Ecological site F121XY021KY
Loess Capped Upland

Last updated: 10/01/2024
Accessed: 09/17/2026

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): 121X–Kentucky Bluegrass

General: MLRA 121 is in Kentucky (83 percent), southern Ohio (11 percent), and southern Indiana (6 percent). It makes up about 10,680 square miles (27,670 square kilometers). The cities of Cincinnati, Ohio, and Louisville, Frankfort, and Lexington, Kentucky, are in this area. Physiography: This area is primarily in the Lexington Plain Section of the Interior Low Plateaus Province of the Interior Plains. Soils: The dominant soil orders in MLRA 121 are Alfisols, Inceptisols, and Mollisols. The soils in the area dominantly have a mesic soil temperature regime, an udic soil moisture regime, and mixed mineralogy. They are shallow to very deep, generally well-drained, and loamy or clayey. Hapludalfs formed in residuum on hills and ridges (Beasley, Cynthiana, Eden, Faywood, Lowell, and McAfee series) and in loess over residuum on hills and ridges (Carmel and Shelbyville series). Paleudalfs (Crider and Maury series) formed in loess or other silty sediments over residuum on hills and ridges. Fragiudalfs (Nicholson series) formed in loess over residuum on ridges. Hapludolls formed in residuum on hills and ridges (Fairmount series) and in alluvium on floodplains (Huntington series). Eutrudepts (Nolin series) formed in alluvium on flood plains. Geology: Most of this area has an Ordovician-age limestone that has been brought to the surface in the Jessamine Dome, a high part of a much larger structure called the Cincinnati Arch. The strata of limestone have a propensity to form caves and karst topography. Younger units of thin-bedded shale, siltstone, and limestone occur at the eastern and western edges of the area. The area has no coal-bearing units. Pleistocene-age loess deposits cover most of the bedrock units in this MLRA, and some glacial lake sediments are at the surface in the northwest corner of the area. Unconsolidated alluvium is deposited in the river valleys.

Classification relationships

Deep Soil Mesophytic Forest syn = western mesophytic forest (in part), mesic upland forest, typic mesophytic forest (Kentucky State Nature Preserves Commission, 2009) Interior Highlands Dry to Mesic oak Forests and Woodlands (Plant communities of the Midwest) Calcareous Mesophytic Forest, (Kentucky State Nature Preserves Commission)

Ecological site concept

The Loess Capped Upland ecological site includes soils capped with loess on uplands. Representative soils include: Cincinnati, Crider, Jessup, Switzerland. State 1, Phase 1.1: Plant species dominants: Quercus alba-Quercus rubra/Lindera benzoin/Podophyllum peltatum-Parthenocissus quinquefolia (white oak- red oak/ spicebush / mayapple- Virginia creeper) State 1, Phase 1.2: Plant species dominants: Acer saccharum.-Quercus spp. / Lindera benzoin /Podophyllum peltatum-Parthenocissus quinquefolia The majority of these sites within MLRA 121 are now utilized as pasture or cropland, so high quality forested reference communities are extremely rare. State: 2. Pasture State 2, Phase 2.1: Managed Pasture. Plant species dominants: Schedonorus arundinaceus (tall fescue) State 2, Phase 2.2: Minimally Managed Pasture. Plant species dominants: Rosa multiflora- Rubus spp. /Schedonorus arundinaceus State 2, Phase 2.3: Warm season pasture. This sites are very suitable for the development of warm season pastures for forage production or wildlife habitat. Species composition is dependent upon seeding and management. State 3, Phase 31: Plant species dominants: eastern red cedar (Juniperus virginiana)/ tall fescue (Schedonorus arundinaceus)-giant ironweed (Vernonia gigantean) State: 4. Honeysuckle Invaded Woodland State 4, Phase 4.1: Plant species dominants: Acer saccharum- Celtis occidentalis / Lonicera maackii. This state is characterized by a dense understory of Lonicera spp. (usually L. maackii in MLRA 121) which fundamentally alters the native plant communities due to shade and competition. Long-term, multi-year control efforts are required to control this aggressive non-native plant and restore native woodlands. State: 5. Cropland State 5, Phase 5.1: Plant species dominants: dependent upon seeding and management. Most common crops are corn and soybeans.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus rubra*
Shrub	(1) *Lindera benzoin*
Herbaceous	(1) *Podophyllum peltatum* (2) *Parthenocissus quinquefolia*

Physiographic features

These soils are deep/very deep capped with loess on uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hill
Runoff class	Very low to very high
Elevation	140 – 370 m
Slope	0 – 20 %
Water table depth	40 – 180 cm
Aspect	Aspect is not a significant factor

Climatic features

These ecological sites are located in MLRA 121 and are at the northern periphery of the humid subtropical climate zone. Generally characterized by hot, humid summers and cold winter, the area has four distinct seasons. The expected annual precipitation for sites included in this ecological site description is generally in the range of 40 to 50 inches. The majority of precipitations falls during the freeze-free months, and thunderstorms with heavy rainfall are common during the spring and summer months. The freeze-free period varies somewhat based on localized topography and longitude.

