Ecological site F136XY150VA
Mesic Temperature Regime, Low Terraces and Drains, Rare Inundation

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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 CEGL006498 Quercus phellos - Quercus (palustris, lyrata) / Ilex decidua / Carex typhina APPLICABLE EPA ECOREGIONS Level III: 45. Piedmont Level IV: 45e. Northern Inner Piedmont (EPA 2013). APPLICABLE USFS ECOLOGICAL UNITS Domain: Humid Temperate Division: Subtropical Ecological province: 231. Southeastern Mixed Forest Ecological sections: 231I. Central 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 seasonally wet areas on low stream terraces, or along drainageways, which sit slightly above the active flood plain and which are not subject to regular overbank flooding. It is situated in river valleys, or along the lower segments of drainageways leading down to river valleys, in the mesic soil temperature regime portion of the MLRA. Because this ecological site typically sits at an intermediate elevation above the river, the frequency of flooding is typically lower than those ecological sites found on active flood plains.

Flooding occurs mainly after a period of unusually wet weather. It is usually of brief duration. Still, flooding frequency is usually higher than on PX136X00X160, an associated ecological site that often sits on the higher-lying stream terraces nearby. When overbank flooding does occur, it typically slows by the time it reaches this ecological site, so that scouring and movement of debris are relatively minor, but periodic deposition of sediment-bound nutrients is important for fertility. Though flooding is important to consider for planning purposes, it is not the primary driver of pedogenesis or ecological dynamics. Soils on this ecological site are typically very deep, somewhat poorly drained Ultisols or Alfisols. They are generally better developed than those of adjacent flood plains, as the flooding frequency is not great enough to interfere with soil formation to any major extent. Being situated on more stable surfaces, soils on this ecological site usually have an argillic horizon in subsurface layers. Parent materials are typically clayey to loamy old alluvial sediments. The reference state supports a closed canopy forest dominated by bottomland oaks, including willow oak (Quercus phellos) and swamp chestnut oak (Quercus michauxii), along with other species typical of alluvial settings. Dominant land uses include cropland, pasture and hayland, and wildlife habitat. ES CHARACTERISTICS SUMMARY • Mesic soil temperature regime • Occurs on low stream terraces (flood-plain steps) in river valleys, or along the lower segments of drainageways leading down to river valleys • Seasonal high water table: 12 - 18 inches from the soil surface • Soils: very deep, somewhat poorly drained Ultisols or Alfisols

Associated sites

F136XY140VA	**Mesic Temperature Regime, Low Terraces and Drains, Occasional Inundation** Found in similar or slightly lower landscape positions. The seasonal high water table is shallower (0-12 inches from the soil surface), supporting a greater proportion of obligate wetland indicator species.
F136XY160VA	**Mesic Temperature Regime, High Terraces, Very Rare Inundation** Typically found in higher landscape positions further from the stream channel. Flooding is generally less frequent and the seasonal high water table is deeper (> 18 inches from the soil surface), resulting in a decrease in obligate or facultative wetland indicator species and an increase in species associated with upland landscapes.

Similar sites

F136XY110VA	**Mesic Temperature Regime, Flood Plain Forest, Wet** Found on active flood plains that are subject to regular overbank flooding and higher flooding-related tree mortality, supporting an increase in riparian species which invest in rapid growth and early reproduction (e.g., sweetgum (Liquidambar styraciflua), sugarberry (Celtis laevigata), etc.). Soil pH and natural fertility are usually higher on these younger surfaces.
F136XY650NC	**Low Terraces and Drains, Rare Inundation** The soil temperature regime is thermic, occurring within the native range of loblolly pine (Pinus taeda).

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.

Table 4. Dominant plant species

Tree	(1) *Quercus phellos* (2) *Quercus michauxii*
Shrub	(1) *Ilex decidua* (2) *Lindera benzoin*

Herbaceous	(1) *Athyrium filix-femina ssp. asplenioides* (2) *Carex*

Physiographic features

This ecological site is found on stream terraces. Although colloquially these landforms are described as low stream terraces, they are formally classified as flood-plain steps, since they usually sit below the 100 year flood zone. Occasionally, this ecological site can be found along the lower segments of drainageways leading down to river valleys. In either case, overbank flooding is not the primary driver of pedogenesis or ecological dynamics.

This ecological site is geographically restricted to the mesic soil temperature regime portion of the MLRA. It is most extensive on the stepped surfaces of relatively broad river valleys of large river systems. These low terraces, sit elevated slightly above the active flood plain, and are spared from some of the flooding experienced on lower flood plain surfaces.

