

Ecological site F129XY002WV Sandstone Steep

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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): 129X–Sand Mountain

Major Land Resource Area (MLRA) 129 is in Alabama (96 percent), Georgia (3 percent), and Tennessee (1 percent). It makes up about 8,030 square miles (20,805 square kilometers). The towns of Jasper, Cullman, and Fort Payne, Alabama, are in this MLRA. Interstate 65 crosses this area from north to south, and Interstates 24 and 59 join in the area just west of Chattanooga, Tennessee, which is just outside the northeast tip of the MLRA. Areas of the Redstone Arsenal Military Reservation are in the northern part of the MLRA. The William B. Bankhead National Forest and the Sipsey National Forest Wilderness are in the western part.

Most of this area is in the Cumberland Plateau Section of the Appalachian Plateaus Province of the Appalachian Highlands. This MLRA is deeply dissected and consists mainly of a series of rather narrow valleys, steep escarpments, and broad plateaus that are underlain by consolidated bedrock. Elevation ranges from 165 to 2,265 feet (50 to 690 meters). Valley floors are commonly about 100 to 400 feet (30 to 120 meters) below the adjacent plateau summits, but local relief may be as much as 1,200 feet (365 meters). The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Mobile-Tombigbee (0316), 50 percent; Middle Tennessee-Elk (0603), 25 percent; Alabama (0315), 21 percent; and Middle Tennessee-Hiwassee (0602), 4 percent. The Sipsey Fork, Locust Fork, and Mulberry Fork Rivers, headwaters of the Black Warrior River, are in this area. The Tennessee River forms part of the northern boundary of the area.

Classification relationships

231C-Southern Cumberland Plateau Section

The terrain is gently sloping tablelands of level-bedded sandstone formations and hilly to mountainous terrain consisting of shale and sandstone slopes forming deep canyons with steep connecting escarpment. Forests are largely oak-pine, loblolly-shortleaf pine, or oak-hickory cover types (McNab et al. 2005).

Ecological site concept

This Provisional Ecological Site (PES) occurs on upland sandstone residuum. Most of this site is forested although some of it has been cleared for pasture or cropland. Forests typically consist of mixed hardwoods dominated by oaks and hickories with some pine, depending on fire proximity and frequency. Soils are acidic, well drained and shallow to moderately deep. Parent material is primarily level bedded sandstone. This site can occur with sandstone rock outcrop in places. This site is of large extent.

Associated sites

F129XY007WV	Sandstone Ridge
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Similar sites

F125XY001WV	Sandstone Residuum This PES is very similar to the Sandstone Residuum found in MLRA 125 on the Cumberland Plateau, especially in the southern extent of MLRA 125.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus alba</i> (2) <i>Pinus</i>
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs primarily on sandstone residuum in uplands. This site can be steep and can occur with areas of rock outcrop. In some cases this site can occur on level bedded sandstone. Soils are typically well drained and acidic.

Table 2. Representative physiographic features

Landforms	(1) Plateaus or tablelands > Upland slope
Flooding frequency	None
Ponding frequency	None
Elevation	50–788 m
Slope	5–60%

Climatic features

Table 3. Representative climatic features

Frost-free period (characteristic range)	180-189 days
Freeze-free period (characteristic range)	204-206 days
Precipitation total (characteristic range)	1,422-1,524 mm
Frost-free period (actual range)	177-191 days
Freeze-free period (actual range)	204-206 days
Precipitation total (actual range)	1,372-1,524 mm
Frost-free period (average)	184 days
Freeze-free period (average)	205 days
Precipitation total (average)	1,473 mm

