

# Ecological site F121XY022KY

## Somewhat Poorly Drained Fragipan Upland

Last updated: 10/01/2024  
Accessed: 11/09/2024

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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), 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 (Cridler 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

Wet depression forest (Kentucky State Nature Preserves Commission, 2009)

### Ecological site concept

The Somewhat Poorly Drained Fragipan Upland ecological site is characterized by somewhat poorly drained soils with a fragipan. Representative soils include: Johsburg, Lawrence.

Sites are located mainly on upland flats although some may be found on terraces in a few counties.

This group will be split further based on drainage upon future field work.

Plant species, especially the understory forbs, herbs, vines, and shrubs, are those that prefer a moist to wet

environment. Based on a GIS analysis utilizing current soil (SSURGO 2015) and aerial photography coverages, over 95% of these sites in MLRA 121 are cropland, pasture, urban, highly disturbed or successional woodlands; therefore, the exact characteristics of a true historic reference community is difficult to accurately define. Historical records research and field studies would be required to develop a restoration plan for conservation purposes.

Native forest for these areas would likely have been a mix of water-tolerant oaks, black willow, sweetgum, cottonwood, American sycamore, green ash, red maple, and American beech.

State 2: Pasture

Phase 2.1: Managed Pasture.

Plant species dominants: *Schedonorus arundinaceus* (tall fescue)

Phase 2.2: Minimally Managed Pasture. Plant species dominants: *Rosa multiflora* (multiflora rose)- *Rubus* spp. /*Schedonorus arundinaceus* (tall fescue)-*Eutrochium* spp. (joe pye weed)

Phase 2.3: Native Grass Pasture. Plant species dominants: *Panicum virgatum* (switchgrass) - *Andropogon gerardii* (big bluestem)

State: 3 – Transitional (Abandoned) Field

Phases 3.1: *Acer saccharinum*-*Platanus occidentalis* /*Rosa multiflora*- *Rubus* spp. /*Schedonorus arundinaceus*

State: 4. Old Cropfield Pioneer Woodland

Phase 4.1: Plant species dominants: henbit deadnettle (*Lamium amplexicaule*)- mouse-eared chickweed (*Cerastium* L.)

State 5, Phase 5.1: Plant species dominants: *Zea* spp. – *Glycine* spp.

Plants on these sites will be dependent upon seeding and management. Most common crops are corn and soybeans. Due to the drainage issues on these soil, many have been tilled extensively to facilitate crop production.

## Associated sites

F121XY023KY	<b>Well Drained &amp; Moderately Well Drained Fragipan Upland</b> Well Drained and Moderately well Drained Fragipan Upland
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## Similar sites

F121XY017KY	<b>Somewhat Poorly Drained Fragipan Terrace</b> Somewhat Poorly Drained Fragipan Terrace
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Table 1. Dominant plant species

Tree	(1) <i>Liquidambar styraciflua</i> (2) <i>Acer rubrum</i>
Shrub	(1) <i>Asimina triloba</i>
Herbaceous	(1) <i>Boehmeria cylindrica</i> (2) <i>Pilea pumila</i>

## Physiographic features

These soils are on uplands, have a fragipan layer and are somewhat poorly drained.

Table 2. Representative physiographic features

Landforms	(1) Flat (2) Knob (3) Ridge
Runoff class	Very low to low

Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours) to very long (more than 30 days)
Ponding frequency	None
Elevation	718–1,127 ft
Slope	0–4%
Water table depth	12–14 in
Aspect	Aspect is not a significant factor

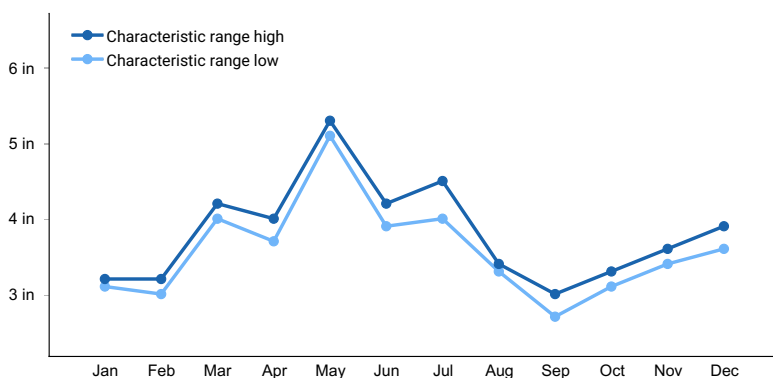
## Climatic features

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.