Stream terraces form in response to gradual downcutting of a stream channel and its immediately adjacent surfaces, usually initiated by events that shift erosional and depositional equilibrium. Over time, abandoned portions of the flood plain are left behind as remnant features. Representative locations are nearly level to gently sloping, with a representative slope of 0 to 4 percent and a maximum slope of 8 percent. The geologic substrate is typically loamy to clayey old alluvial sediments (Zinck 2016; Schoeneberger and Wysocki 2017).

Table 5. Representative physiographic features

Landforms	(1) River valley > Flood-plain step (2) Piedmont > Drainageway
Runoff class	Low to high
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	110 – 270 m
Slope	0 %
Water table depth	30 – 50 cm
Aspect	Aspect is not a significant factor

Table 6. Representative physiographic features (actual ranges)

Runoff class	Negligible to very high
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)

Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	60 – 480 m
Slope	0 – 10 %
Water table depth	30 – 60 cm

Climatic features

On this ecological site, the average mean annual precipitation is 46 inches. On average, the rainiest months occur from May through September, as well as in March. The driest months occur from October through February.

Table 7 Representative climatic features

Frost-free period (characteristic range)	150-170 days
Freeze-free period (characteristic range)	180-210 days
Precipitation total (characteristic range)	1,120-1,190 mm
Frost-free period (actual range)	140-180 days
Freeze-free period (actual range)	170-220 days
Precipitation total (actual range)	1,070-1,270 mm
Frost-free period (average)	160 days
Freeze-free period (average)	190 days
Precipitation total (average)	1,170 mm

- (1) LOUISA [USC00445050], Louisa, VA
- (2) PALMYRA 3S [USC00446491], Palmyra, VA
- (3) BREMO BLUFF [USC00440993], New Canton, VA
- (4) APPOMATTOX [USC00440243], Appomattox, VA
- (5) TYE RIVER 1 SE [USC00448600], Amherst, VA
- (6) LYNCHBURG RGNL AP [USW00013733], Lynchburg, VA
- (7) LYNCHBURG #2 [USC00445117], Lynchburg, VA

- (8) BEDFORD [USC00440551], Bedford, VA
- (9) BROOKNEAL [USC00441082], Brookneal, VA
- (10) CHATHAM [USC00441614], Chatham, VA
- (11) ROCKY MT [USC00447338], Rocky Mount, VA
- (12) MARTINSVILLE FLTR PLT [USC00445300], Martinsville, VA
- (13) DANVILLE [USC00442245], Danville, VA
- (14) DANVILLE RGNL AP [USW00013728], Danville, VA
- (15) STUART [USC00448170], Stuart, VA
- (16) REIDSVILLE 2 NW [USC00317202], Reidsville, NC
- (17) DANBURY [USC00312238], Danbury, NC
- (18) MT AIRY 2 W [USC00315890], Mount Airy, NC
- (19) NORTH WILKESBORO [USC00316256], Wilkesboro, NC
- (20) YADKINVILLE 6 E [USC00319675], East Bend, NC
- (21) WINSTON SALEM RYNLDS AP [USW00093807], Winston Salem, NC
- (22) HICKORY FAA AP [USW00003810], Hickory, NC
- (23) STATESVILLE 2 NNE [USC00318292], Statesville, NC
- (24) MORGANTON [USC00315838], Morganton, NC
- (25) W KERR SCOTT RSVR [USC00319555], Wilkesboro, NC
- (26) RURAL HALL [USC00317548], Rural Hall, NC
- (27) TAYLORSVILLE [USC00318519], Taylorsville, NC
- (28) LENOIR [USC00314938], Lenoir, NC
- (29) PIEDMONT TRIAD INTL AP [USW00013723], Greensboro, NC
- (30) HIGH POINT [USC00314063], High Point, NC
- (31) LEXINGTON [USC00314970], Lexington, NC
- (32) MOCKSVILLE 5SE [USC00315743], Mocksville, NC
- (33) SALISBURY [USC00317615], Salisbury, NC
- (34) SALISBURY 9 WNW [USC00317618], Salisbury, NC
- (35) PHILPOTT DAM 2 [USC00446692], Henry, VA

Influencing water features

This ecological site sits high enough above the active flood plain to avoid some of the flooding experienced on lower surfaces. Flooding occurs mainly after a period of unusually wet weather. The heavy rainfall generates saturation-excess runoff, filling rivers and streams, leading to flooding on the higher river valley surfaces. Unless artificial drainage is introduced, a seasonal high water table is apparent at depths between 12 and 18 inches in representative pedons, generally during the months of December to May.

