Ecological site F128XY509WV
Thermic Quartzose Limestone And Calcareous Shale Uplands

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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): 128X–Southern Appalachian Ridges and Valleys

MLRA 128 falls into the East and Central Farming and Forest Region. This MLRA is in Tennessee (36 percent), Alabama (27 percent), Virginia (25 percent), and Georgia (12 percent). It makes up about 21,095 square miles (54,660 square kilometers).

Most of this MLRA is in the Tennessee Section of the Valley and Ridge Province of the Appalachian Highlands. The thin stringers in the western part of the area are mostly in the Cumberland Plateau Section of the Appalachian Plateaus Province of the Appalachian Highlands. A separate area of the MLRA in northern Alabama is in the Highland Rim Section of the Interior Low Plateaus Province of the Interior Plains. The western side of the area is dominantly hilly to very steep and is rougher and much steeper than the eastern side, much of which is rolling and hilly. Elevation ranges from 660 feet (200 meters) near the southern end of the area to more than 2,400 feet (730 meters) in the part of the area in the western tip of Virginia. Some isolated linear mountain ridges rise to nearly 4,920 feet (1,500 meters) above sea level.

The MLRA is highly diversified. It has many parallel ridges, narrow intervening valleys, and large areas of low, irregular hills. The bedrock in this area consists of alternating beds of limestone, dolomite, shale, and sandstone of early Paleozoic age. Ridgetops are capped with more resistant carbonate and sandstone layers, and valleys have been eroded into the less resistant shale beds. These folded and faulted layers are at the southernmost extent of the Appalachian Mountains. The narrow river valleys are filled with unconsolidated deposits of clay, silt, sand, and gravel.

Ecological site concept

This PES occurs on residuum, colluvium, and alluvium derived from reddish quartzose limestone and calcareous shale in the southern Ridge and Valley, MLRA 128.

Martin (1989) reports white oak - northern red oak communities on this site and states that they were probably more common in the past. Due to their high timber value, a lot of those species have been logged out of existing stands where they would historically have been better represented.

Pine can be prevalent on previously disturbed sites. DeSelm notes that most areas have been grazed in the past.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus rubra*
Shrub	(1) *Parthenocissus quinquefolia*
Herbaceous	Not specified

Physiographic features

This PES occurs on residuum, colluvium, and alluvium derived from reddish quartzose limestone and calcareous shale in the southern Ridge and Valley, MLRA 128.
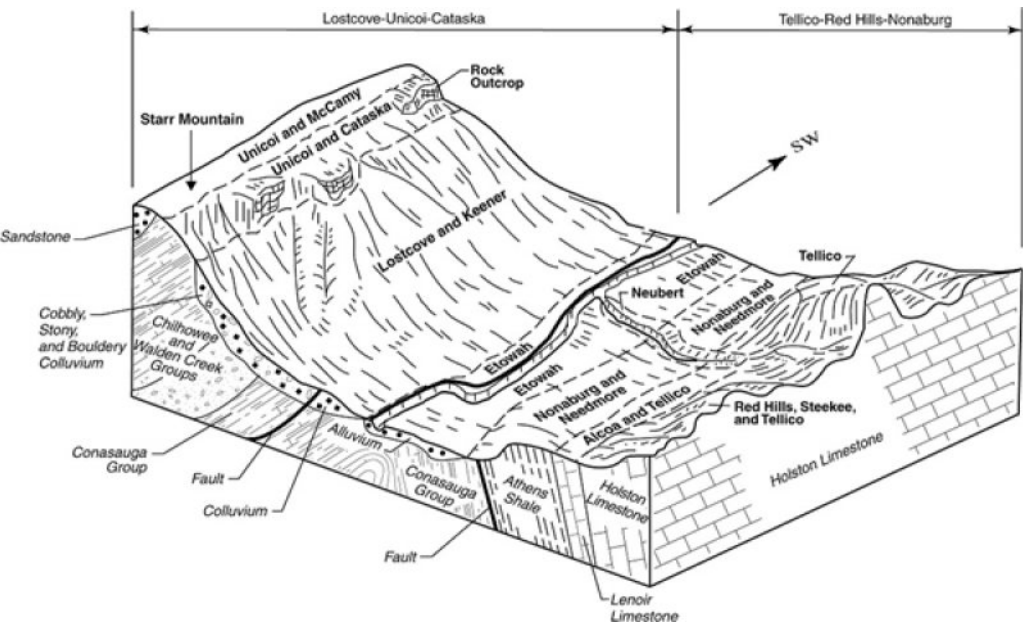