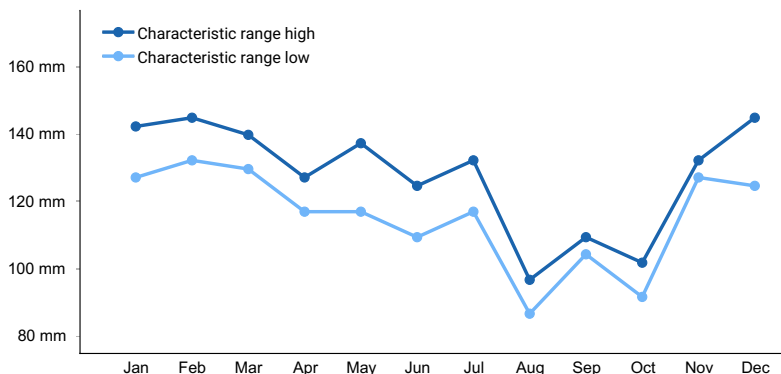


Figure 1. Monthly precipitation range

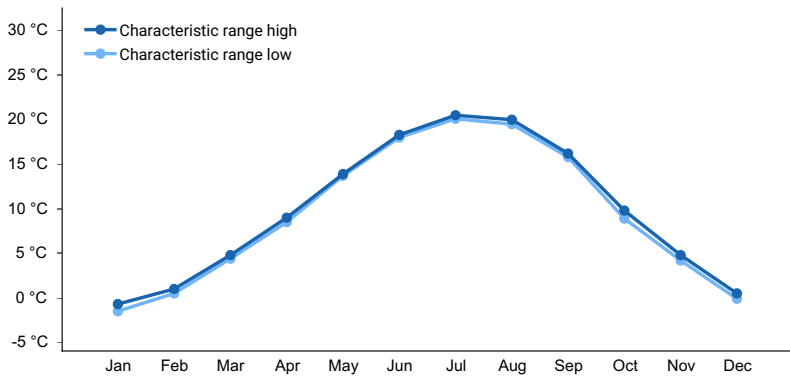


Figure 2. Monthly minimum temperature range

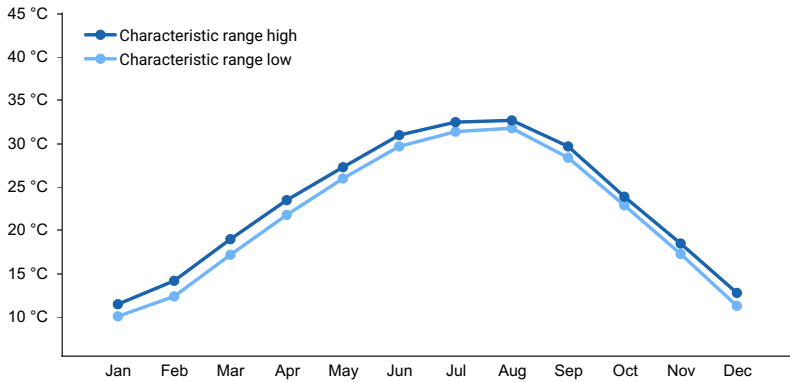


Figure 3. Monthly maximum temperature range

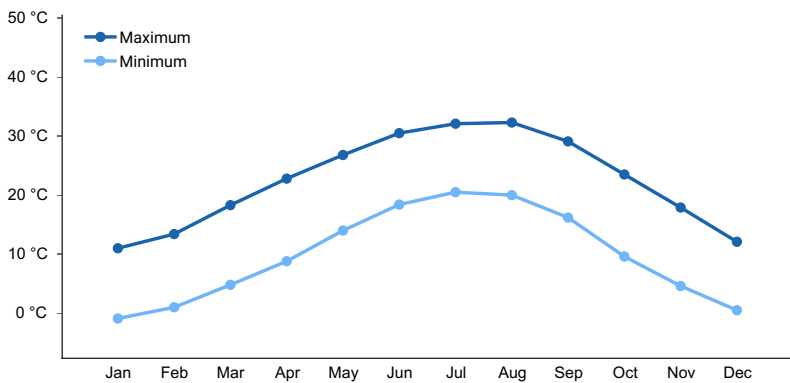


Figure 4. Monthly average minimum and maximum temperature

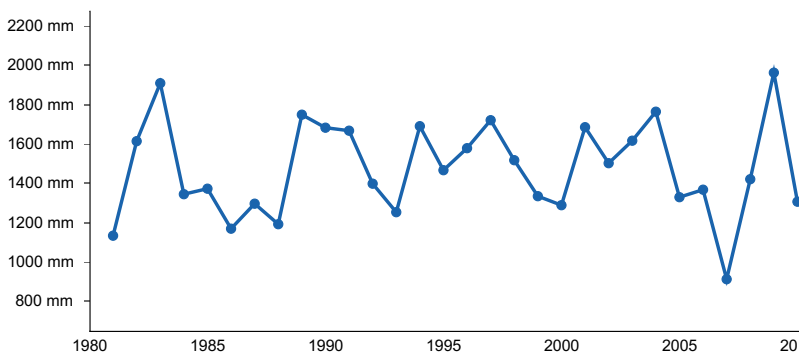


Figure 5. Annual precipitation pattern

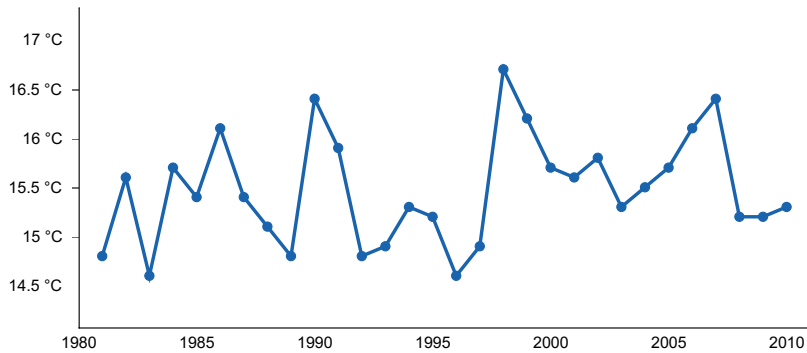


Figure 6. Annual average temperature pattern

Climate stations used

- (1) HANCEVILLE [USC00013655], Hanceville, AL
- (2) BANKHEAD LOCK & DAM [USC00010505], Northport, AL
- (3) JASPER [USC00014226], Jasper, AL
- (4) ADDISON [USC00010063], Addison, AL
- (5) SAND MT SUBSTN [USC00017207], Crossville, AL

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

The soil series associated with this site are: Sunlight, Smithdale, Sipse, Ramsey, Pirum, Nella, Nauvoo, Muskingum, Mountainburg, Luverne, Leesburg, Hector, Hartsells, Gorgas, Gilpin, Bouldin, and Bankhead. They are Well drained to Somewhat excessively drained, with very acidic to strongly acidic soil reaction.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone (2) Residuum–sandstone and shale
Surface texture	(1) Channery, cobbly, gravelly fine sandy loam (2) Channery loam (3) Fine sandy loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow to rapid
Soil depth	30–152 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–15%

Ecological dynamics

This PES is largely forested. It occurs on the Cumberland Plateau on uplands. The most fitting NatureServe description is "Allegheny-Cumberland Dry Oak Forest and Woodland - Hardwood" (CES202.359), for most of the MLRA. This system encompasses dry hardwood forests on predominately acidic substrates. These forests are typically dominated by *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus coccinea*, with lesser amounts of *Acer rubrum*, *Carya glabra*, and *Carya alba*. Small inclusions of *Pinus echinata* and/or *Pinus virginiana* may occur, particularly adjacent to escarpments or following fire. In addition, *Pinus strobus* may be prominent in some stands in the absence of fire. It occurs in a variety of situations, including on nutrient-poor or acidic soils. Sprouts of *Castanea dentata* can often be found where it was formerly a common tree (NatureServe, 2017).*

