USDA Natural Resources
Conservation Service

Ecological site F125XY001WV
Sandstone Residuum

Accessed: 05/18/2024

General information

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

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 125X–Cumberland Plateau and Mountains

MLRA 125 — Cumberland Plateau and Mountains

This area is in Kentucky (43 percent), Tennessee (25 percent), West Virginia (20 percent), Virginia (9 percent), and Alabama (3 percent). It makes up about 20,330 square miles (52,685 square kilometers). The towns of Logan, Madison, Welch, and Williamson, West Virginia, and Norton and Wise, Virginia, are in the northeastern part of this area. The towns of Middlesboro, Williamsburg, Corbin, London, Hazard, and Pikeville, Kentucky, and La Follette and Crossville, Tennessee, are in the area. Chattanooga, Tennessee, and Huntsville, Alabama, are just outside the southeast and southwest corners, respectively.
Interstates 24, 64/77, 75, and 40/75 cross this area. The Cumberland Gap National Historic Park is in the part of this area
along the Virginia and Kentucky border. The Daniel Boone and Jefferson National Forests occur in this area. Numerous State forests and parks are throughout the area (USDA-NRCS, 2006).

Classification relationships

This MLRA falls into the following Forest Service Sections: Northern Cumberland Mountains, Northern Cumberland Plateau. It falls into the following EPA Level III Ecoregions: Central Appalachians, Southwestern Appalachians, Central Appalachians (USDA-NRCS, 2006).

Ecological site concept

The Cumberland Plateau is a large, flat-topped tableland characterized by rugged terrain, a moderate climate, and abundant rainfall (National Park Service, accessed 2017).

Soils on this Provisional Ecological Site (PES) are shallow to very deep, Well drained to Excessively drained, and Very slow to Rapid permeable soils, with very acidic to strongly acidic soil reaction, that formed in Residuum from Interbedded sedimentary rock, Quartzite, Sandstone, Sandstone and shale, Sandstone and siltstone, Shale and siltstone. All of this MLRA falls into the mesic temperature regime.

This PES is largely forested, although some pasture does occur. It is characterized by dry hardwood forests dominated by oak, on predominately acidic substrates. Disturbance plays an important role in vegetation dynamics on this site; fire (both human-caused and natural) and forestry are very important.

Associated sites

F125XY002WV	**Interbedded Sedimentary Colluvium**
F125XY003WV	**Interbedded Sedimentary Uplands**
F125XY004WV	**Floodplain Alluvium**
F125XY005WV	**Low Stream Terrace Alluvium**

Similar sites

F125XY002WV	**Interbedded Sedimentary Colluvium**

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus prinus*
Shrub	(1) *Vaccinium* (2) *Smilax*
Herbaceous	Not specified

Physiographic features

The block diagram below represents the relationship of soils to topography and geology in the Hazleton-Sharondale-Dekalb-Marrowbone general soil map unit (Soil Survey of Floyd and Johnson Counties, Kentucky; 2000).

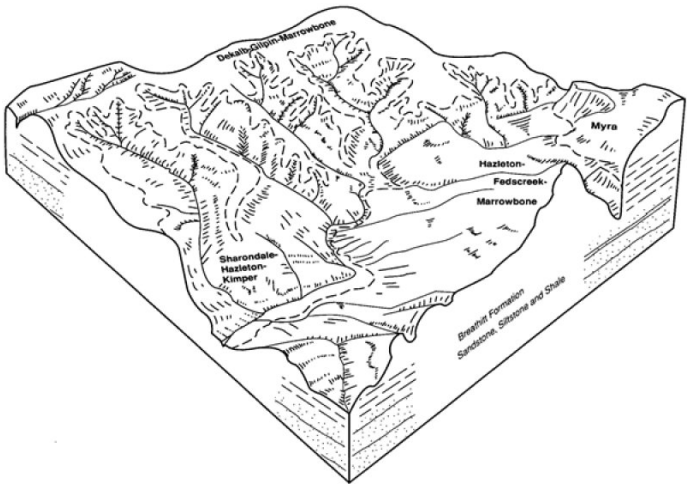

Figure 2. Block Diagram

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	177–1,037 m
Slope	2–70%
Water table depth	152 cm

Climatic features

The average annual precipitation is mostly 37 to 45 inches
(940 to 1,145 millimeters) in the northern third of this area and 45 to 60 inches (1,145 to 1,525 millimeters) in the southern two-thirds. It is almost 60 inches (1,525 millimeters) at the higher elevations in the northern third of the area and is as much as 75 inches (1,905 millimeters) in the mountains in the southern two-thirds. Almost half of the annual precipitation falls during the growing season. Rainfall typically occurs during high-intensity, convective thunderstorms in summer. Snow may occur during winter in the northern part of the area
and at the higher elevations. The average annual temperature is 50 to 60 degrees F (10 to 15 degrees C). The freeze-free period averages 200 days and ranges from 170 to 225 days. The shorter freeze-free periods are at the higher elevations and in the more northerly parts of the area (USDA-NRCS, 2006).