Figure 1. Block diagram

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Elevation	499–1,801 ft
Slope	2–60%
Water table depth	60 in
Aspect	N, S

Climatic features

This area falls under the humid, mesothermal climate classification (Thornwaite, 1948). Precipitation is fairly evenly distributed throughout the year, with little or no water deficiency during any season. The average annual precipitation in most of this area is 45 to 55 inches. It increases to the south. Maximum precipitation occurs in midwinter and midsummer, and the minimum occurs in autumn. Most rainfall occurs as high-intensity, convective thunderstorms. Snowfall may occur in winter. Average annual temperatures range from 46 to 70 degrees F, increasing to the south. The freeze-free period averages 205 days and is longest in the southern part of the area and shortest at higher elevations to the north. The growing season corresponds to climate. Local climate can be variable and microclimates factor into the distribution of plants. In general, topographic features such as slope aspect, landform, steepness, and position of the ridges and valleys are important site variables in the distribution of vegetation across the landscape (Martin, 1989).

Table 3. Representative climatic features

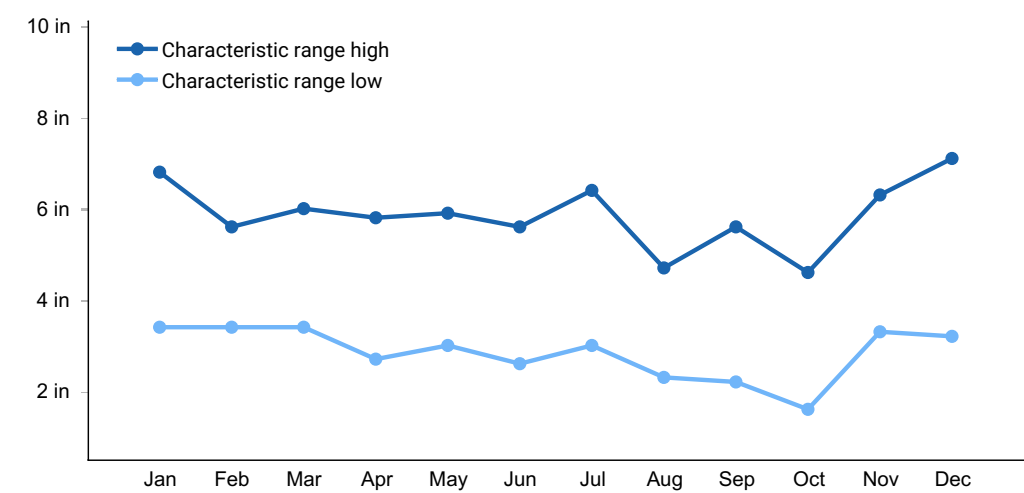| Frost-free period (average)	177 days
Freeze-free period (average)	205 days
Precipitation total (average)	56 in

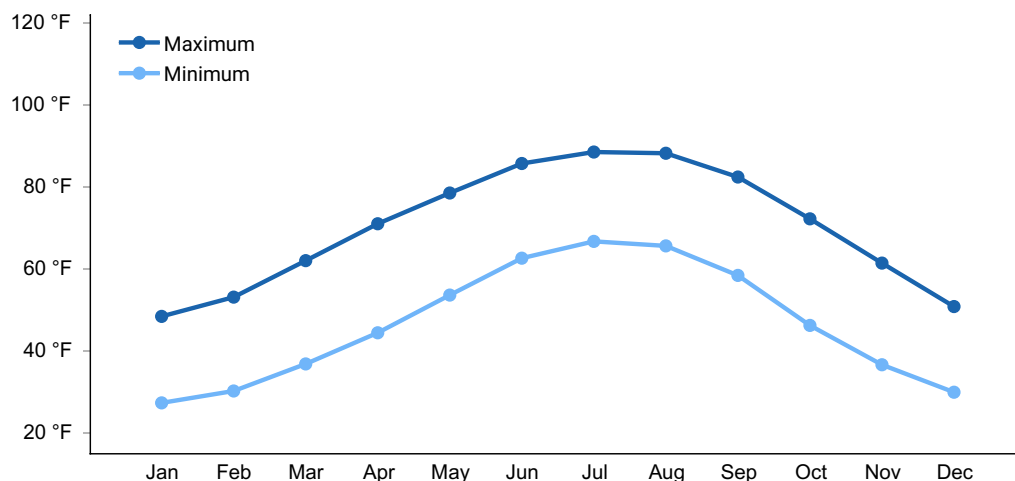**Figure 2. Monthly precipitation range**