Soil features

Soils on this ecological site are typically very deep, somewhat poorly drained Ultisols or Alfisols. They are better developed than soils of adjacent flood plains, as they are generally found on more stable surfaces that are more conducive to soil genesis. As such, soils on this ecological site usually have an argillic horizon in subsurface layers. These soils are typically in a fine-loamy or fine particle size family. Redoximorphic features (iron and/or manganese depletions) are found at depths between 12 to 18 inches and below in representative pedons. Parent materials are typically old loamy or clayey alluvial sediments.

Reaction in the subsoil is typically moderately acid to extremely acid (pH 3.5 to 6.0), though it can be closer to neutral under unusually rich site conditions. 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 6.0 in representative pedons.

Soils on this ecological site have a mesic soil temperature regime, which is characterized by a mean annual soil temperature is 8°C to 15°C and a winter to summer temperature differential of 6°C or more in the subsoil.

Modal taxa include: Aeric Endoaquults.
Modal soil series include: Wate
Other soils attributed to this ecological site include Belews Lake and Delanco

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

Table 8. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock

Surface texture	(1) Loam (2) Sandy loam (3) Silt loam
Family particle size	(1) Fine-loamy (2) Fine
Drainage class	Somewhat poorly drained
Permeability class	Moderately slow to moderate
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-203.2cm)	22.86 – 33.02 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5 – 10
Subsurface fragment volume <=3" (0-203.2cm)	0 – 10 %
Subsurface fragment volume >3" (0-203.2cm)	Not specified

Table 9. Representative soil features (actual values)

Drainage class	Somewhat poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	200 cm

Surface fragment cover <=3"	0 %
Surface fragment cover >3"	0 %
Available water capacity (0-203.2cm)	20.32 – 35.56 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5 – 6.5
Subsurface fragment volume <=3" (0-203.2cm)	0 – 10 %
Subsurface fragment volume >3" (0-203.2cm)	0 %

Ecological dynamics

U.S. National Vegetation Classification (USNVC) associations that are consistent with reference conditions on this ecological site include CEGL006498 Quercus phellos - Quercus (palustris, lyrata) / Ilex decidua / Carex typhina. This concept is closely related to the reference community, though in North Carolina, pin oak (Q. palustris) is usually of minor importance in the canopy (USNVC 2022).

MATURE FORESTS
The reference state supports a closed canopy forest dominated by bottomland oaks, including willow oak (Quercus phellos) and swamp chestnut oak (Quercus michauxii), among others. Other characteristic species include green ash (Fraxinus pennsylvanica), American elm (Ulmus americana), and bitternut hickory (Carya cordiformis), and sweetgum (Liquidambar styraciflua). Though usually a minor component of the canopy, upland oaks and hickories are often present in small numbers.

In the subcanopy layer, American hornbeam (Carpinus caroliniana) is usually dominant, as it is in many alluvial settings. Other characteristic species include blackgum (Nyssa sylvatica) and common persimmon (Diospyros virginiana). In the shrub layer, characteristic species include possumhaw (Ilex decidua), blackhaw (Viburnum prunifolium), giant cane (Arundinaria gigantea), southern arrowwood (Viburnum recognitum) and black highbush blueberry (Vaccinium fuscatum).

In the herb layer, dominant species include asplenium ladyfern (Athyrium filix-femina ssp. asplenioides), Jack in the pulpit (Arisaema triphyllum), partridgeberry (Mitchella repens), several species of Carex (C. debilis, amphibola, radiata, etc.), Indian woodoats (Chasmanthium latifolium), and sweet woodreed (Cinna arundinacea).

The reference forest type is best developed on the stepped surfaces of relatively broad river valleys. Here, distinct landforms, such as stream terraces, flood plain flats, backswamps, and natural levees, tend to be better developed. In this setting, stream terraces tend to be broader and include more extensive wet areas. Here, vegetation communities typically sort out better along gradients of hydroperiod, elevation above the river channel, and other flooding-related variables.

DYNAMICS OF NATURAL SUCCESSION
Successional dynamics on this ecological site are not well-documented. Tree replacement likely takes place in canopy gaps caused by windthrow, disease, and the like, much like on moist uplands of the Piedmont. Flooding presumably plays a relatively minor role. Though fire was historically a key driver of successional dynamics on Piedmont uplands, the influence of fire on this ecological site was likely insignificant.