Table 3. Representative climatic features

Frost-free period (average)	162 days
Freeze-free period (average)	189 days
Precipitation total (average)	1,295 mm

Climate stations used

- (1) SODDY DAISY-MOWBRAY [USC00408445], Soddy Daisy, TN
- (2) BARBOURVILLE [USC00150381], Corbin, KY
- (3) GRUNDY [USC00443640], Grundy, VA
- (4) LONDON LOCKS [USC00465365], Cedar Grove, WV

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: Wallen, Ramsey, Muskingum, Marrowbone, Lonewood, Lily, Hartsells, Dekalb, Crossville, Beersheba, Alticrest. They are shallow to very deep, Well drained to Excessively drained, and Very slow to Rapid permeable soils, with very acidic to strongly acidic soil reaction, that formed in Residuum from Interbedded sedimentary rock, Quartzite, Sandstone, Sandstone and shale, Sandstone and siltstone, Shale and siltstone.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone

Surface texture	(1) Channery clay loam (2) Extremely gravelly fine sandy loam (3) Gravelly loam
Drainage class	Well drained to excessively drained
Permeability class	Very slow to rapid
Soil depth	38–183 cm
Surface fragment cover <=3"	0–9%
Surface fragment cover >3"	0–9%
Available water capacity (0-101.6cm)	3.56–19.05 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–5.3
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–40%

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" for most of the MLRA, especially the southern portion. 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).

Toward the northern part of the MLRA, this PES may occur as a Northeastern Interior Dry-Mesic Forest. These systems are dominated by oaks and typically occur as closed-canopy forests. Species might include *Quercus rubra*, *Quercus alba*, *Quercus velutina*, and *Quercus coccinea*. Carya can be dominant in mature stands. *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 these soils 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.

There may be potential habitat in this PES for the golden-winged warbler, listed as a high conservation concern and

prioritized by NRCS, among other agencies and organizations. The causes for the decline of this species include loss of breeding habitat due to reforestation and current mining practices, hybridization with the closely related Blue-winged Warbler, and habitat loss on the wintering grounds.

Whelton (2003) suggested that the focal concentration for future conservation efforts in Tennessee for golden-winged warblers be in the Cumberland Mountains at elevations above 2,800'. At elevations lower than this, hybridization with blue-winged warblers can occur which may muddy genetic resources. In her study, most golden-winged warblers were noted in narrow benches left from previous strip mining. Focusing on maintaining these existing areas while expanding management to other areas would potentially have a beneficial impact on the species. For example, to maintain the early successional habitat and tree line required by the species, timber harvest followed by prescribed burning might have a beneficial effect.

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 such as sericea lespedeza and autumn olive.