Castanea dentata was a prominent tree prior to the chestnut blight. Pine species might indicate younger stands

(NatureServe, 2017).*

Some areas are in pasture but it is largely a forest, in varying stages of succession depending on past disturbance. "Successional shrub/scrub (clear cut)" indicates that forestry can be important on these sites. Glendon Smalley (1982) characterized this site as Broad Undulating Sandstone Uplands. His vegetation description includes white oak, scarlet oak, southern red oak, chestnut oak, hickories, black oak, blackgum, red maple, shortleaf pine, Virginia pine, and loblolly pine. In the midstory, dogwood, sassafras, sourwood, serviceberry, persimmon, sumac, hawthorns, etc. American holly and smilax as common understory species. Smalley has ranked natural stands and old-field plantations for productivity of certain species.

Localized natural disturbances are important on this site. They include fire, ice storms, wind-throw, and the southern pine beetle. These disturbances can result in a patchwork of forest, younger stands, regenerating forests and relatively open grasslands, where fire is kept on the landscape. However, these open habitats are typically only maintained through human intervention. Left to its own, this site will regenerate to forest.

The role of fire in the ecological dynamics of this PES is not well understood but several published studies and research currently underway indicate that it may be important, especially to maintaining grassland communities important to both plant and animal diversity. Further investigation is needed into the role of fire within individual ESDs that fall into this PES.

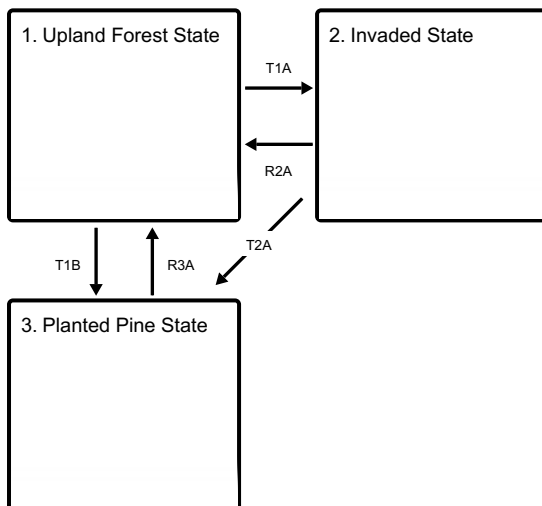
Especially where land has been cleared for crops or pasture in the past and then abandoned, there is often a problem with invasive, exotic plant species. Wisteria was commonly noted in the field as a problematic invasive plant.

Pine plantations, typically loblolly pine, are a common land-use on this site.

