

Ecological site F122XY020TN Cherty Limestone Escarpment

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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): 122X–Highland Rim and Pennyroyal

MLRA 122 is in Tennessee (47 percent), Kentucky (43 percent), Indiana (7 percent), and Alabama (3 percent). It makes up about 21,530 square miles (55,790 square kilometers).

SOILS:

Many of the soils in this MLRA are Udalfs. The moderately deep to very deep, well drained, clayey soils formed in limestone residuum. They are dominantly in rolling to steep areas of the “Outer Basin” (Mimosa, Braxton, Gladdice, and Hampshire series) and the undulating to hilly areas of the “Inner Basin” (Talbot and Bradyville series). The most agriculturally productive soils are the very deep, well drained, clayey or loamy soils that formed in alluvium and/or loess over alluvium or limestone residuum in nearly level to undulating areas (Armour, Cumberland, Harpeth, Lomond, and Maury series). The less extensive soils generally are moderately well drained to somewhat poorly drained and formed in loamy or clayey alluvium and/or residuum (Byler, Capshaw, Colbert, and Tupelo series). This MLRA has a significant acreage of Mollisols. Shallow or moderately deep, well drained, clayey Udolls (Ashwood and Barfield series) formed in limestone residuum dominantly in rolling to steep areas. Very shallow, well drained, clayey Rendolls (Gladeville series) formed in limestone residuum dominantly in undulating to rolling areas of the “Inner Basin.” Very deep, well drained or moderately well drained Udolls (Arrington, Egam, Lynnvill, and Staser series) and somewhat poorly drained or poorly drained Aquolls (Agee, Godwin, and Lanton series) formed in loamy or clayey alluvium derived from limestone on flood plains. Most of the remaining soils on flood plains are moderately well drained or well drained Udepts (Lindell and Ocana series). Udufts are of small extent in this area. Most are very deep, well drained, and loamy and formed in gravelly colluvium or colluvium and the underlying residuum on steep hillsides (Dellrose soils).

BIOLOGICAL RESOURCES:

This area supports mixed oak forest vegetation. White oak, black oak, northern red oak, and some scarlet oak are the dominant tree species. Shagbark hickory, bitternut hickory, pignut hickory, and mockernut hickory also occur. Oak, blackgum, flowering dogwood, sassafras, Virginia pine, pitch pine, and shortleaf pine grow mostly on ridgetops.

(Excerpt from 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.)

Classification relationships

Scientific Name: Southern Interior Low Plateau Dry-Mesic Oak Forest, Unique Identifier: CES202.898

Ecological site concept

This PES describes plant communities likely to be found on these soils but does not encompass the entire complexity or diversity of these sites. Future field work is required to develop ecological site descriptions (ESDs)

which can be utilized for conservation and planning purposes. Multiple ESDs may be developed from this initial grouping.

Common trees as listed in NASIS and county soil surveys for this group include:

southern red oak, white oak, black oak, scarlet oak, chestnut oak, blackgum, sourwood, yellow poplar, hickories, shortleaf pine, loblolly pine, and eastern red cedar.

Only two tree species can be selected for entry into the database as dominants; however, multiple tree species may be dominant on these sites depending on aspect, soil depth, seed sources, management, and disturbance history.

State 1. Forestland

Phase 1.1: Plant species dominants:

southern red oak (*Quercus falcata*) - chestnut oak (*Q. prinus*) / flowering dogwood (*Cornus florida*) - hophornbeam (*Ostrya virginiana*) / Canadian black snakeroot (*Sanicula canadensis*) - ticktrefoils (*Desmodium* spp).

State: 2. Pasture

Phase 2.1: Managed Pasture. Plant species dominants: *Schedonorus arundinaceus* (tall fescue)

Pasture plant species are dependent on seeding, weed control, concurrent land uses, on-going levels of disturbance, and landowner goals. Individual site and soil characteristics, along with management activities, will influence production levels.

