USDA Natural Resources
Conservation Service

Ecological site F122XY005KY
Moderately Deep Well Drained 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): 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). Bloomington, Indiana, is in the small part of this area that extends into southern Indiana.

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” (Talbott 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, Lynnville, 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). Udults 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). Rock outcrops are common on uplands.

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

Possible NatureServe Association(s):

white oak - black oak - hickory forest
Quercus velutina - *Quercus alba* - Carya (glabra, ovata) Forest, CEGL002076

Ecological site concept

Moderately Deep Well-Drained Uplands
MLRA 122
Ecological Dynamics:

This PES describes hypotheses based on available data of many different scales and sources. 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.

Ecological Dynamics
This PES describes an oak-hickory forest community on moderately-deep, well-drained, soils formed in residuum of limestone or interbedded limestone/shale.

The range of variation in plant composition on these sites vary mainly due to soil depth, available water, and aspect.

State 1. Forestland
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.

Phase 1.1:
black oak – white oak / coralberry - Carolina buckthorn / bedstraw- bignonia
(*Quercus velutina – Quercus alba* / *Symphoricarpos orbiculatus* - *Frangula caroliniana* / Gallium spp. -*Bignonia capreolata*)

These sites are characterized by moderately-deep soils predominately influenced by parent materials of limestone, calcareous shale, or interbedded limestone and shale. Soil depths of 20 to 40 inches provide an adequate moisture and growing environment for a wide range of quality hardwood trees, including various species of oaks and hickories. White oak, black oak, shagbark hickory, chinkapin oak, and sugar maple are likely to be on these sites.

Remaining wooded sites on these soil are generally located on hillsides and ridges, and are oak-hickory or oak-hickory-sugar maple forests with a robust and diverse herbaceous layer. Understory species may include agrimony, bedstraws, black snakeroots, white snakeroot, Virginia creeper, bignonia, smooth Solomon's seal, and false Solomon's seal. The shrub layer usually consisted of coralberry, Carolina buckthorn, and/or northern spicebush.

Other States and phases are described in the Community Phase Data Section.

Table 1. Dominant plant species

Tree	(1) *Quercus velutina* (2) *Quercus alba*
Shrub	(1) *Symphoricarpos orbiculatus* (2) *Frangula californica*
Herbaceous	(1) *Galium* (2) *Bignonia capreolata*

Physiographic features

These soils are located on uplands and are well drained and moderately deep.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Knob (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	107–396 m
Slope	2–60%
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)	175 days
Freeze-free period (average)	197 days
Precipitation total (average)	1,397 mm