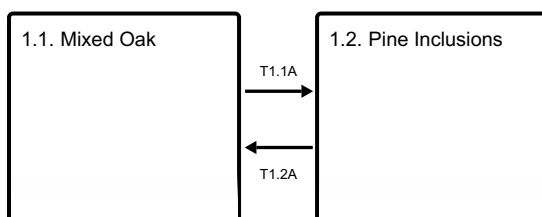
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State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1 Upland Forest State

Mature stands include a mixture of oak and hickory species. In some cases, pockets of shortleaf pine, Virginia pine

and white pine may be present. Forestry is the most important land-use on this site. It is not well suited for crops or pasture. Natural disturbances include ice, wind, and fire. These have historically been very important in regenerating stands. Human induced disturbances include mining, forestry practices such as clear-cutting, and fire.

Community 1.1

Mixed Oak



These forests are typically dominated by *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus coccinea*, with lesser amounts of *Acer rubrum*, *Carya glabra*, and *Carya alba*.

Community 1.2

Pine Inclusions

Small inclusions of *Pinus echinata* and/or *Pinus virginiana* may occur, particularly adjacent to escarpments or following fire. It occurs in a variety of situations, including on nutrient-poor or acidic soils.

Pathway T1.1A

Community 1.1 to 1.2

Disturbance such as fire, ice storms, wind throws, etc.

Pathway T1.2A

Community 1.2 to 1.1

Fire exclusion/lack of disturbance

State 2

Invaded State



Figure 7. Chinese wisteria infestation Photo by Randy Westbrooks, U.S. Geological Survey, Bugwood.org

This state is caused by extensive invasion by non-native plants that can over-run native vegetation, prohibit regeneration of native species, and completely alter the ecological potential of a site. This state can include multiple species and treatment/control will vary depending on local site conditions, species composition, management goals and available resources. All recommendations should be given by an expert at the local level. Commonly noted invasive species of concern on this site included the non-native privets and wisterias. Wisteria in particular can girdle trees and eventually lead to their death. It can completely overwhelm native flora and will take over a site if left untreated.

State 3 Planted Pine State



This state is characterized by pine plantations, typically loblolly pine (*Pinus taeda*). Loblolly pine naturally occurs in the southern U.S. but in this state, they are managed as plantations and, unless abandoned, do not revert to the naturalized state. Forestry is the most important land-use for this state and management practices can be based on natural or artificial regeneration. Once that is decided, the methods used to achieve objectives can be determined. Many resources are available on the variety of management practices for loblolly pine plantations. Selection of management practices should be based on the site conditions, management goals and resources available for the stand.

Transition T1A State 1 to 2

Disturbance (in some cases); invasion by non-native plant species

Transition T1B State 1 to 3

Conversion to pine plantation. Management approaches can vary based on the condition and species composition of the stand and the operational goal. Practices might include clearing, site preparation, weed control, fertilization, planting, thinning, etc.

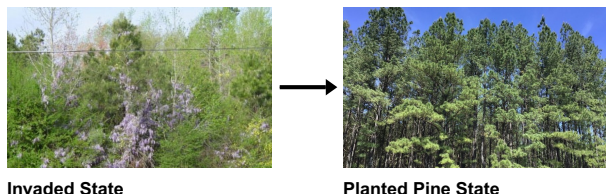
Restoration pathway R2A

State 2 to 1

Management and control of non-native, invasive plant species. Methods vary and will depend on site-specific conditions as well as the species of concern and overall goals.

Transition T2A

State 2 to 3



An invaded state could transition to a pine plantation only with intensive management to control non-native species and most like plant pine and maintain competition control including non-natives.

Restoration pathway R3A

State 3 to 1

If pine plantations are not managed and allowed to mature naturally, they will eventually revert to a mixed hardwood/pine forest as pines die out over time. Disturbance can play a role in this dynamic as well (both natural and human-caused). Southern pine beetle can decimate a pine plantation, resetting conditions for hardwood regeneration and natural pine regeneration. Storm damage can have a localized similar affect. Management practices that mimic natural disturbances can accelerate natural succession if that is a goal. Outcomes will always depend on stand-level conditions, including the presence of hardwood tree roots that are in tact and alive. They can sprout vigorously after sunlight is allowed back into the understory. As with any forest management in the south, non-native invasive plants should be a top concern as they often proliferate after a disturbance.

Additional community tables

Other references

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Contributors

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Approval

Nels Barrett, 9/10/2019

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**
-
6. **Extent of wind scoured, blowouts and/or depositional areas:**
-
7. **Amount of litter movement (describe size and distance expected to travel):**
-
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**
-
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant:
- Sub-dominant:
- Other:
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
-
14. **Average percent litter cover (%) and depth (in):**
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
-
16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability:
