

# Ecological site F121XY005KY

## Black Shale Upland

Last updated: 10/01/2024  
Accessed: 01/14/2025

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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): 121X–Kentucky Bluegrass

General: MLRA 121 is in Kentucky (83 percent), Ohio (11 percent), and 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

Acidic sub-xeric forest: Kentucky State Nature Preserves Commission

Acidic xeric forest/woodland: Kentucky State Nature Preserves Commission

Xeric Virginia pine forest/woodland: Kentucky State Nature Preserves Commission.

### Ecological site concept

The Black Shale Upland ecological site encompasses dry hardwood and dry hardwood-pine forest communities on soils of various depths, aspects, and micro-topography which are underlain by acidic hard black shale.

Representative soils include: Berea, Blago, Colyer, Covedale, Greenbriar, Jessietown, Muse, Rohan, Trappist.

The range of variation in plant composition on these sites vary mainly due to soil depth, available water, and aspect. The floristic expression of these sites likely varies considerably due to depth differences and future field work may result in one or more ecological site description developed within the current PES soil grouping.

State 1. (Reference): Black Shale Uplands Provisional Ecological Site (PES)

State 1, Phase 1.1: Plant species dominants:

*Quercus prinus-Quercus coccinea/Vaccinium arboreum/Danthonia spicata-Hieracium venosum*

(chestnut oak – scarlet oak / farkleberry / poverty oat grass – rattlesnake weed.

State 2, Phase 1.2: Plant species dominants: *Quercus prinus-Pinus virginiana/ Vaccinium/Antennaria*

*plantaginifolia-Lespedeza spp.*

(chestnut oak – Virginia pine/ blueberry / women’s tobacco – lespedeza)

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: 3 – Post Large-Scale Disturbance Forest

State 3, Phases 3.1: Post Large-Scale Disturbance Forest State. Plant species dominants:

*Pinus virginiana-Acer rubra /Rubus spp. / Panicum spp.-Lespedeza spp.*

(Virginia pine – red maple / blackberry / panic grass – lespedeza)

State: 4. Abandoned Field

State 4, Phase 4.1: Plant species dominants: *Rhus copallina-Sassafras albidum /Rubus spp. – Smilax.*

*/Schedonorus arundinaceus*

Transitioning to a reference condition will require timber stand improvement practices to control non-native vegetation and manage for higher quality oak or hickory species.

**Table 1. Dominant plant species**

Tree	(1) <i>Quercus prinus</i> (2) <i>Quercus coccinea</i>
Shrub	(1) <i>Vaccinium arboreum</i>
Herbaceous	(1) <i>Danthonia spicata</i> (2) <i>Hieracium venosum</i>

## Physiographic features

This PES encompasses dry hardwood and dry hardwood-pine forest communities on soils of various depths, aspects, and micro-topographies but which are all underlain by acidic hard black shale. Future field work with likely develop multiple ESDs from this initial group.

The range of variation in plant composition on these sites vary mainly due to soil depth, available water, and aspect. Actual field work is required to develop an ecological site description, a field-based state and transition model, and accurate plant community phases to support conservation planning.

The floristic expression of these sites likely varies considerably due to depth differences and future field work may result in one or more ecological site description developed within the current PES soil grouping.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Ridge
Flooding frequency	None

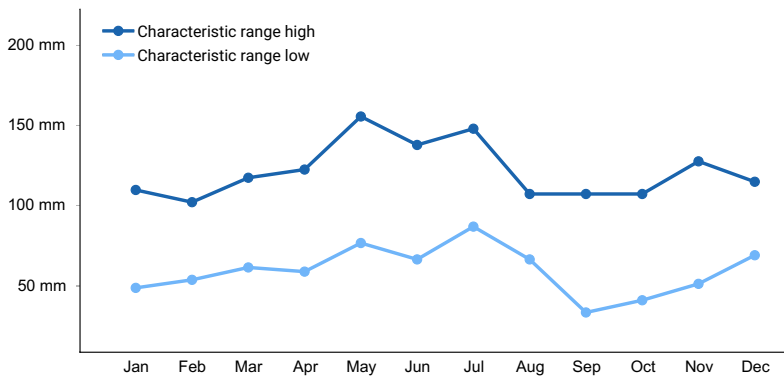
Ponding frequency	None
Elevation	168–411 m
Slope	2–60%
Water table depth	38–137 cm
Aspect	Aspect is not a significant factor