State: 3 – Transitional (Abandoned Field)

Phases 3.1: Plant species dominants: eastern red cedar (*Juniperus virginiana*)/ multi-flora rose (*Rosa multiflora*) – berries (*Rubus* spp.) / tall fescue (*Schedonorus arundinaceus*)

Tree species regeneration on these sites will depend on the severity and duration of disturbance, soil characteristics, adjacent plant communities and seed sources, post-disturbance management inputs, presence or absence of continued site disturbances (grazing), slope, and aspect.

Lower slope mapunits may be used for cropland, but pasture and woodlands are the predominant uses of these site.

Table 1. Dominant plant species

Tree	(1) <i>Quercus falcata</i> (2) <i>Quercus prinus</i>
Shrub	(1) <i>Cornus florida</i> (2) <i>Ostrya virginiana</i>
Herbaceous	(1) <i>Sanicula canadensis</i> (2) <i>Desmodium</i>

Physiographic features

These sites are on upland hills and ridges.

Table 2. Representative physiographic features

Landforms	(1) Escarpment (2) Hill (3) Ridge
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	None to rare
Elevation	137–411 m
Slope	5–70%

Ponding depth	0–38 cm
Water table depth	152 cm

Climatic features

Climate

The average annual precipitation in this area is 43 to 63 inches (1,090 to 1,600 millimeters), increasing to the south. The maximum precipitation occurs in winter and early in spring, and the minimum occurs in fall. Most of the rainfall occurs as high-intensity, convective thunderstorms. Snowfall may occur in winter. The average annual temperature is 52 to 60 degrees F (11 to 16 degrees C), increasing to the south. The freeze-free period averages 210 days and ranges from 185 to 235 days. The longer freeze-free periods occur in the more southerly parts of the area.

(Excerpt from 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.)

Table 3. Representative climatic features

Frost-free period (average)	178 days
Freeze-free period (average)	198 days
Precipitation total (average)	1,422 mm