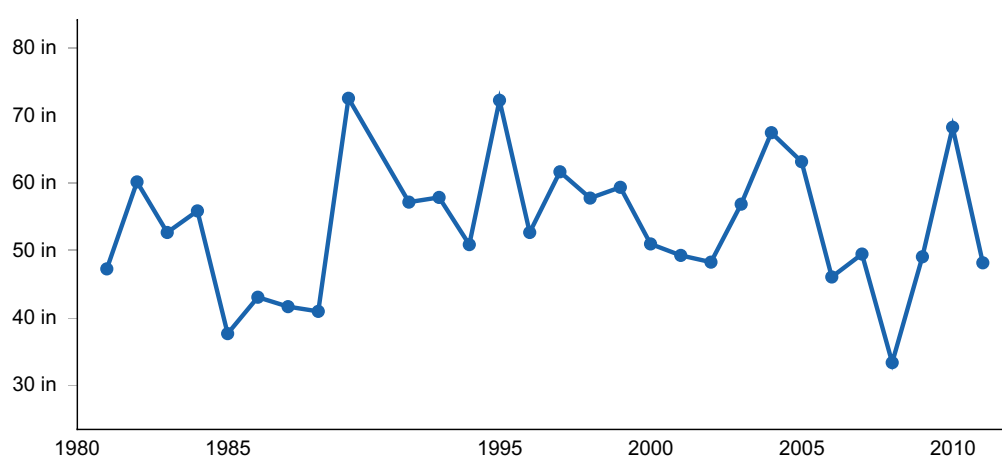**Figure 3. Monthly average minimum and maximum temperature**

Figure 4. Annual precipitation pattern

Climate stations used

- (1) KNOXVILLE EXP STN [USC00404946], Louisville, TN
- (2) ATHENS [USC00400284], Athens, TN
- (3) CLEVELAND FLTR PLT [USC00401808], Charleston, TN

Influencing water features

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

Soil features

These soils formed in residuum, colluvium, and alluvium derived from reddish quartzose limestone and calcareous shale. The slopes range from 2 to 90 percent. They are shallow to very deep (10 to more than 60 inches) to bedrock, and are well drained. The available water capacity of these soils is very low to moderate. The depth to a seasonal high water table is more than 6 feet. They are not subject to flooding or ponding. The soil reaction ranges from extremely acid to moderately acid (pH from 3.5 to 6.0).

The soil series associated with this site are: Alcoa, Red Hills, Steekee, Tellico

Parent Material Kind: residuum, colluvium, alluvium

Parent Material Origin: limestone and sandstone; limestone, sandstone and shale; limestone, unspecified

Table 4. Representative soil features

Parent material	(1) Residuum–limestone and sandstone (2) Colluvium–limestone, sandstone, and shale (3) Alluvium–limestone
Surface texture	(1) Flaggy clay loam (2) Fine sandy loam (3) Loam
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Soil depth	14–58 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.6–6.5 in
Soil reaction (1:1 water) (0-40in)	5–5.3
Subsurface fragment volume <=3" (Depth not specified)	0–28%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

Martin (1989) reports white oak - northern red oak communities on this site and states that they were probably more common in the past. Due to their high timber value, a lot of those species have been logged out of existing stands where they would historically have been better represented.

DeSelm vegetation plots characterize this PES as upland deciduous forest. He noted it was mostly mixed oak (white oak) and could be mixed mesophytic (mixed oak or mixed sugar maple/mixed oak). This probably depends on aspect, past disturbance, etc. He does not note deer browse or grazing. Virginia creeper and poison ivy were noted in the ground cover.

DeSelm had numerous vegetation plots on this PES in Blount, Monroe and McMinn counties (TN). He primarily classifies it as mixed oak or mixed hardwood but notes on certain plots in different topographic positions that box elder-sycamore, tulip poplar-beech-oaks, box elder-hackley-swamp, and hemlock (in a ravine) communities can occur. He notes Parthenocissus commonly in the understory. On several plots, he notes his opinion that they were probably a pasture in the past or grazed in the past or agriculture in the past so, past conversion to agriculture of some sort and subsequent succession back to forst will be important on this site. It needs further investigation to determine reference community beyond "mixed oak."

Pine plantations may be found to be important. Some areas are in pasture but few in crops. However, that needs to be investigated in future projects.

Due to the lack of sufficient data, a very generalized State and Transition Model has been developed. The lack of detail is intentional and should be populated in future projects.