## Climatic features

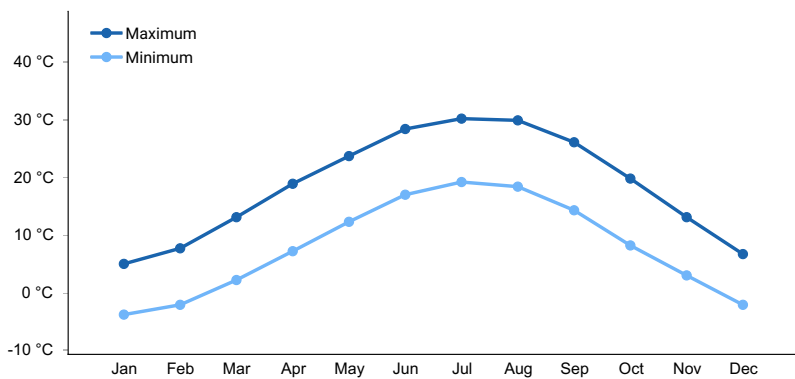
The average annual precipitation in most of this area is 41 to 45 inches. It is 45 to 52 inches along the southern edge of the area. About one-half of the precipitation falls during the growing season. Most of the rainfall occurs as high-intensity, convective thunderstorms. The annual snowfall averages about 14 inches (370 millimeters). The average annual temperature is 51 to 57 degrees F (10 to 14 degrees C). The freeze-free period averages 210 days and ranges from 185 to 230 days.

**Table 3. Representative climatic features**

Frost-free period (average)	187 days
Freeze-free period (average)	206 days
Precipitation total (average)	1,143 mm



**Figure 1. Monthly precipitation range**



**Figure 2. Monthly average minimum and maximum temperature**

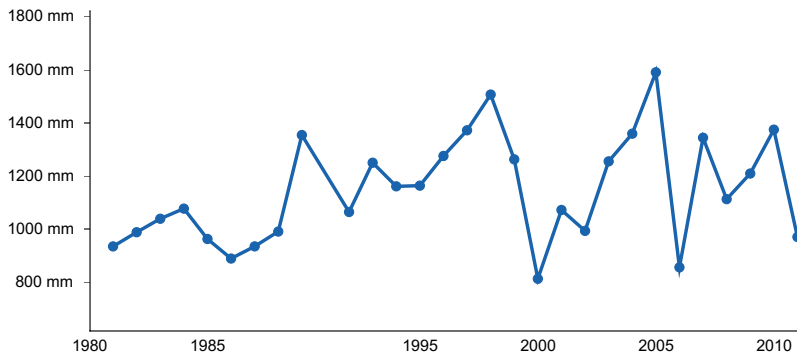


Figure 3. Annual precipitation pattern

### Climate stations used

- (1) LEXINGTON BLUEGRASS AP [USW00093820], Lexington, KY

### Influencing water features

There are not major water features that influence this site.

### Soil features

This project consists of soil over black shale. Field work is required to further refine the grouping and will likely result in multiple ESDs being developed from this initial grouping. Representative soils include: Berea, Blago, Colyer, Covedale, Greenbriar, Jessietown, Muse, Rohan, Trappist.

Table 4. Representative soil features

Parent material	(1) Residuum–acid shale (2) Colluvium–sandstone and siltstone (3) Noncalcareous loess–shale
Surface texture	(1) Channery sandy loam (2) Very channery silty clay (3) Gravelly silty clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	23–165 cm
Surface fragment cover <=3"	0–8%
Surface fragment cover >3"	0–8%
Available water capacity (0-101.6cm)	2.29–21.08 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.3–5.3
Subsurface fragment volume <=3" (Depth not specified)	0–47%
Subsurface fragment volume >3" (Depth not specified)	0–6%

## Ecological dynamics

### ECOLOGICAL DYNAMICS:

This PES encompasses dry hardwood and dry hardwood-pine forest communities on soils of various depths, aspects, and micro-topography which are underlain by acidic hard black shale. The range of variation in plant composition on these sites vary mainly due to soil depth, available water, and aspect. Actual field work is required to develop an ecological site description, a field-based state and transition model, and accurate plant community phases to support conservation planning.