MLRA climate summary: The average annual precipitation in most of this area is 41 to 45 inches. It is 45 to 52 inches along the southern edge of the area. About one-half of the precipitation falls during the growing season. Most of the rainfall occurs as high-intensity, convective thunderstorms. The annual snowfall averages about 14 inches (370 millimeters). The average annual temperature is 51 to 57 degrees F (10 to 14 degrees C). From: 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, 2006)

Table 3 Representative climatic features

Frost-free period (characteristic range)	160-180 days
Freeze-free period (characteristic range)	190-200 days

Precipitation total (characteristic range)	1,090-1,140 mm
Frost-free period (actual range)	160-180 days
Freeze-free period (actual range)	190-210 days
Precipitation total (actual range)	1,090-1,140 mm
Frost-free period (average)	170 days
Freeze-free period (average)	190 days
Precipitation total (average)	1,120 mm

- (1) LOUISVILLE INTL AP [USW00093821], Louisville, KY
- (2) LEXINGTON BLUEGRASS AP [USW00093820], Lexington, KY
- (3) CINCINNATI NORTHERN KY AP [USW00093814], Burlington, KY

Influencing water features

These sites have no influencing water features.

Soil features

Moderately well drained or well drained soils of variable depth with a loess cap.
Representative soils include: Cincinnati, Crider, Jessup, Switzerland.

Table 4. Representative soil features

Parent material	(1) Loess – limestone (2) Noncalcareous loess – calcareous shale
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately slow
Soil depth	40 – 250 cm

Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	7.62 – 20.32 cm
Soil reaction (1:1 water) (0-101.6cm)	3.6 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

State 1, Phase 1.1: Plant species dominants: Quercus alba-Quercus rubra/Lindera benzoin/Podophyllum peltatum-Parthenocissus quinquefolia
(white oak- red oak/ spicebush / mayapple- Virginia creeper)

State 1, Phase 1.2: Plant species dominants: Acer saccharum.-Quercus spp. / Lindera benzoin /Podophyllum peltatum-Parthenocissus quinquefolia

The majority of these sites within MLRA 121 are now utilized as pasture or cropland, so high quality forested reference communities are extremely rare. Oak and hickory trees would likely be the historical dominant forest type; however, due to the cessation of a natural fire regime and decades of disturbances, phase 1.2 is common.

Dominant phase 1.1 trees may include Quercus alba (white oak), Quercus muehlenbergii (chinkapin oak), Quercus rubra (red oak), Quercus shumardii (Shumard oak), Carya ovata (shagbark hickory), Carya tomentosa (mockernut hickory), Ulmus rubra (slippery elm), Acer saccharum (sugar maple), Fraxinus quadrangulata (blue ash), Cercis canadensis (redbud), Cornus florida (dogwood), Oxydendrum arboreum (sourwood), Ulmus americana (American elm), and Juniperus virginiana (eastern red cedar).

Phase 1.2 is typified by dominant trees that are more mesic, quick-growing, and shade tolerant than oaks or hickories. Sugar maple, white ash, red maple, hackberry, and boxelder have increased in density. The increase in forest floor shade reduces oak-hickory regeneration and grown while providing an advantageous environment for shade tolerant tree species.

Forest stand management inputs including maple-ash removal, prescribed fire, non-native species control and other timber stand improvement activities are often warranted on these sites to develop a quality reference community.

State: 2. Pasture
State 2, Phase 2.1: Managed Pasture. Plant species dominants: Schedonorus arundinaceus (tall fescue)
State 2, Phase 2.2: Minimally Managed Pasture. Plant species dominants: Rosa multiflora- Rubus spp. /Schedonorus arundinaceus
State 2, Phase 2.3: Warm season pasture. This sites are very suitable for the development of warm season pastures for forage production or wildlife habitat. Species composition is dependent upon seeding and management.

State 3, Phase 31: Plant species dominants: eastern red cedar (Juniperus virginiana)/ tall fescue (Schedonorus arundinaceus)-giant ironweed (Vernonia gigantean)

Narrative: This phase is best described as an old field habitat with a mixture of native and introduced grasses, a variety of native and non-native herbs and forbs, a selection of non-native weedy plants such as thistles, a robust community of young eastern red cedar trees, and a few hardwood seedlings. These sites can be found on property of landowners interested in wildlife habitat or on wildlife management areas. The variety of plants found on these successional sites provides desired habitat for non-game and game species. To reduce the density of the eastern red cedar trees, many landowners chose to actively managing these properties by thinning or removal of cedar trees thereby maintaining this state though active management.

Common shrub species may include: winged sumac (Rhus copallinum), smooth sumac (Rhus glabra), Carolina rose (Rosa Carolina), fragrant sumac (Rhus aromatic), and multiflora rose (Rosa multiflora).

Tree seedling and saplings would be dependent on adjacent seed sources, especially for the mast species. Species may include: eastern redcedar (Juniperus virginiana), chinquapin oak (Quercus muehlenbergii), boxelder (Acer negundo), sugar maple (Acer saccharum), common hackberry (Celtis occidentalis), black cherry (Prunus serotina), white ash (Fraxinus Americana) and black locust (Robinia pseudoacacia).

State: 4. Honeysuckle Invaded Woodland
State 4, Phase 4.1: Plant species dominants: Acer saccharum- Celtis occidentalis / Lonicera maackii.

This state is characterized by a dense understory of Lonicera spp. (usually L. maackii in MLRA 121) which fundamentally alters the native plant communities due to shade and competition. Long-term, multi-year control efforts are required to control this aggressive non-native plant and restore native woodlands.

State: 5. Cropland
State 5, Phase 5.1: Plant species dominants: dependent upon seeding and management. Most common crops are corn and soybeans.

State and transition model

Figure 7. MLRA 121, Group 21

Additional community tables

Inventory data references

Site Development and Testing Plan Future work is needed, as described in a future project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

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Contributors

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Approval

Greg Schmidt, 10/01/2024

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	09/17/2026
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):**

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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:**
