plain). Here, unconsolidated Coastal Plain sediments intersect the much older Piedmont bedrock. Along it's northwestern boundary, it sits adjacent to MLRAs 130B (Southern Blue Ridge), 130A (Northern Blue Ridge), and 128 (Southern Appalachian Ridges and Valleys). These MLRAs are distinguished from the Southern Piedmont by topographic and elevational differences, as well as differences in the age, origin, and degree of metamorphism of the underlying bedrock. Five states are intersected by the MLRA, including North Carolina (29 percent), Georgia (27 percent), Virginia (20 percent), South Carolina (17 percent), and Alabama (7 percent). The MLRA extent makes up about 63,720 square miles (165,034 square kilometers). MLRA PHYSIOGRAPHY The landscape is generally rolling to hilly, with a well-defined drainage pattern. Streams have dissected the original Piedmont plateau, forming narrow ridgetops, somewhat broad interfluves, and short, steep side slopes adjacent to the streams and drainageways. With some exceptions, the valley floors are generally narrow and make up about 10 percent or less of the land area. The associated stream terraces are generally small and of minor extent. The landscape is moderately dissected overall, with isolated erosional remnants (monadnocks) and other areas of high topographic relief interspersed. Over most of the MLRA, elevation ranges from approximately 325 to 1,315 feet (100 to 400 meters), with elevations generally increasing toward the Appalachian Highlands, in the upper Piedmont, and decreasing toward the Coastal Plain, in the lower Piedmont. The major rivers that cross this area en route to the ocean include, from north to south, the James, Roanoke, Cape Fear, Savannah, Altamaha, Chattahoochee, and Alabama Rivers. These rivers typically originate within the Piedmont or in the Blue Ridge. They flow east and south across the Coastal Plain and empty into the Atlantic Ocean or the Gulf of America. MLRA GEOLOGY Precambrian and Paleozoic metamorphic and igneous rocks underlie almost all of this MLRA. The dominant metamorphic rock types include gneiss, schist, slate, argillite, and phyllite, among others. Dominant igneous rock types include granite and other related felsic crystalline rocks. Mafic intrusive rocks, including gabbro, diabase, amphibolite, and other dark colored rocks, underlie a minority of the upland landscape. These mafic intrusions crop out in the form of dikes and sills, and often weather to produce soils high in base cations. The Carolina Slate Belt runs lengthwise through the east-central part of the MLRA, in southern Virginia, North Carolina, South Carolina, and the eastern-most part of the Georgia Piedmont. This region is underlain by fine-grained metasedimentary and metavolcanic rock, which generally weathers to produce soils high in silt. From Virginia to North Carolina, and in a single county in South Carolina, fault-bounded Triassic Basins are scattered amongst the igneous and metamorphic uplands. These basins are underlain by Triassic and Jurassic siltstone, shale, sandstone, and mudstone, which were laid down in response to continental rifting and subsequent erosion during the Mesozoic era. MLRA SOILS The dominant soil orders of the MLRA are Ultisols, Inceptisols, and Alfisols. Ultisols and Alfisols are typically found on more stable landforms, such as interfluves, gentle hillslopes, broad ridgetops, and stream terraces, while Inceptisols are typically found on less stable landforms, including flood plains, steep hillslopes, and narrow ridgetops. Soils of the region predominantly have a thermic temperature regime, a udic moisture regime, and generally have kaolinitic or mixed mineralogy. In the upper Piedmont of Virginia and North Carolina however, soils have a mesic soil temperature regime, as depicted in figure 2. The mesic soil temperature regime portion of the MLRA is oriented from northeast to southwest and occupies approximately 18 percent of the MLRA extent, or 11,729 square miles (30,377 square kilometers). Broadly speaking, soils of the Southern Piedmont uplands are shallow to very deep, well drained, and loamy or clayey. Soils of the river valleys are generally very deep, well to poorly drained, and loamy. Soils tend to be finer-textured than in Coastal Plain regions. MLRA CLIMATE In general, precipitation is evenly distributed throughout the year in this MLRA, with occasional drought-like conditions extending from late summer into autumn. During the growing season, most of the rainfall comes from high-intensity, convective thunderstorms. Significant moisture also comes from the movement of warm and cold fronts across the MLRA from November to April. High amounts of rain can also occur during hurricanes, usually during the months of August through October. Over most of the MLRA, snowfall is typically light, though overall, the mesic soil temperature regime portion of the MLRA features colder temperatures, more snowfall, and a shorter growing season than in the thermic portion. The cooler climate in this region supports an increase in species with northern or