The floristic expression of these sites likely varies considerably due to depth differences and future field work may result in one or more ecological site description developed within the current PES soil grouping.

State 1. (Reference): Black Shale Uplands Provisional Ecological Site (PES)

State 1, Phase 1.1: Plant species dominants:

*Quercus prinus-Quercus coccinea/Vaccinium arboreum/Danthonia spicata-Hieracium venosum*  
(chestnut oak – scarlet oak / farkleberry / poverty oat grass – rattlesnake weed.

State 2, Phase 1.2: Plant species dominants: *Quercus prinus-Pinus virginiana/ Vaccinium/Antennaria plantaginifolia-Lespedeza spp.*

(chestnut oak – Virginia pine/ blueberry / women's tobacco – lespedeza)

These plant communities are influenced by variations in soil depth, rock content, slope, pH, aspect, micro-topography, and available water. Sites are generally on upland hillsides and ridges within the Knobs Norman Upland with a few sites in the Knobs-Lower Scioto Dissected Plateau Physiographic Region. Sites are dominated by sub-xeric and xeric plants species including dry- upland oaks, hickories and pines. Generally, north slopes and sites with deeper soils have a reference community of mixed oaks or oak-hickory components. Dominant species include *Quercus prinus*, *Quercus coccinea* and *Pinus virginiana*. Additional species found on these sites include *Quercus alba*, *Quercus velutina*, *Carya glabra*, *Carya ovata*, *Sassafras albidum*, and *Acer rubrum*. South-facing slopes and sites with shallow soils have plant communities that reflect the resulting reduction in available water. These communities include the more xeric oak species such as *Quercus stellata*, *Quercus marilandica* and *Pinus virginiana*.

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*

A pasture phase for this provisional ecological community is feasible only on lower sloping sites. Many black shale sites are too steep for this state and should only be managed as woodlands. Plant species within pasture phases depend on seeding, management, and concurrent land uses. As with all sites, soil characteristics and management inputs will influence production levels.

Transitioning this state to a reference condition would likely require extensive and long-term timber stand improvement practices including control of non-native vegetation and management for desired oak or hickory species.

State: 3 – Post Large-Scale Disturbance Forest

State 3, Phases 3.1: Post Large-Scale Disturbance Forest State. Plant species dominants:

*Pinus virginiana-Acer rubra /Rubus spp. / Panicum spp.-Lespedeza spp.*  
(Virginia pine – red maple / blackberry / panic grass – lespedeza)

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.

Dr. Mary Wharton conducted six years of research documenting plant community succession on Kentucky's black shale sites. According to her reports, plants species that frequently occurred on post-cleared upland sites include *Acer rubrum*, *Campsis radicans*, *Diospyros virginiana*, *Nyssa sylvatica*, *Pinus virginiana*, *Quercus prinus*, *Quercus*

*coccinea*, *Quercus imbricaria*, *Rhus copallina*, *Rubus* spp. *Sassafras albidum*, and *Smilax glauca*.