State and transition model

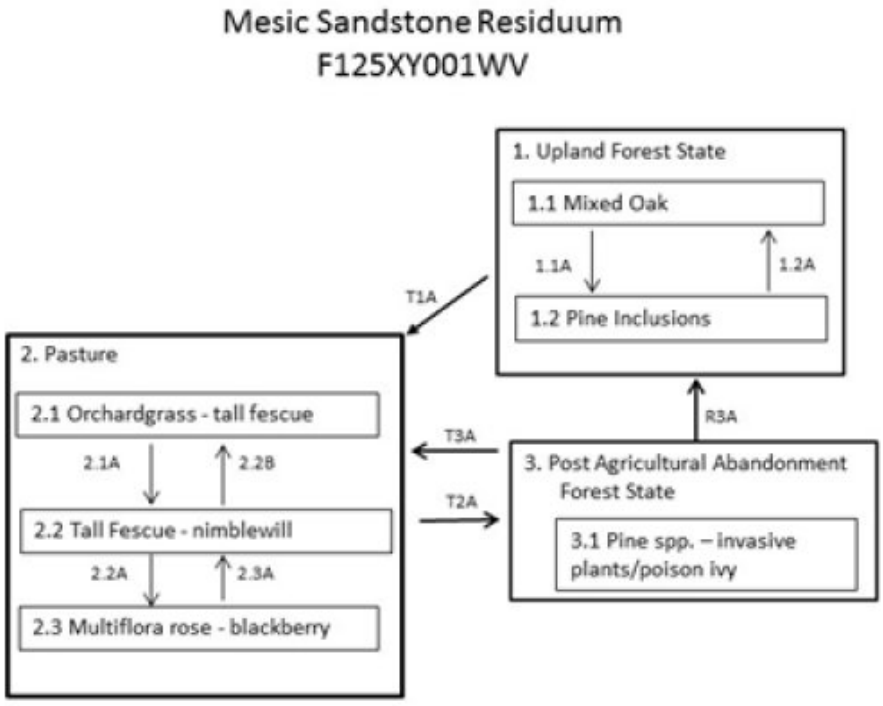

Figure 7. State and Transition Model

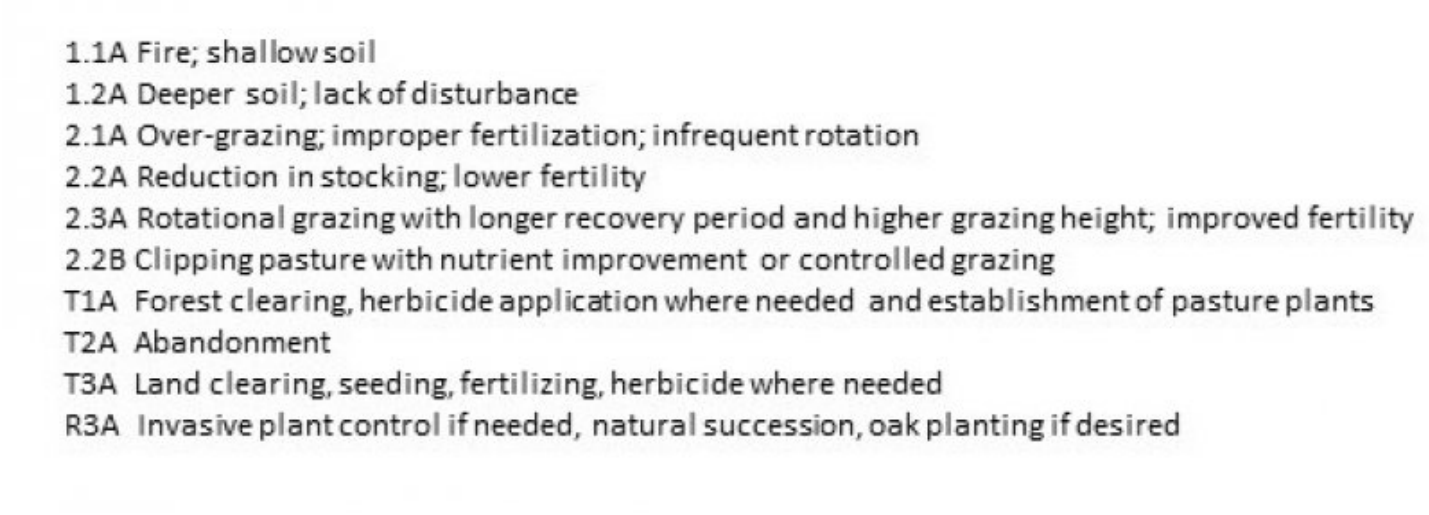

Figure 8. STM Legend

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. Young stands can support the golden-winged warbler, especially in the higher elevations. Human induced disturbances include mining, forestry practices such as clear-cutting, and fire. Forestry practices in combination with prescribed burning might be used to create habitat for the golden-winged warbler, but this is site-specific and would not apply to the full extent of this PES.

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 A
Community 1.1 to 1.2

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

Pathway A
Community 1.2 to 1.1

Fire exclusion/lack of disturbance

State 2
Pasture State

Managed pasture for a variety of livestock is a typical land-use on this site.

Community 2.1
Orchardgrass - tall fescue

Community 2.2
Tall Fescue - nimblewill

Community 2.3
Multiflora rose - blackberry

Pathway A
Community 2.1 to 2.2

Overstocked pasture; rotation infrequent

Pathway B
Community 2.2 to 2.1

Rotational grazing with longer recovery period and higher grazing height; improved fertility

Pathway A
Community 2.2 to 2.3

Reduction in stocking rate; low fertility

Pathway A
Community 2.3 to 2.2

Clipping pasture with nutrient improvement or controlled grazing

State 3
Post Agricultural Abandonment Forest State

This state results when land has been put in crops or pasture and abandoned. Pine and weedy species usually colonize. Depending on the rate and intensity of invasion, it may naturally return to an upland forest or it might need management.

Community 3.1
Pine species - invasive plants/poison ivy

Transition A
State 1 to 2

Forest clearing, herbicide application where needed and establishment of pasture plants.

Transition A
State 2 to 3

Abandonment

Restoration pathway A
State 3 to 1

Invasive plant control if needed, natural succession, oak planting if desired

Transition A
State 3 to 2

Land clearing, seeding, fertilizing, herbicide where needed

Additional community tables

Other references

Golden-winged warbler references (Accessed March 2017):

http://www.tnbirds.org/MigrantOnline/V074/V074p061-082.pdf

http://www.tnwatchablewildlife.org/details.cfm?displayhabitat=grassland&sort=aounumber&typename=GRASSLAND%20AND%20SHRUB&uid=09041619331163947&commonname=Golden-winged%20Warbler

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1303489.pdf

National Park Service. Geology and History of the Cumberland Plateau [web application]. Available https://www.nps.gov/biso/planyourvisit/upload/webgeo.pdf (Accessed: April 11, 2017).

NatureServe. 2017. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (Accessed: April 11, 2017).

Smalley, Glendon W. 1982. Classification and evaluation of forest sites on the Mid-Cumberland Plateau. USDA-USFS., Gen. Tech. Rep. SO-38. Southern Forestry Experiment Station., New Orleans, LA. 58 p.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Welton, M. 2003. Status and distribution of the Golden-winged Warbler in Tennessee. Migrant 74:61–82.

Contributors

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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	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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

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

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17. **Perennial plant reproductive capability:**