Blue Ridge affinities. Both the mean annual temperature and the length of the freeze-free period increase from north to south and with decreasing elevation from the upper to the lower Piedmont. MLRA LAND USE AND RESOURCES Once largely cultivated, much of this region is now planted to loblolly pine or has reverted to successional pine and hardwood forests. The more productive lands support small to medium-size family farms that produce crops and livestock, while the less productive lands have been in forest for some time. Most of the open areas are used for grazing beef cattle, though in years past, dairy cattle were also important to the local economy. The principal crops of the region include corn, soybeans, and small grains. Burley tobacco remains a crop of local importance. Cotton is grown in the thermic soil temperature regime portion of the MLRA. Several major land cover transformations have occurred in the Southern Piedmont over the past several centuries; from open woodlands sculpted by fire, to farmland, to closed forests and planted pine, past land uses have played an outsized role in shaping present-day soils and vegetation patterns in the region. Land-use intensity peaked with the arrival of the industrial revolution, which gradually increased demand for textiles. Cotton became the dominant crop over much of the region. In spite of early successes, two centuries of poor management practices accelerated soil erosion, stripping away the fertility and moisture-supplying capacity of soils. In addition to soil losses in the uplands, legacy sediments derived from the eroded land rapidly accumulated in the river valleys below, often leading to changes in hydrology and flooding frequency. After being stripped of it's loamy topsoil, many areas of the Piedmont had been so badly eroded as to render the land unsuitable or economically impractical for agriculture. The effects of erosion were widespread, with cumulative soil loss estimates ranging from 5 to 10 inches on average. The steeper slopes, which had often been cleared and farmed at the height of the Cotton era, generally suffered greater losses. By the 1930's, crop production was in rapid decline in the Southern Piedmont. The loss of soil productivity due to erosion, losses to the cotton boll weevil, development of synthetic fibers, and the onset of the Great Depression all contributed to rapid abandonment of cropland. By 1960, cropland acres had decreased by more than 50 percent in nearly every county in the Southern Piedmont. While crop production is still important today on the more productive lands, those of lower productivity, or those that were subject to severe erosion, were often abandoned some time ago. Typically, they have either reverted to forest, or have been converted to other uses. Although the productivity of soils was greatly reduced through erosion, less intensive land uses such as grazing and forestry were still feasible. These land uses gained popularity as patterns of urban migration, low commodity prices, and other factors gradually made crop production less economical on the marginal lands. In recent years, large-scale adoption of soil conservation practices have led to better outcomes with respect to erosion in much of MLRA, increasing the economic viability and long-term sustainability of Piedmont farms. Despite some success, water erosion remains one of the most important soil resource concerns in the MLRA. Other major resource concerns include increasing conversion of prime farmland and farmland of statewide importance to urban uses. Throughout the MLRA, metropolitan areas are expanding into lands that have historically been used for timber or agriculture. This change in land use is occurring rapidly in the corridor called the Piedmont Crescent, which extends from Atlanta, Georgia, to Raleigh, North Carolina. HISTORIC VEGETATION COVER Over most of the Southern Piedmont uplands, the historic oak-hickory, or oak-hickory-pine forest, once covered large portions of the landscape. It was dominated by upland oaks, such as white oak (Quercus alba), northern red oak (Quercus rubra), and southern red oak (Quercus falcata), with a smaller contribution from hickories (Carya spp.) and pines. The principal pine species are shortleaf pine (Pinus echinata), loblolly pine (Pinus taeda), and to the north and west, Virginia pine (Pinus virginiana). In the southernmost and easternmost portions of the MLRA, the historic montane longleaf pine forest, dominated by longleaf pine (Pinus palustris), shortleaf pine (P. echinata), and dry-site oaks, was found on ridgetops and steep south or west-facing slopes. According to historic accounts, forests and woodlands of the past were generally more open and park-like, having been exposed to a more frequent fire regime. Piedmont prairies, likely maintained by Native Americans, were also reportedly common across the landscape, as were fire-maintained canebrakes along the streams (Trimble 1974; Daniels 1987; Griffith et al. 2002; Van Lear et al. 2004; Dearman and James 2019; Schomberg et al. 2020; USDA-NRCS 2022).