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. Abandoned Field**

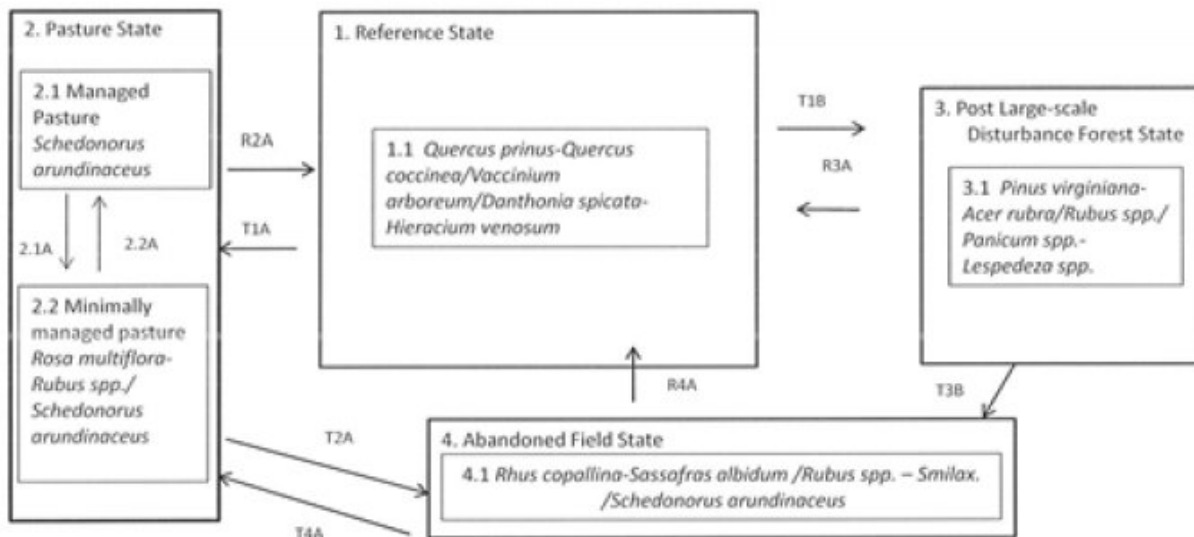
State 4, Phase 4.1: Plant species dominants: *Rhus copallina*-*Sassafras albidum* /*Rubus* spp. – *Smilax*. /*Schedonorus arundinaceus*

After a field is abandoned, it is first occupied by a ruderal plant community until shrubs and trees become established. Associated species with this state and phase were identified by Dr. Mary Wharton on her work conducted on black shale uplands. She documented over 69 species specifically found on black shale abandoned field sites. Species especially common on moist acidic sites in the Knobs region include joe-pye weed (*Eutrochium fistulosum*, meadow phlox (Phlox maculate), Indian plantain (*Arnoglossum atriplicifolium*), downy lobelia (*Lobelia puerula*), and tall tickseed (*Coreopsis tripteris*). Other species that may occur include: *Rhus copallina*, *Rubus* spp., *Sassafras albidum*, *Smilax glauca*, and seedlings of *Quercus* spp., *Carya* spp., *Acer* spp, *Pinus* spp., *Achillea millefolium*, *Andropogon virginicus*, *Aster pilosus*, *Erigeron annuus*, *Erigeron Canadensis*, *Gnaphalium purpureum*, *Hedeoma pulegioides*, *Hypericum punctatum*, *Houstonia caerulea*, *Lactuca Canadensis*, *Potentilla simplex*, *Rumex acetosella*, *Specularia perfoliata*, and *Verbascum thapsus*.

Transitioning this state to a reference condition will require timber stand improvement practices to control non-native vegetation and manage for higher quality oak or hickory species.

**State and transition model**

**F121XY005KY -Black Shale Uplands Provisional Ecological Site 5**



T1A, T2A, T3B: pasture development (lower slopes only)  
 T1B: Forest clearing (lower slope sites only).  
 R2A: Transition from maple-oak woodland to oak dominated reference phases. Timber stand improvement inputs required.  
 R2A, R3A, R4A: Restoration to Reference community. Substantial, long-term inputs required.  
 2.1A: decreased mgmt. inputs.  
 2.2A: increased mgmt. inputs.

## 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.

## Other references

Abrams, M.D. and G.J. Nowacki. 2008. Native Americans as active and passive promoters of mast and fruit trees in the eastern USA. *The Holocene* 18.7. pp. 1123-1137.

Barbour, M.G., J.H. Burk, W.D. Pitts, F.S. Gilliam, and M.W. Schwartz. 1999. *Terrestrial Plant Ecology* (ed. 3). Benjamin/Cummings, Inc., Menlo Park, California.

Braun, E.L. 1950. *Deciduous forests of Eastern North America*. Blakinston Co, Pennsylvania. Reprinted in 2001 by Blackburn Press, Caldwell, New Jersey.

Carey, Andrew B. 1983. Cavities in trees in hardwood forests. In: Davis, Jerry W.; Goodwin, Gregory A.; Ockenfeis, Richard A., technical coordinators. *Snag habitat management: proceedings of the symposium; 1983 June 7-9; Flagstaff, AZ*. Gen. Tech. Rep. RM-99. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 167-184. [17833]

Clark, R.C. and T.J. Weckman. 2008. Annotated catalog and atlas of Kentucky woody plants. *Castanea, Occasional Paper in Eastern Botany* No. 3: 1–114.