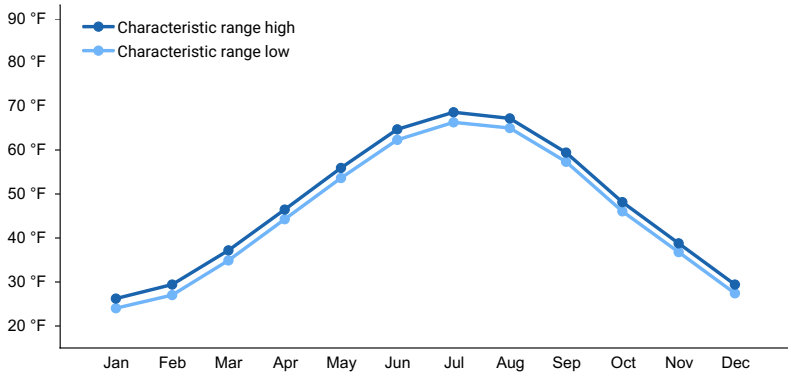
MLRA climate summary: The average annual precipitation in most of this area is 41 to 45 inches. It is 45 to 52 inches along the southern edge of the area. About one-half of the precipitation falls during the growing season. Most of the rainfall occurs as high-intensity, convective thunderstorms. The 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**

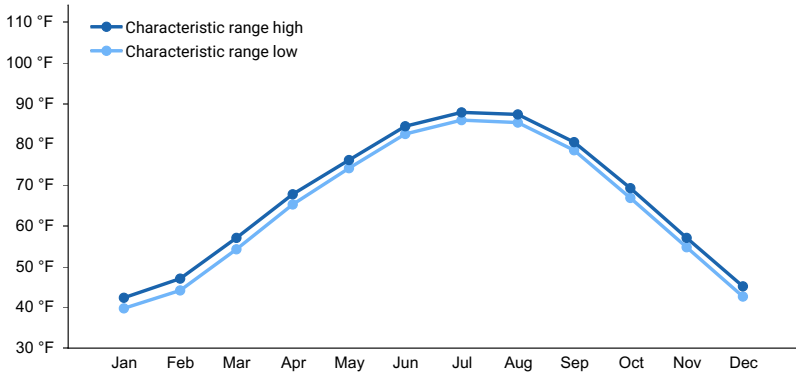
Frost-free period (characteristic range)	160-178 days
Freeze-free period (characteristic range)	186-199 days
Precipitation total (characteristic range)	43-45 in
Frost-free period (actual range)	155-183 days
Freeze-free period (actual range)	186-205 days
Precipitation total (actual range)	43-45 in
Frost-free period (average)	169 days
Freeze-free period (average)	193 days
Precipitation total (average)	44 in



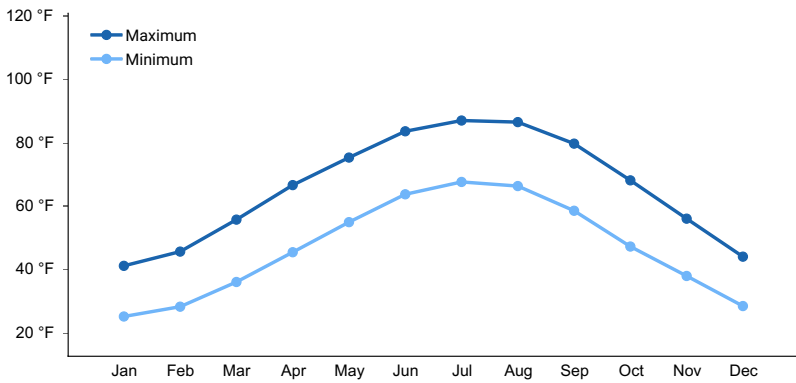
**Figure 1. Monthly precipitation range**



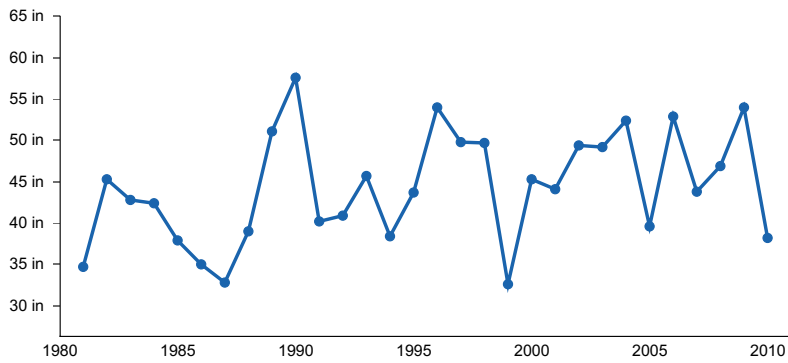
**Figure 2. Monthly minimum temperature range**



**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**

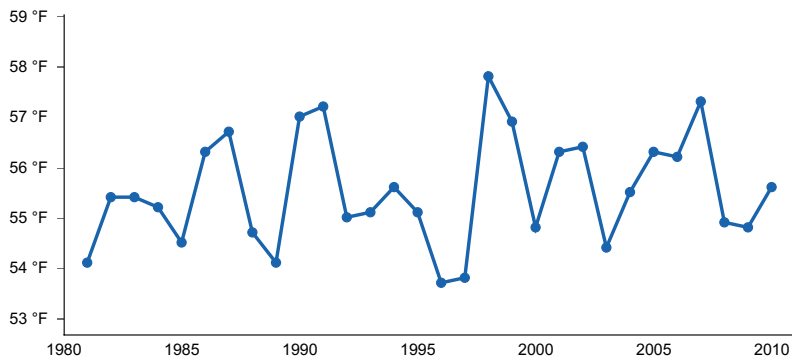


Figure 6. Annual average temperature pattern

### Climate stations used

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

### Influencing water features

These soils are somewhat poorly drained and may be influenced by a shallow water table that is within 12" to 14" of the surface.