LRU notes

MLRA 136 is one of the largest MLRAs in the United States. It has a broad north-south and east-west extent and covers a wide range of elevations. The MLRA is partitioned by the mesic-thermic line, which divides the MLRA into mesic and thermic soil temperature regimes (figure 2.). The mesic soil temperature regime was delineated based on estimates of the native range of loblolly pine, which was historically absent in this part of the MLRA. In addition, this region is said to represent the northern and western limits of cotton production, an important crop to the south and east. ESDs developed for this MLRA were split geographically into mesic and thermic ecological site concepts. Climate variation across the MLRA extent warrants the development of Land Resource Unit (LRU) classifications, to further subdivide the MLRA and support more precise Ecological Site Descriptions.

Classification relationships

APPLICABLE USNVC ASSOCIATIONS CEGL008437 Pinus palustris - Pinus echinata / Quercus marilandica - (Quercus montana) / Vaccinium pallidum; CEGL004432 Pinus palustris - Pinus echinata / Quercus coccinea - Quercus georgiana APPLICABLE EPA ECOREGIONS Level III: 45. Piedmont Level IV: 45d. Talladega Upland; 45h. Pine Mountain Ridges (EPA 2013). APPLICABLE USFS ECOLOGICAL UNITS Domain: Humid Temperate Division: Subtropical Ecological province: 231. Southeastern Mixed Forest Ecological sections: 231A. Southern Appalachian Piedmont (Cleland et al. 2007). Based on the USGS physiographic classification system (Fenneman and Johnson 1946), most of MLRA 136 is in the Piedmont Upland section of the Piedmont province, in the Appalachian Highlands division.

Ecological site concept

This ecological site includes steep side slopes, on high hills and ridges of fine-grained metasedimentary origin in the Talladega Uplands and in the Pine Mountain region in Georgia and Alabama. It is typically found in backslope or shoulder positions, though it can also be found in the summit position on narrow ridges. It is geographically restricted to the thermic soil temperature regime portion of the MLRA. The terrain is rugged, rising gradually to a higher elevation than the surrounding uplands. Elevation is considerably lower however, than the adjacent ridge systems underlain by quartzite, which sit above, as represented by PX136X00X910, an associated ecological site concept. Soils on this ecological site are typically shallow, well drained Ultisols. Parent materials are residuum derived from felsic metasedimentary rocks. Soils are typically loamy, with a high rock fragment content throughout. Base saturation is less than 35 percent in the subsoil. The reference state supports a partially open tree canopy dominated by longleaf pine (Pinus palustris) and shortleaf pine (Pinus echinata), with stunted dry-site oaks and acid-tolerant herbs and shrubs in the understory. Oaks and other deciduous species occupy more of the canopy cover downslope, increasing gradually from summit to lower backslope. Dominant land uses include wildlife habitat, planted pine, and pasture. ES CHARACTERISTICS SUMMARY • Thermic soil temperature regime • Occurs on Piedmont uplands, typically in backslope and shoulder positions, on high hills and ridges of the Talladega Uplands and in the Pine Mountain region in Georgia and Alabama • Base saturation: 35 percent in the subsoil • Seasonal high water table: absent within 72 inches of the soil surface • Depth to bedrock is 40 inches, AND the available water storage capacity of the profile (from the soil surface to 80 inches, or to paralithic or lithic bedrock, whichever is shallower) is less than 4 inches • Parent materials: residuum derived from high grade, fine-grained metasedimentary rock (i.e., phyllite, schist, etc.) • Soils: shallow, well drained Ultisols