State and transition model

Ecosystem states
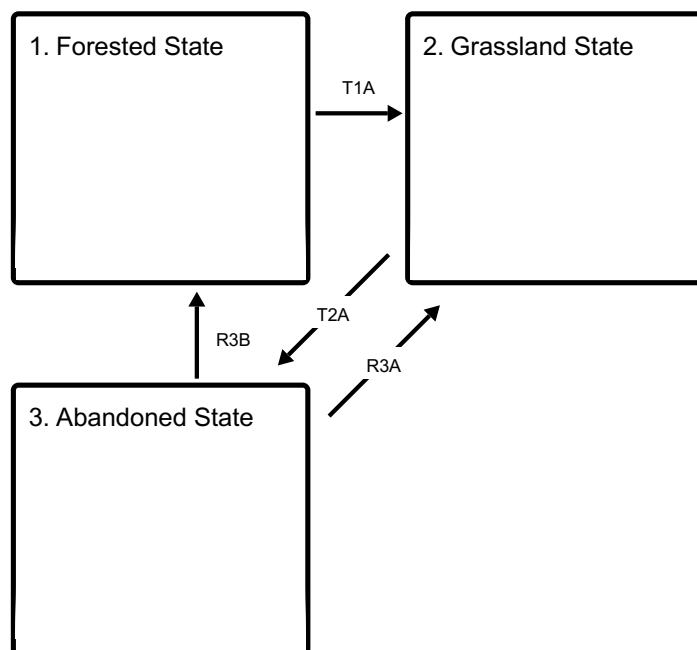
State 1
Forested State

This state approximates reference conditions. It varies widely across the MLRA from north to south. Generally, forests consist of some mixture of pine and hardwood species. Notable species include the hickories, red oak, white oak. Yellow poplar and the maples are also common. Some areas are planted in pine for pulpwood production. If this is found to be an important land-use, it may require it's own state in future iterations.

State 2

Grassland State

The primary land-use is pasture and hay.

State 3
Abandoned State

This state represents a managed site (E.g., pasture) that is no longer being managed and has been abandoned to succession. Species composition and overall health of this state will largely depend on the type and extent of previous land-use disturbance. It is likely that non-native invasive plants will be introduced to this state. Other native early successional species will also be represented but will naturally fall out over time as the site ages. In some cases, early successional habitat is desirable (E.g., for some wildlife species). If that is the case, then it must be managed to be maintained. Management practices should be locally determined based on the native species composition, presence of non-native invasive plants and landowner goals.

Transition T1A
State 1 to 2

Tree clearing, pasture species establishment, continued pasture management

Transition T2A
State 2 to 3

Natural succession after pasture/hay management ceases. Sometimes this includes invasion by undesirable non-native plants.

Restoration pathway R3B
State 3 to 1

If few or no invasive, non-native plant species are present this site will naturally regenerate to the forested state. In some cases, herbicide or mechanical control might be needed to select desirable species if the future goal is timber management. In some cases, tree planting might be merited.

Restoration pathway R3A
State 3 to 2

Brush clearing where needed, application of herbicides where needed, pasture management (may include re-seeding with desirable forage). Where native grasslands/prairies are the management objective, different techniques should be employed. Site preparation and seeding mixtures would likely be needed. If early successional habitat is the management goal, practices such as brush clearing, herbicide application where needed and prescribed fire might be necessary to maintain this

condition.

Other references

DeSelm, Hal. 1989 – 2009. Natural Terrestrial Vegetation of Tennessee (Vegetation Plot Data). Unpublished raw data. http://treeimprovement.utk.edu/DeSelmData/DataDSC.htm

Griffith, G.E., Omernik, J.M., and Azevedo, S.H., 1997, Ecoregions of Tennessee: Corvallis, Oregon, U.S. Environmental Protection Agency EPA/600R-97/022, 51 p.

Martin, William H. 1989. Forest patterns in the Great Valley of Tennessee. Journal of the Tennessee Academy of Science 64(3): 137 – 143.

Natureserve. 2016. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, VA. U.S.A. Available http://explorer.natureserve.org.

Thornthwaite, Charles W. 1948. An approach toward a rational classification of climate. Geographical Review 38(1): 55-94.

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.

Vegetation plot data. 2015. Retrieved from: http://vegbank.org/vegbank/index.jsp

Vegetation community description. 2015. Retrieved from: http://www.basic.ncsu.edu/segap/

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	12/17/2025
Approved by	Matthew Duvall
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:**