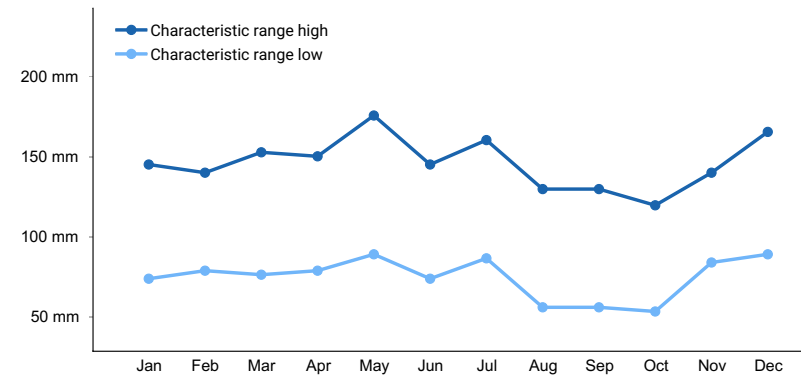


Figure 1. Monthly precipitation range

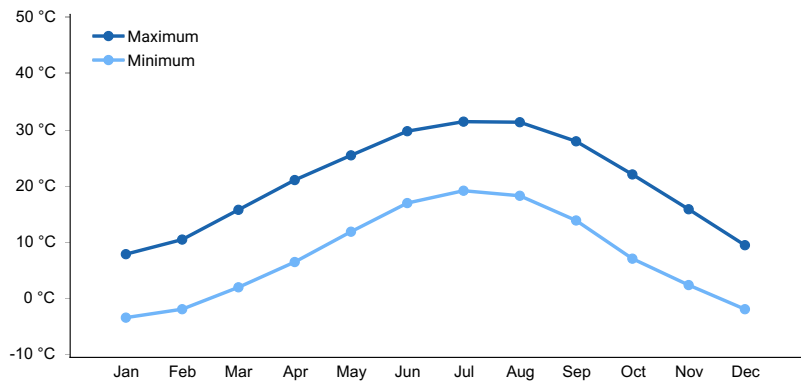


Figure 2. Monthly average minimum and maximum temperature

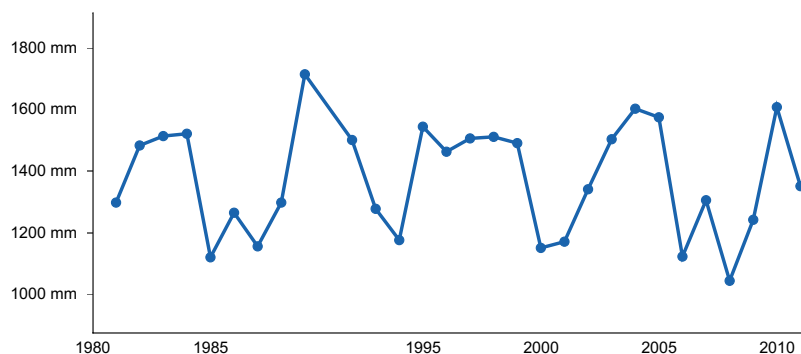


Figure 3. Annual precipitation pattern

Climate stations used

- (1) BOWLING GREEN WARREN CO AP [USW00093808], Bowling Green, KY
- (2) GREENSBURG [USC00153430], Greensburg, KY
- (3) WAYNESBORO [USC00409502], Waynesboro, TN
- (4) COOKEVILLE [USC00402009], Cookeville, TN

Influencing water features

These sites have no influencing water features.

Soil features

Soils in this group are well drained to somewhat excessively drained, have moderate to rapid permeability, and most are formed in residuum from cherty limestone, shale and siltstone.

Table 4. Representative soil features

Parent material	(1) Residuum—cherty limestone
Surface texture	(1) Channery silt loam (2) Gravelly (3) Very gravelly
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Rapid to very rapid
Soil depth	41–130 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–5.4
Subsurface fragment volume <=3" (Depth not specified)	1–50%
Subsurface fragment volume >3" (Depth not specified)	0–29%

Ecological dynamics

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Soil mapunits included in this preliminary grouping include: Biffle, Bodine, Dandridge-Needmore, Fullerton, Hawthorn, Saffell, Sugargrove, and Sulphura. Future ESD development may result in mapunits being added or removed from this PES group.

Ecological Dynamics:

Individual sites deserve a detailed understanding before conservation and restoration practices are implemented; therefore, it should be noted that the communities described in this provisional document reflect plant communities that are likely to be found on these soils and have not been field verified. Therefore, this PES describes hypotheses based on available data of many different scales and sources and has not been developed utilizing site-specific ecological field monitoring. This PES also does not encompass the entire complexity or diversity of these sites. Field studies would be required to develop a comprehensive and science-based native plant restoration plan for these sites.

Forest Vegetation as listed in Official Soil Series Description:

Biffle: Native woodland consists of chestnut oak, red oak, white oak, with few shortleaf pine, beech, and hickory.

Bodine: Most of this soil is in forest of chestnut oak, post oak, blackjack oak, white oak, hickory, maple, beech, eastern redcedar, and Virginia pine.

Dandridge: Native vegetation is forest of oak, hickory, beech, maple, elm, and locust.

Fullerton: Where wooded -- oak, hickory, elm, yellow poplar, dogwood, and beech

Hawthorn: Most of the acreage is woodland consisting of chestnut and white oaks, hickory, hackberry, and eastern red cedar.

Saffell: Principal use is woodland of shortleaf pine, loblolly pine, and upland oaks.

Sugargrove: About one-half of the acreage is cleared and used mainly for pasture. The remainder is in oak-hickory forest.

Sulphura: Most of the acreage is in woodland consisting of chestnut and white oaks, hickory, hackberry, beech, Virginia pine, and eastern redcedar.

Common trees found on site as listed in NASIS and county soil surveys for this group include:

southern red oak, white oak, black oak, scarlet oak, chestnut oak, blackgum, sourwood, yellow poplar, hickories, shortleaf pine, loblolly pine, and eastern red cedar.

Only two tree species can be selected for entry into the database as dominants; however, multiple tree species may be dominant on these sites and it will vary depending on aspect, soil depth, seed sources, management, and disturbance history.