Cleland, D. T., J. A. Freeouf, J. E. Keys, Jr., G. J. Nowacki, C. A. Carpenter, and W. H. McNab. 2007. *Ecological Subregions: Sections and Subsections of the Conterminous United States*. GTR-WO-76C-1. [http://fsgeodata.fs.fed.us/other\\_resources/ecosubregions.html](http://fsgeodata.fs.fed.us/other_resources/ecosubregions.html).

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. *Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems*. NatureServe, Arlington, Virginia.

DeGraaf, Richard M; Shigo, Alex L. 1985. *Managing cavity trees for wildlife in the Northeast*. Gen. Tech. Rep. NE-101. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Delcourt, P.A. and H.R. Delcourt. 1998. The influence of prehistoric human-set fires on oak- chestnut forests in the southern Appalachians. *Castanea* 63:337-345.

Evans, M., and G. Abernathy. 2008. *Presettlement land cover of Kentucky*. Kentucky State Nature Preserves Commission, Frankfort, Kentucky, USA.

Fenneman, N.M. 1917. *Physiographic subdivisions of the United States*. *Proceedings of the National Academy of Sciences of the United States of America*. Vol. 3(1). pp. 17 -22.

Fenneman, N.M. 1938. *Physiography of Eastern United States*. McGraw-Hill Book Co., New York.

Guyette, R.P. and D.C. Dey. 2000. Humans, topography, and wildland fire: the ingredients for long-term patterns in ecosystems. Pp. 28-35 in D.A. Yaussy (ed.). *Proceedings of the workshop on fire, people, and the central hardwoods landscape*. General Technical Report NE-274. U.S. Department of Agriculture, Forest Service, Northeastern Forest Experimentation Station. Radnor, Pennsylvania.

- Guyette, R.P., M.C. Stambaugh, D.C. Dey and R. Muzika. 2011. Predicting fire frequency with chemistry and climate. *Ecosystems* Published online: DOI: 10.1007/s10021-011-9512-0.
- Halls, Lowell K. 1977. Southern fruit-producing woody plants used by wildlife. USDA Forest Service, General Technical Report SO-16. Southern Forest Experiment Station, New Orleans, LA.
- Hardin, Kimberly I.; Evans, Keith E. 1977. Cavity nesting bird habitat in the oak-hickory forests--a review. Gen. Tech. Rep. NC-30. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 23 p.
- Jennings, M.D., Faber-Langedoen, D., Loucks, O.L., Peet, R.K. and Roberts, D. 2009. Standards for associations and alliances of the U.S. National Vegetation Classification. *Ecological Monographs*, 79(2), 2009, pp. 173–199.
- Johnson, Paul S. 1992. Oak overstory/reproduction relations in two xeric ecosystems in Michigan. *Forest Ecology and Management*. 48: 233-248.
- Kartesz, J.T., The Biota of North America Program (BONAP). 2011. North American Plant Atlas (<http://www.bonap.org/MapSwitchboard.html>). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2010. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)].
- Kentucky Division of Geographic Information. 2004. Kentucky 2001 Anderson level III land cover. Kentucky Division of Geographic Information, Frankfort, Kentucky, USA.
- Keever, C. 1978. A study of the mixed mesophytic, western mesophytic, and oak chestnut regions of the eastern deciduous forest including a review of the vegetation and sites recommended as potential natural landmarks. Millersville State College, Pennsylvania.
- Kentucky Geological Survey, Geospatial Analysis Section, Digital Mapping Team. 2004. Geologic formations. Kentucky Geological Survey, Lexington, Kentucky, USA.
- Kentucky State Nature Preserves Commission. 2009. Natural communities of Kentucky. Frankfort, KY
- Kentucky State Nature Preserves Commission. 2011. Kentucky natural areas inventory dataset. Frankfort, KY.
- Kentucky State Nature Preserves Commission. 2012. Kentucky natural heritage database. Frankfort, KY.
- Lawless, P. J., Baskin, J. M. and C. C. Baskin. 2006. Xeric Limestone Prairies of Eastern United States: Review and Synthesis. *The Botanical Review* 73(4): 303–325. The New York Botanical Garden.
- NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA USA
- NatureServe. 2014. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>.
- McNab, W.H. and P.E. Avers. 1994. Ecological subregions of the United States. U.S. Forest Service. Prepared in cooperation with Regional Compilers and the ECOMAP Team of the Forest Service.
- McNab, W.H, D. T. Cleland, J. A. Freeouf, J. E. Keys, Jr., G. J. Nowacki, and C. A. Carpenter. 1997. Description of "Ecological Subregions: Sections of the Conterminous United States".
- Noss, R. F. 1983. A regional landscape approach to maintain biodiversity. *BioScience* 33(11): 700-706.
- Pickett, S.T.A. and P.S. White. 1985. Patch dynamics: a synthesis. In: S.T.A. Pickett and P.S. White. *The ecology of natural disturbance and patch dynamics*. New York: Academic Press: 371-384.
- Pyne, S.J. 1982. *Fire in America: a cultural history of wildland and rural fire*. Princeton University Press, Princeton, New Jersey.