### Soil features

This group includes somewhat poorly drained soils on uplands. Representative soils include: Johsburg, Lawrence.

Table 4. Representative soil features

Parent material	(1) Residuum
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained
Soil depth	24–40 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–6 in
Soil reaction (1:1 water) (0-40in)	3.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–3%
Subsurface fragment volume >3" (Depth not specified)	0–2%

### Ecological dynamics

These sites are characterized by somewhat poorly drained soils with a fragipan. Sites are located mainly on upland flats although some may be found on terraces in a few counties.

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## State and transition model

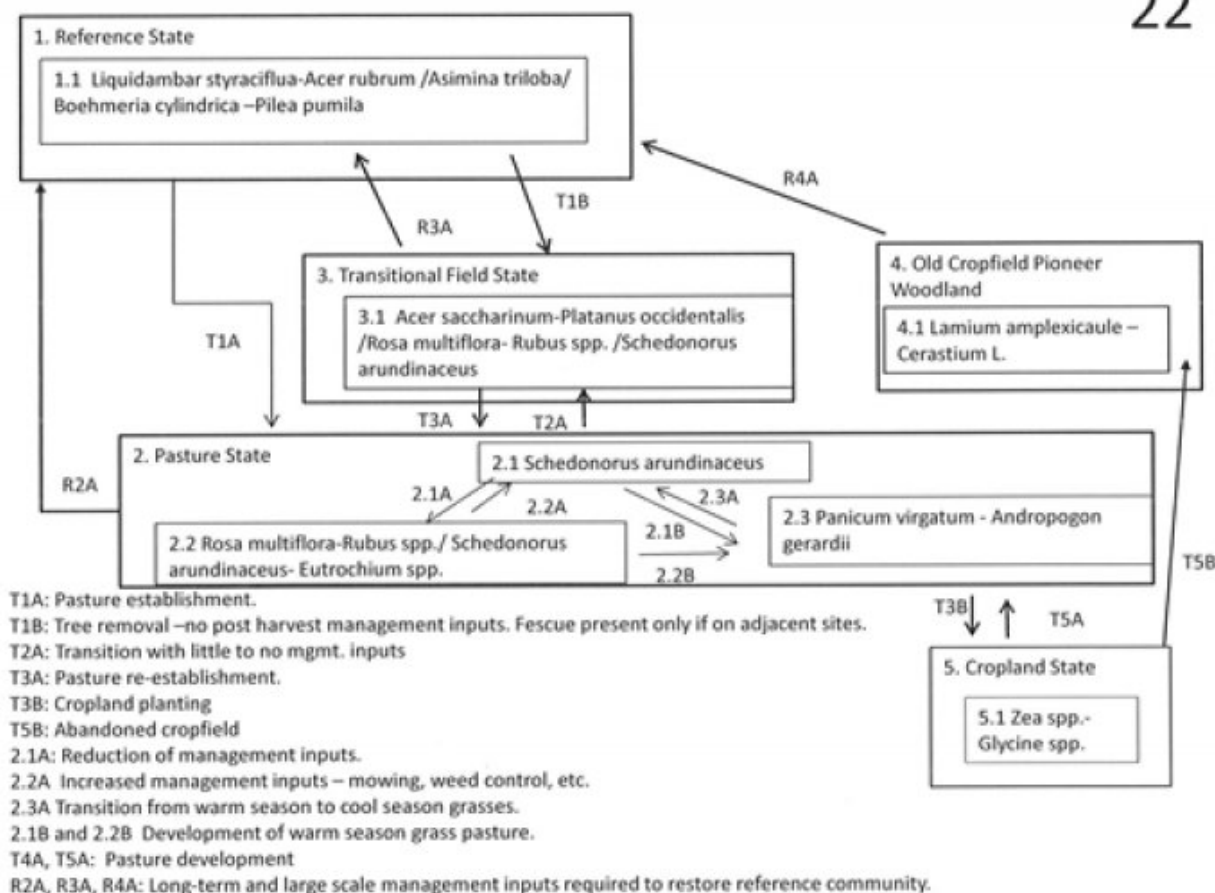


Figure 7. MLRA 121, Group 22

## 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.

## Contributors

Anita Arends

## 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	11/09/2024
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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