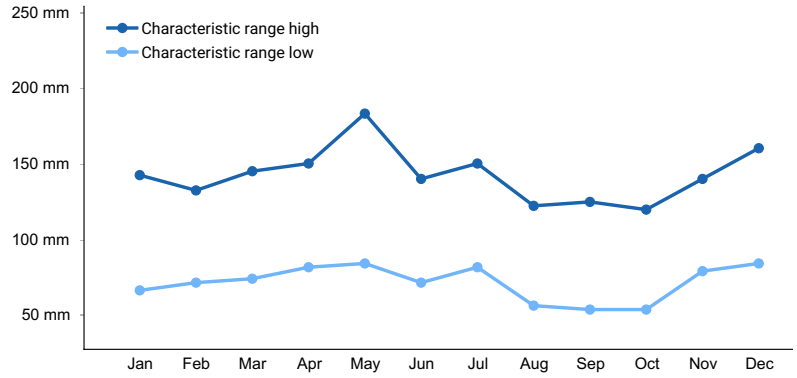

Figure 1. Monthly precipitation range

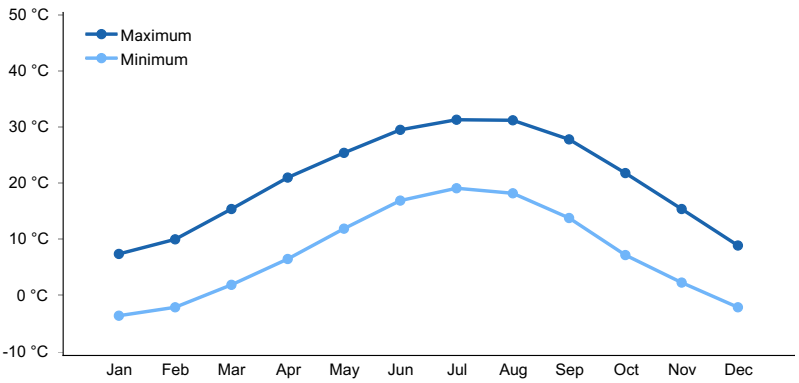

Figure 2. Monthly average minimum and maximum temperature

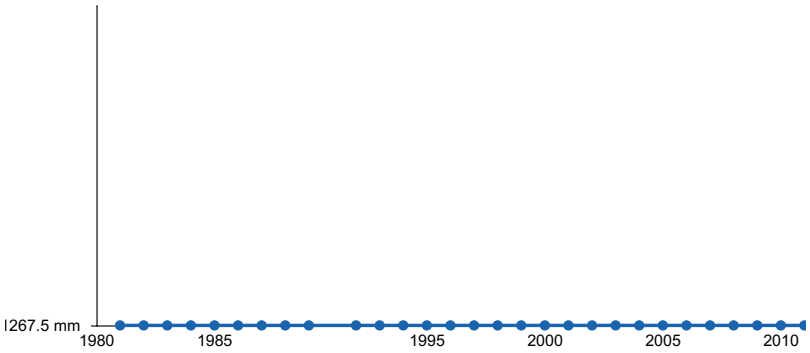

Figure 3. Annual precipitation pattern

Climate stations used

- (1) GREENSBURG [USC00153430], Greensburg, KY
- (2) CLARKSVILLE WWTP [USC00401790], Clarksville, TN
- (3) COOKEVILLE [USC00402009], Cookeville, TN
- (4) SALEM [USC00127755], Salem, IN
- (5) WAYNESBORO [USC00409502], Waynesboro, TN

Influencing water features

There are no influencing water features for this group.

Soil features

These uplands soils are moderately deep and well drained.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone (2) Loess–cherty limestone
Surface texture	(1) Sandy loam (2) Silty clay loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	152–203 cm
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	7.62–17.78 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)	4.6–6

Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–21%

Ecological dynamics

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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. Additional field studies are required to develop a comprehensive and science-based ESD.

Forest Vegetation as listed in Official Series Descriptions (OSD):
Caneyville: Native forests are oaks, hickory, elm, hackberry, and redbud as the dominant species.
Fredonia: Native forests have redcedar, oaks, hickory, elm, ash, walnut, and redbud as common species.
Needmore: The native vegetation is forests consisting of dominantly of oaks, hickories, elms, maples, beech, and dogwood.

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Phase 1.1:
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These sites are characterized by moderately-deep soils predominately influenced by parent materials of limestone, calcareous shale, or interbedded limestone and shale. Soil depths of 20 to 40 inches provide an adequate moisture and growing environment for a wide range of quality hardwood trees, including various species of oaks and hickories. White oak, black oak, shagbark hickory, chinkapin oak, and sugar maple are likely to be on these sites. Understory communities, while influenced by differences in soil depths and soil parent materials, will exhibited similarities in species composition.

Remaining wooded sites on these soil are generally located on hillsides and ridges, and are oak-hickory or oak-hickory-sugar maple forests with a robust and diverse herbaceous layer. Understory species may include agrimony, bedstraws, black snakeroots, white snakeroot, Virginia creeper, bignonia, smooth Solomon's seal, and false Solomon's seal. The shrub layer usually consisted of coralberry, Carolina buckthorn, and/or northern spicebush.

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 Field
Phase 3.1: Plant species dominants: Eastern red cedar / berries / ironweed- tall fescue

Eastern red cedar would likely be the dominant successional tree species on these sites. Seedlings and saplings of Acer spp, (especially red maple, sugar maple, and boxelder), *Sassafras albidum* (sassafras), *Robinia pseudoacacia* (black locust), *Celtis occidentalis* (hackberry), Fraxinus spp. (ash), Quercus spp., and Carya spp. may be present depending on management and adjacent seed sources. Shrubs may include sumac, blackberries, dewberries, multiflora rose, Carolina rose, and other successional species.

Tree 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, fire, timber cutting), slope, and aspect.

Transitioning this state to a reference condition would likely require timber stand improvement practices to control non-native vegetation and manage for desired tree species.
State 4: Phase 4.1. Abandoned Croplands

Plant species dominant:
henbit deadnettle (*Lamium amplexicaule*) – mouse-eared chickweed (Cerastium L.)

Abandonment of cropland would result in many weed species taking over the site. Initially, annual weeds would be predominate followed by grasses, shrubs and finally, pioneers trees.

It would require years of management, plantings, and weed control to establish successional communities that could transition to a reference community.