- Quarterman, E. and R.L. Powell. 1978. Potential ecological/geological natural landmarks on the Interior Low Plateaus. pp. 7-73. U.S. Department of the Interior, Washington, D.C. Quarterman,
- Rooney, T.P., S.M. Wiegmann, D.A. Rogers and D.M. Waller. 2004. Biotic impoverishment and homogenization in unfragmented forest understory communities. *Conservation Biology* (in press).
- Slone, T. and Wethington, T. 2001. *Kentucky's Threatened and Endangered Species*. Kentucky Department of Fish and Wildlife Resources, Frankfort, KY.
- Smalley, Glendon W. 1990. *Carya glabra* (Mill.) Sweet pignut hickory. *Silvics of North America*. Vol. 2. Hardwoods. Agric. Handbook 654. Washington, DC: U.S. Department of Agriculture, Forest Service: 198-204.
- Stambaugh, M.C. and R.P. Guyette. 2008. Predicting spatio-temporal variability in fire return intervals with a topographic roughness index. *Forest Ecology and Management* 254:463-473.
- Stritch, L.R. 1990. Landscape-scale restoration of barrens-woodland within the oak-hickory forest mosaic. *Restoration & Management Notes* 8: 73-77.
- Sweeney, J.M., ed. 1990. *Management of dynamic ecosystems*. North Cent. Sect., The Wildl. Soc., West Lafayette, Ind.
- Sole, Jeffery. 1999. Distribution and Habitat of Appalachian Cottontails in Kentucky. *Proceedings of the Annual Conference of Southeastern Association Fish and Wildlife Agencies* 53:444-448.
- United States Department of Agriculture (USDA), Natural Resources Conservation Service. Soil survey of Bullitt and Spencer Counties, KY.
- United States Department of Agriculture (USDA), Natural Resources Conservation Service. Soil survey of Casey County, KY.
- United States Department of Agriculture (USDA), Natural Resources Conservation Service. Soil survey of Garrard and Lincoln Counties, KY.
- United States Department of Agriculture (USDA), Natural Resources Conservation Service. Soil survey of Hardin and Larue Counties, KY.
- United States Department of Agriculture (USDA), Natural Resources Conservation Service. Soil survey of Jefferson County, KY.
- United States Department of Agriculture (USDA), Natural Resources Conservation Service. Soil survey of Marion County, KY.
- United States Department of Agriculture (USDA), Natural Resources Conservation Service. Soil survey of Nelson County, KY.
- United States Department of Agriculture-Forest Service, Agriculture Handbook 654, *Silvics of North America*.
- Sork, Victoria L.; Stacey, Peter; Averett, John E. 1983. Utilization of red oak acorns in non-bumper crop year. *Oecologia*. 59: 49-53.
- Woods, A.J., Omernik, J.M., Martin, W.H., Pond, G.J., Andrews, W.M., Call, S.M, Comstock, J.A., and Taylor, D.D., 2002, *Ecoregions of Kentucky* (color poster with map, descriptive text, summary tables, and photographs): Reston, VA., U.S. Geological Survey (map scale 1:1,000,000).
- Zollner, D., M.H. MacRoberts, B.R. MacRoberts, & D. Ladd. 2005. Endemic vascular plants of the Interior Highlands, U.S.A. *Sida* 21:1781-1791.

## 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	01/14/2025
Approved by	Greg Schmidt
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:**

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