The PES reference community was determined primarily by information found in NASIS, county soil surveys (trees on site, common trees) and Glendon Smalley's U.S. Forest Service technical report SO-43 entitled, "Classification and Evaluation of Forest Sites on the Eastern Highland Rim and Pennyroyal."

State 1. Forestland

Phase 1.1: Plant species dominants:

southern red oak (*Quercus falcata*) - chestnut oak (*Q. prinus*) / flowering dogwood (*Cornus florida*) - hophornbeam (*Ostrya virginiana*) / Canadian black snakeroot (*Sanicula canadensis*) - ticktrefoils (*Desmodium* spp).

Forests on these limestone-influenced sites are generally oak or oak-hickory. In areas with more topography, the north and east slopes may show an increase in more mesic hardwood species, such as beech and maples.

Understory communities contain herbs and forbs that thrive on limestone soils. The shrub layer is usually sparse in older, reference type communities but may be dense in successional stages.

Depending upon external influences such as fire and site management history, tree species may include white oak,

southern red oak, scarlet oak, chestnut oak, pignut hickory, shagbark hickory, sourwood, yellow poplar, pines, eastern red cedar, blackgum, and dogwoods.

Field work and site inspections are needed to determine the typical composition and dominance of understory species.

State: 2. Pasture

Phase 2.1: Managed Pasture. Plant species dominants: *Schedonorus arundinaceus* (tall fescue)

Pasture plant species are dependent on seeding, weed control, concurrent land uses, on-going levels of disturbance, and landowner goals. Individual site and soil characteristics, along with management activities, will influence production levels.

Many species of grass, both warm and cool season, are available and suitable for these sites. Common forage species include tall fescue, orchard grass, Kentucky bluegrass, Johnson grass, timothy, and various species of clover.

Management of pasture sites should follow conservation planning standards and protocols which include watershed protection, soil health, and adequate forage species.

Transitioning this state to a reference condition would require long-term timber stand improvement practices to control non-native vegetation and manage for desired hardwood species.

State: 3 – Transitional (Abandoned Field)

Phases 3.1: Plant species dominants: eastern red cedar (*Juniperus virginiana*)/ multi-flora rose (*Rosa multiflora*) – berries (*Rubus* spp.) / tall fescue (*Schedonorus arundinaceus*)

Tree species regeneration on these sites will depend on the severity and duration of disturbance, soil characteristics, adjacent plant communities and seed sources, post-disturbance management inputs, presence or absence of continued site disturbances (grazing), slope, and aspect.

Transitioning this state to a reference condition will likely require timber stand improvement practices to control non-native vegetation and manage for desired hardwood species.

The following information is from Glendon Smalley's U.S. Forest Service technical report SO-43 entitled, "Classification and Evaluation of Forest Sites on the Eastern Highland Rim and Pennyroyal."

Landtype 1, Ridges and Upper Slopes. Dominant soils include Bodine.

Dominant species: Scarlet oak, chestnut oak, white oak, hickories, southern red oak, loblolly pine, Virginia pine, and shortleaf pine.

Occasional species: black oak, blackgum, red maple, yellow poplar, blackjack oak, northern red oak, and eastern red cedar.

Common understory species: flowering dogwood, sourwood, eastern hophornbeam, winged elm, sassafras, Vacciniums, and wild plum.

Landtype 4, Cherty North Slopes. Dominant soils include Bodine, Fullerton.

Dominant species: white oak, black oak, southern red oak, yellow poplar, northern red oak, hickories, blackgum, red maple.

Occasional species: scarlet oak, chestnut oak, chinkapin oak, post oak, elms, white ash, black walnut, black cherry, eastern redcedar, American beech, sugar maple, shortleaf pine, loblolly pine, Virginia pine.

Common in understory: flowering dogwood, sassafras, persimmon, eastern hophornbeam, eastern redbud, devils club, Euonymuses, hydrangea, Vacciniums.

Landtype 5, Cherty South Slopes. Dominant soils include Bodine, Fullerton.

Dominant species: white oak, scarlet oak, chestnut oak, chinkapin oak, post oak, hickories, black oak southern red oak, eastern redcedar, loblolly pine, Virginia pine, shortleaf pine.