Associated sites

F136XY910AL	**Talladega Upland and Pine Mountain Quartzite Ridges, Dry** Found in higher landscape positions over quartzite rocks, on curvilinear ridges of considerably higher elevation. Longleaf pine (Pinus palustris) usually makes a smaller contribution to the canopy under reference conditions, particularly at the higher end of the range in elevation.
F136XY850AL	**Acidic High Hills and Isolated Ridges, Dry-moist** Found on nearby surfaces of greater geomorphic stability, such as broad ridgetops and less steeply sloping backslopes. Soils are deeper to bedrock (usually ? 40 inches) and better developed, with a higher available water storage capacity (? 4 inches). Species composition is similar but primary productivity is presumably higher.
F136XY840GA	**Acidic Upland Colluvial Forest** Found in lower landscape positions, in sheltered colluvial areas that receive water from upslope. Moisture-loving plant species, such as American beech (Fagus grandifolia), northern red oak (Quercus rubra), and tuliptree (Liriodendron tulipifera) are dominant in the canopy.

Similar sites

F136XY910AL	**Talladega Upland and Pine Mountain Quartzite Ridges, Dry** Found in higher landscape positions over quartzite rocks, on curvilinear ridges of considerably higher elevation. Longleaf pine (Pinus palustris) usually makes a smaller contribution to the canopy under reference conditions, particularly at the higher end of the range in elevation.
F136XY880GA	**Acidic High Hills and Isolated Ridges, Depth Restriction, Dry** Found on the surrounding high hills and ridges, outside of the Talladega Uplands and Pine Mountain. Though other soil and site characteristics are similar, elevation is usually lower outside of these regions.

Figure 1. EPA level IV ecoregions of the Southern Piedmont (45).

Figure 2. Spatial illustration of soil temperature regimes of the Southern Piedmont.

Figure 3. Spatial extent of this ecological site representing the major areas where this site is important on the landscape.

Figure 4. An approximation of the native range of montane longleaf pine in Alabama and Georgia, symbolized in dark grey (Varner et al. 2003).

Table 5. Dominant plant species

Tree	(1) *Pinus palustris* (2) *Pinus echinata*
Shrub	(1) *Quercus* (2) *Vaccinium*
Herbaceous	(1) *Sorghastrum nutans* (2) *Pteridium aquilinum*

Physiographic features

This ecological site occurs on high hills and ridges in the Talladega Uplands and in the Pine Mountain region in Georgia and Alabama (EPA ecoregions 45d and 45h respectively), which sit at a lower elevation than nearby curvilinear ridges underlain by quartzite. The landscape is highly dissected, with steep side slopes and narrow ridges, and with a well-defined drainage pattern. This ecological site is typically found in backslope and shoulder positions, though it can also be found in the summit position on narrow ridges.

Representative locations are gently sloping on ridgetops, to steeply sloping on backslopes, with a representative slope of 15 to 45 percent and a maximum slope of 60 percent. The geologic substrate is typically low in ferromagnesian minerals and high in silica. Parent materials include high grade, fine-grained metasedimentary rock, such as phyllite, schist, or gneiss.