This ecological site is particularly vulnerable to invasion by Chinese privet (Ligustrum sinense), a non-native shrub or small tree which was introduced in the mid-nineteenth century. Many thousands of acres of bottomlands and flood plain forests now have a nearly continuous layer of Chinese privet, excluding most of the native flora beneath. Also problematic is Nepalese browntop (Microstegium vimineum), otherwise known as Japanese stiltgrass, which thrives in low-lying areas. This non-native bamboo-like grass can outcompete most native herbs under conditions of low light, often forming dense monospecific stands with few other species. These and other introduced species, such as multiflora rose (Rosa multiflora), usually require disturbance to gain a foothold, but once they do, they are remarkably persistent due to their reproductive capacity and tolerance for shade.

YOUNG SECONDARY FORESTS
Young secondary forests associated with this ecological site are usually even-aged, less diverse, and more likely to be invaded by non-native understory species. These forests are more common on the landscape today due to the long history of agricultural use and logging in river valleys of the Southern Piedmont. Typically, these forests are strongly dominated by only a handful of species. Sweetgum (L. styraciflua) is probably most common overall, although it can be scarce in the northern extreme of the MLRA and in the western foothills. The dominance of sweetgum (L. styraciflua) and other early pioneers declines as the forest matures, though many of these species remain important in mature stands as well, albeit to a lesser extent. Other characteristic species of young secondary forests on this ecological site include box elder (Acer negundo), American sycamore (Platanus occidentalis), tuliptree (Liriodendron tulipifera), red maple (Acer rubrum), blackgum (Nyssa sylvatica), common persimmon (Diospyros virginiana), and winged elm (Ulmus alata) (Schafale and Weakley 1990; Matthews 2011; Fleming 2012; Schafale 2012a, 2012b; Fleming et al. 2021).

SPECIES LIST
Canopy layer: Quercus phellos, Quercus michauxii, Fraxinus pennsylvanica, Ulmus americana, Carya cordiformis, Liquidambar styraciflua, Liriodendron tulipifera, Ulmus alata, Acer rubrum

Subcanopy layer: Carpinus caroliniana, Nyssa sylvatica, Diospyros virginiana, Acer negundo, Prunus serotina, Cornus florida, Ilex decidua, Juniperus virginiana, Ligustrum sinense (I)

Vines/lianas: Bignonia capreolata, Parthenocissus quinquefolia, Smilax rotundifolia, Smilax bona-nox, Smilax glauca, Smilax tamnoides, Campsis radicans, Vitis rotundifolia, Toxicodendron radicans, Vitis cinerea var. baileyana, Lonicera japonica (I)

Shrub layer: Ilex decidua, Viburnum prunifolium, Arundinaria gigantea, Ilex opaca, Euonymus americanus, Viburnum recognitum, Vaccinium fuscatum, Viburnum nudum, Ligustrum sinense (I), Rosa multiflora (I)

Herb layer: Athyrium filix-femina ssp. asplenioides, Arisaema triphyllum, Mitchella repens, Scutellaria integrifolia, Cryptotaenia canadensis, Polygonatum biflorum, Boehmeria cylindrica, Viola sororia, Lysimachia ciliata, Galium triflorum, Asarum canadense, Geranium maculatum, Thelypteris noveboracensis, Botrychium dissectum, Botrychium biternatum, Botrychium virginianum, Galium tinctorium, Geum canadense, Polygonum virginianum, Polystichum acrostichoides, Ranunculus recurvatus, Ranunculus hispidus, Sisyrinchium angustifolium, Smallanthus uvedalius, Solidago rugosa, Agrimonia parviflora, Solidago gigantea, Claytonia virginica, Onoclea sensibilis, Osmunda cinnamomea, Ophioglossum vulgatum, Symphyotrichum lateriflorum, Trillium catesbaei, Lysimachia nummularia (I)

Herb layer - graminoids: Carex spp. (debilis, amphibola, radiata, etc), Chasmanthium latifolium, Cinna arundinacea, Elymus virginicus, Dichanthelium boscii, Dichanthelium sphaerocarpon var. isophyllum, Leersia Virginica, Dichanthelium clandestinum, Juncus coriaceus, Juncus effusus, Microstegium vimineum (I), Arthraxon hispidus (I)

(I) = introduced

State and transition model

Additional community tables

Table 10. Community 2.1 plant community composition

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

Table 11. Community 2.2 plant community composition

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

Table 12. Community 2.3 plant community composition

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

Table 13. Community 4.1 plant community composition

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

Table 14. Community 4.2 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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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	08/20/2026
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):

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

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**