Occasional species: red maple, elms, blackgum, yellow poplar.

Common in understory: eastern redbud, eastern hophornbeam, flowering dogwood, vacciniums, euonymuses, winged elm, sassafras, wild plum.

Landtype 6, Shaly North Slopes (soils over cherty and shaly limestone). Dominant soils include Sulphura.

Dominant species: white oak, black oak, southern red oak, yellow poplar, blackgum, red maple, northern red oak, hickories.

Occasional species: scarlet oak, chestnut oak, elms, white ash, black walnut, black cherry, sugar maple, eastern redcedar, loblolly pine, shortleaf pine, Virginia pine.

Common in understory: flowering dogwood, sassafras, eastern hophornbeam, winged elm, American beech, eastern redbud, euonymuses and vacciniums.

Landtype 7, Shaly South Slopes. Dominant soils include Sulphura.

Dominant species: white oak, scarlet oak, chestnut oak, hickories, southern red oak, black oak, eastern redcedar, loblolly pine, shortleaf pine, Virginia pine.

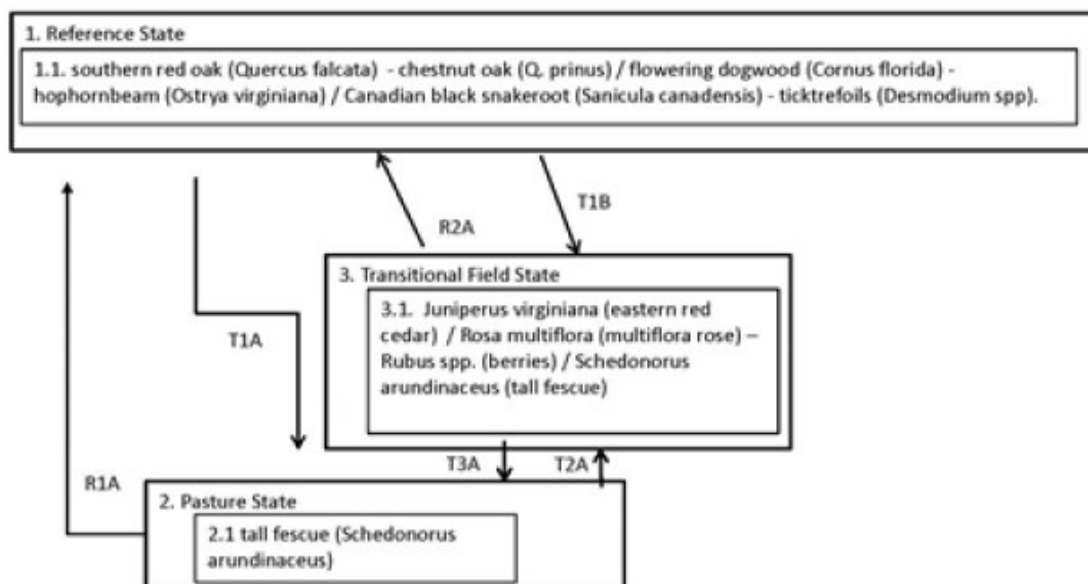
Occasional species: elms, yellow poplar, blackgum, American beech, white ash, sugar maple, black walnut, black cherry, and red maple.

Common in understory: flowering dogwood, sassafras, winged elm, vacciniums, eastern hophornbeam, and euonymuses.

State and transition model

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PES F122XY020TN – Cherty Limestone Escarpment



T1A: Pasture establishment.

T1B: Tree removal –no post-harvest management inputs. Fescue present if on adjacent sites or seeded.

T3A: Pasture re-establishment. Inputs may include brush/tree removal, weed control, seeding, etc.

T2A: Natural transition in absence of management inputs.

R1A, R2A: Extensive and long term forest management inputs required to create forest reference community.

Cropland was not included for this group, as the majority of mapunits are higher slope sites.

Lower slopes may be appropriate for cropland.

Figure 5. 20-Cherty Limestone Escarpment

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:**
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17. **Perennial plant reproductive capability:**
-