Note: Along the southwestern boundary of the Piedmont rise the Talladega, Cheaha, and Rebecca Mountains, together constituting a range of low mountains some 50 miles long, adhering to the same southwest-northeast orientation as the Appalachian Highlands. Over the years, there has been some debate as to which physiographic province the Talladega Uplands belong to, be it the Piedmont or the Blue Ridge. Like the Blue Ridge, these mountain outliers straddle the boundary between the Ridge and Valley to the northwest and the Piedmont plateau to the southeast, suggesting a similar geologic origin. Nonetheless, most modern physiographic classification systems place this region within the Piedmont province, in part because of its modest elevation, and in part because of its location many miles removed from the Blue Ridge proper. From an ecological standpoint however, it has much in common with the Blue Ridge, though with ample influence from warmer regions further south (Mohr 1901; Fenneman and Johnson 1946; Craul et al. 2005; Cleland et al. 2007; Wills and Davenport 2016).

Table 6. Representative physiographic features

Hillslope profile	(1) Backslope (2) Shoulder (3) Summit
Landforms	(1) Piedmont > Ridge (2) Piedmont > Hill
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	290 – 460 m

Slope	20 – 50 %
Water table depth	180 – 2,540 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 7. Representative physiographic features (actual ranges)

Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	220 – 530 m
Slope	10 – 60 %
Water table depth	180 – 2,540 cm

Climatic features

On this ecological site, the average mean annual precipitation is 53 inches. On average, the rainiest months occur from February through March, as well as in July. The driest months occur in September and October, as well as in May in some years.

Table 8 Representative climatic features

Frost-free period (characteristic range)	170-200 days
Freeze-free period (characteristic range)	210-240 days
Precipitation total (characteristic range)	1,270-1,420 mm
Frost-free period (actual range)	170-200 days
Freeze-free period (actual range)	200-240 days
Precipitation total (actual range)	1,250-1,470 mm
Frost-free period (average)	180 days

Freeze-free period (average)	220 days
Precipitation total (average)	1,350 mm

- (1) ASHLAND 3 ENE [USC00010369], Ashland, AL
- (2) THOMASTON [USC00098661], Thomaston, GA
- (3) WEST POINT [USC00099291], Lanett, GA
- (4) HEFLIN [USC00013775], Heflin, AL
- (5) SYLACAUGA 4 NE [USC00017999], Sylacauga, AL

Influencing water features

This ecological site is not influenced by surface or ground water features.

Soil features

Soils on this ecological site are typically shallow, well drained Ultisols. Soils typically have a high content of rock fragments, including gravel and channers. Typically, the depth to unweathered or partially weathered bedrock is less than 20 inches from the surface. Soils weathered from high grade, fine-grained, metasedimentary rock, including phyllite, schist, and gneiss. Natural fertility and available water capacity are low.

Reaction in the subsoil is typically very strongly acid (pH 4.5 to 5.0). In the surface layers, reaction varies with land use and management. Under low input or forested conditions, it generally falls somewhere between pH 4.5 and 5.5. Base saturation is less than 35 percent in the subsoil.

Soils on this ecological site have a thermic soil temperature regime, which is characterized by a mean annual soil temperature of 15°C to 22°C and a winter to summer temperature differential of 6°C or more in the subsoil.

Modal taxa include: Typic Hapludults
Modal soil series include: Tallapoosa
Other soils attributed to this ecological site include Talladega

Figure 7. An illustration of a soil profile belonging to the Tallapoosa series, a representative soil series associated with this ecological site.

Figure 8. A soil profile of the Tallapoosa series.