State 5: Phase 5.1. Cropland
Dependent upon seeding and management. Most common crops are corn and soybeans.

It would require years of management, plantings, and weed control to establish successional communities that could transition to a reference community.

TO VALIDATE THE INFORMATION IN THIS PROVISIONAL ECOLOGICAL SITE DESCRIPTION FUTURE FIELD WORK IS NEEDED. This will include field inspection and data collection including medium to high intensity sampling, soil correlations, and analysis of that data.

A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce a document to be utilized for on-site conservation planning.

State and transition model

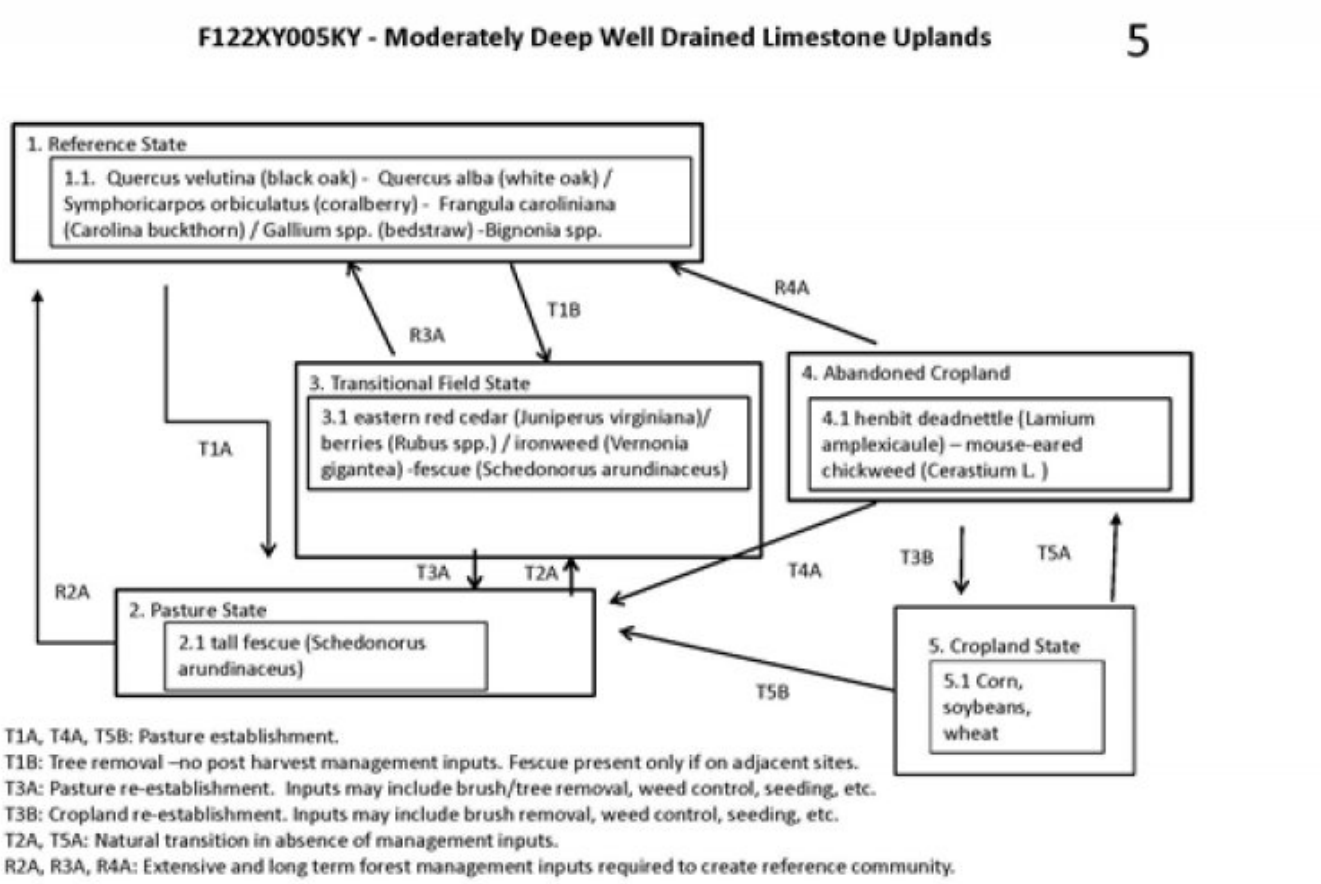

Figure 5. group 5

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:**

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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):**

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:**