Table 9. Representative soil features

Parent material	(1) Residuum – phyllite (2) Residuum – schist (3) Residuum – gneiss (4) Residuum – slate
Surface texture	(1) Gravelly, channery fine sandy loam (2) Gravelly, channery loam (3) Gravelly, channery silt loam

Family particle size	(1) Loamy (2) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	40 cm
Soil depth	40 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-203.2cm)	5.08 – 7.62 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5 – 5.5
Subsurface fragment volume <=3" (0-203.2cm)	10 – 20 %
Subsurface fragment volume >3" (0-203.2cm)	0 – 10 %

Table 10. Representative soil features (actual values)

Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	20 – 50 cm
Soil depth	20 – 50 cm

Surface fragment cover <=3"	0 %
Surface fragment cover >3"	0 %
Available water capacity (0-203.2cm)	2.54 – 10.16 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5 – 5.5
Subsurface fragment volume <=3" (0-203.2cm)	0 – 30 %
Subsurface fragment volume >3" (0-203.2cm)	0 – 10 %

Ecological dynamics

U.S. National Vegetation Classification (USNVC) associations that are consistent with reference conditions on this ecological site include CEGL008437 Pinus palustris - Pinus echinata / Quercus marilandica - (Quercus montana) / Vaccinium pallidum, and CEGL004432 Pinus palustris - Pinus echinata / Quercus coccinea - Quercus georgiana.

The reference community on this ecological site overlaps that of Womack and Carter (2011) 'Pinus palustris - Pinus echinata / Vitis rotundifolia' which was found on ridgetops, 'Pinus palustris - Sassafras albidum / Gaylussacia dumosa,' which was found on upper backslopes, and 'Quercus montana / Acer rubrum / Solidago erecta,' which was found on lower backslopes. The study area was managed with prescribed fire, meant to approximate the historic fire return interval.

MATURE FORESTS
The reference state typically supports a partially open tree canopy that is dominated by pines, with dry-site oaks and other deciduous species gradually increasing in abundance downslope. Canopy elements and their proportions vary with aspect, but perhaps less so than in PX136X00X910, an associated ecological site situated on higher ridges with longer slopes. As noted in several accounts of early reconnaissance (Mohr 1901; Harper 1903, 1905; Howell 1921) the flora associated with the steeper slopes of this region often support species with either Blue Ridge or Coastal Plain affinities, as well as species more typical of the Piedmont. Understory species diversity can be surprisingly high, due at least in part to the regional intersection of the native ranges of many Appalachian and Coastal Plain species here.

The extent of this ecological site spans the central range of the montane longleaf pine ecosystem, which once covered ridgetops and south or west-facing slopes in highly dissected portions of the Southern Piedmont, the Ridge and Valley, and the Cumberland Plateau at elevations up to 2000 feet. It is the least common, the most understudied, and most imperiled ecosystem supporting longleaf pine in the southeast.

Montane longleaf pine woodlands are typically dominated by a mixture of longleaf pine (Pinus palustris) and shortleaf pine (Pinus echinata), widely spaced, with stunted, dry-site oaks confined mostly to the subcanopy and shrub layers. Most remnant examples have been degraded however, through selective logging, tar and turpentine production, and decades of fire exclusion. In response, hardwoods have generally increased in number in the canopy, often significantly so, as compared to historical accounts and witness tree records. Tree vigor has also been impacted, so much so that longleaf pine is often scarcely represented or absent altogether in many contemporary stands.

In the subcanopy, characteristic species include blackjack oak (Quercus marilandica), sassafras (Sassafras albidum), sourwood (Oxydendrum arboreum), scarlet oak (Quercus coccinea), blackgum (Nyssa sylvatica), black oak (Quercus velutina), and chestnut oak (Quercus montana), among others. Given the longer fire return interval in the Piedmont, the historic contribution from deciduous understory species is thought to be greater than in coastward longleaf pine systems, with dry-site oaks being the most representative functional group under the natural fire regime.

In the shrub layer, characteristic species include Blue Ridge blueberry (Vaccinium pallidum), dwarf huckleberry (Gaylussacia dumosa), farkleberry (Vaccinium arboreum), Sassafras (Sassafras albidum), and winged sumac (Rhus copallinum), along with saplings of canopy and subcanopy species.

If managed with prescribed fire, the herb layer can be extremely diverse. Common forbs include western brackenfern (Pteridium aquilinum), Virginia tephrosia (Tephrosia virginiana), anisescented goldenrod (Solidago odora), narrowleaf silkgrass (Pityopsis graminifolia), greater tickseed (Coreopsis major), rice button aster (Symphyotrichum dumosum), several species of lespedeza (Lespedeza spp.), small woodland sunflower (Helianthus microcephalus), kidneyleaf rosinweed (Silphium compositum), flaxleaf whitetop aster (Ionactis linariifolius), and many others. Typical graminoids include Indiangrass (Sorghastrum nutans), splitbeard bluestem (Andropogon ternarius), little bluestem (Schizachyrium scoparium), blackseed speargrass (Piptochaetium avenaceum), variable panicgrass (Dichanthelium commutatum), and silver plumegrass (Saccharum alopecuroides).

DYNAMICS OF NATURAL SUCCESSION AND FIRE ECOLOGY
Historically, oak and oak-pine forests of the Southeast were maintained through recurring fire, either naturally-occurring or introduced by humans. Beginning in the early 20th century, a widespread fire suppression campaign resulted in a dramatic decrease in the frequency of fires across the Southeast. These changes gradually altered the vegetation structure and species composition of ecosystems that were dependent on fire for seedling recruitment, reproduction, and maintenance.

The montane longleaf pine ecosystem was particularly sensitive to these effects, as a result of several key adaptations made by the nominal species to recurring fires of the past. As is true for many pine species, longleaf pine is shade-intolerant, reproducing chiefly in canopy gaps or under an open canopy. The seeds of longleaf pine also require direct contact with mineral soil in order to germinate successfully, a requisite of many other pine species as well.

Longleaf pine begins its life in the compact “grass stage,” where it can remain for up to 10 years. In this stage, a dense tuft of needles protects the vulnerable growing point from fire. It is during this time that seedlings begin to stockpile carbohydrate in the growing taproot. Eventually, these reserves are allocated to rapid above-ground growth, in what is known as the "rocket stage," placing the growing point above the level of recurring ground fires. At maturity, trees develop thick, fire-resistant bark, which serves to insulate the sapwood from fire. These adaptations are beneficial under a frequent fire-regime, but in the absence of fire, the combination of shade-intolerance and slow initial growth is problematic.

In most contemporary examples associated with this ecological site, a thick layer of leaf litter and duff has accumulated on the forest floor, inhibiting the regeneration of longleaf and shortleaf pines, and suppressing the growth of understory grasses and forbs. Shrubs, vines, and small trees have often grown up in the understory, further constraining herb growth. Over years of fire exclusion, these characteristics have often progressed to such a degree that conditions are no longer conducive to the spread of fire, a phenomenon known as mesophication. In this scenario, when fire is removed for long periods of time, positive feedbacks result in succession toward forest systems that are less apt to burn.

In the past, the routine use of fire by Native Americans, coupled with periodic lightning-induced fires, constrained the growth of understory shrubs and fire-intolerant trees. These fires maintained a more open canopy and promoted a dense, and often diverse, herbaceous layer that could efficiently carry fire in future burns. While the historic fire return interval is thought to be relatively similar across most of the Southern Piedmont uplands, drier sites were more prone to fire and hence burned more completely and at higher intensities than moister sites.

Vegetation structure was historically more open throughout the Southern Piedmont uplands, but particularly on drier or more exposed sites. Given the more frequent fire regime of the past, canopy cover was likely more open and more heterogeneous than it is presently, and herb cover higher overall, as per historical accounts and witness tree records.

With a dense grassy herb layer, burning would have been more complete and fire more intense than in the current hardwood litter. Under a more regular fire regime, pyrophytic oaks, pines, and other fire-dependent plant species are more competitive, and fire-sensitive species less competitive. Under these conditions, tree species such as red maple (Acer rubrum), which can be abundant in the understory on this ecological site, would have presumably been supplanted by more fire-tolerant tree species. Moreover, tree replacement would have presumably been less dependent on canopy gaps and more on fire than under current, fire-suppressed conditions.

A combination of prescribed burns and selective removals can open up the understory and constrain the growth of fire-intolerant opportunistic species, thereby restoring the health and vigor of forests that evolved under a more regular fire regime (Wharton 1978; Cowell 1998; Varner and Kush 2003; Craul et al. 2005; Spira 2011; Guyette et al. 2012; Womack and Carter 2011; Edwards et al. 2013; Kressuk et al. 2020; Vander Yacht et al. 2020; Greenberg et al. 2021; Spooner et al. 2021)

SPECIES LIST
Canopy layer: Pinus palustris, Pinus echinata, Pinus taeda, Quercus marilandica, Quercus coccinea, Quercus velutina, Quercus montana, Quercus alba, Pinus virginiana

Subcanopy layer: Quercus marilandica, Sassafras albidum, Oxydendrum arboreum, Quercus coccinea, Quercus velutina, Nyssa sylvatica, Quercus montana, Quercus stellata, Acer rubrum, Prunus serotina, Cornus florida, Carya tomentosa, Diospyros virginiana, Carya glabra, Carya pallida

Vines/lianas: Vitis rotundifolia, Smilax glauca, Smilax rotundifolia, Gelsemium sempervirens

Shrub layer: Vaccinium pallidum, Vaccinium arboreum, Gaylussacia dumosa, Sassafras albidum, Rhus copallinum, Vaccinium stamineum, Rubus arguta, Rubus flagellaris, Hypericum hypericoides, Ceanothus americanus, Prunus umbellata, Toxicodendron pubescens, Rhus glabra, Kalmia latifolia, Symplocos tinctoria, Castanea pumilla, Clinopodium georgianum

Herb layer - forbs: Pteridium aquilinum, Tephrosia virginiana, Solidago odora, Pityopsis graminifolia, Coreopsis major, Symphyotrichum dumosum, Lespedeza hirta, Helianthus microcephalus, Silphium compositum, Antennaria plantaginifolia, Ionactis linariifolius, Iris verna, Liatris pilosa, Parthenium integrifolium, Euphorbia pubentissima, Clitoria marinana, Chamaecrista nictitans, Baptisia bracteata, Stylosanthes biflora, Chamaecrista fasciculata, Sericocarpus linifolius, Coreopsis pubescens, Eupatorium album, Galactia volubilis, Solidago erecta, Chrysopsis mariana, Hypoxis hirsuta, Galium circaezans, Pseudognaphalium obtusifolium, Asclepias tuberosa, Hieracium venosum, Aureolaria pectinata, Helianthus divaricatus, Lespedeza violacea, L. repens, L. virginica, L. capitata, Pleopeltis polypodioides, Mimosa microphylla, Cnidoscolus stimulosus, Asclepias amplexicaulis, Euphorbia corollata, Aureolaria virginica, Aureolaria laevigata, Symphyotrichum undulatum, Symphyotrichum concolor, Hypericum gentianoides, Manfreda virginica, Tradescantia hirsuticaulis, Ipomoea pandurata, Polygala incarnata, Polygala curtissii, Vernonia flaccidifolia, Xerophyllum asphodeloides,

Herb layer - graminoids: Sorghastrum nutans, Andropogon ternarius, Schizachyrium scoparium, Piptochaetium avenaceum, Dichanthelium commutatum, Saccharum alopecuroides, Danthonia sericea, Carex nigromarginata, Gymnopogon ambiguus, Gymnopogon brevifolius, Dichanthelium aciculare, Andropogon elliottii, Muhlenbergia capillaris, Carex cephalophora

State and transition model

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 12. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 13. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 14. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 15. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Inventory data references

Data collection and analysis of field data will be performed during the Verification Stage of ESD development.

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Approval

Charles Stemmans, 5/02/2025

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	08/19/2026
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):**

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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:**
