

Ecological site F121XY016KY

Well Drained & Moderately Well Drained Terrace

Last updated: 10/01/2024
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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 (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

Interior Highlands Mesic Hardwood Forest. (Plant Communities of the Midwest).

Deep soil Mesophytic Forest (Kentucky State Nature Preserves Commission)

Ecological site concept

The Well Drained & Moderately Well Drained Terrace ecological site includes soils generally found on terraces but on a number of differing aspects, slope shapes, profile positions and geomorphic components. The representative soils include: Allegheny, Ashton, Brushcreek, Chavies, Elk, Elkinsville, Lakin, Licking, Markland, Morehead, Uniontown, Wheeling.

The natural vegetation of these sites will vary in relationship to the setting, patterns of drainage, disturbances and

previous vegetation communities. Individual sites deserve a detailed understanding before conservation and restoration practices are implemented. The provisional ecological site communities described in the following narratives reflect plant communities found on these sites but do not encompass the entire complexity or diversity of these sites. Field work is required to delineate and develop a full ecological site description in the future for conservation uses.

State 1. (Reference): Provisional Ecological Site (PES)

State 1, Phase 1.1: Plant species dominants: *Quercus rubra*-*Liriodendron tulipifera*/*Lindera benzoin*/*Podophyllum peltatum*-*Asarum canadense* (Red oak-tulip poplar/ spicebush/ mayapple-wild ginger).

State 2, Phase 2.1: Managed Pasture. Plant species dominant: *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.

State: 3 – Transitional Field

Phases 3.1: Plant species dominants: *Juniperus virginiana*-*Liriodendron tulipifera*/ *Rubus* spp. - *Rosa multiflora*/ *Vernonia gigantea* -*Schedonorus arundinaceus*. (Eastern red cedar- tulip poplar/ berries-multiflora rose/ ironweed-tall fescue)

State: 4. Honeysuckle invaded

State 4, Phase 4.1: Plant species dominants: *Acer saccharum* –*Liriodendron tulipifera* /*Lonicera maackii*.

State: 5. Cropland

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

Associated sites

F121XY017KY	Somewhat Poorly Drained Fragipan Terrace Moderately Well Drained Fragipan Terrace
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Similar sites

F121XY033KY	Well Drained & Moderately Well Drained Floodplain Well Drained and Moderately Well Drained Floodplain
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Table 1. Dominant plant species

Tree	(1) <i>Quercus rubra</i> (2) <i>Liriodendron tulipifera</i>
Shrub	(1) <i>Lindera benzoin</i>
Herbaceous	(1) <i>Podophyllum peltatum</i> (2) <i>Asarum canadense</i>

Physiographic features

This group includes soils generally found on terraces that are moderately well drained or well drained but on a number of differing aspects, slope shapes, profile positions and geomorphic components. The natural vegetation of these sites will vary in relationship to the setting, patterns of drainage,disturbances and previous vegetation communities. This group may be split into multiple ESDs once field work commences.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Stream terrace
Runoff class	Very low to very high
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	137–305 m
Slope	0–30%
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)	171-182 days
Freeze-free period (characteristic range)	190-203 days
Precipitation total (characteristic range)	1,143 mm
Frost-free period (actual range)	169-184 days
Freeze-free period (actual range)	187-206 days
Precipitation total (actual range)	1,143 mm
Frost-free period (average)	177 days
Freeze-free period (average)	197 days
Precipitation total (average)	1,143 mm

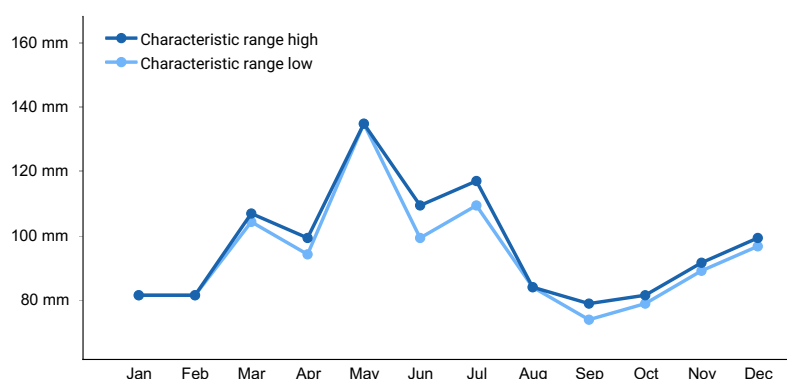


Figure 1. Monthly precipitation range

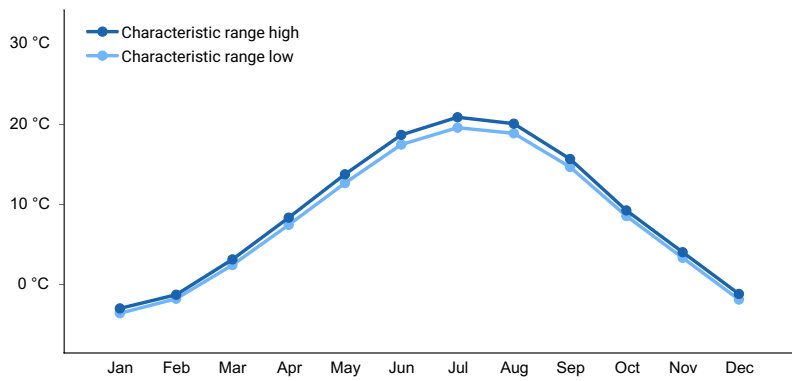


Figure 2. Monthly minimum temperature range

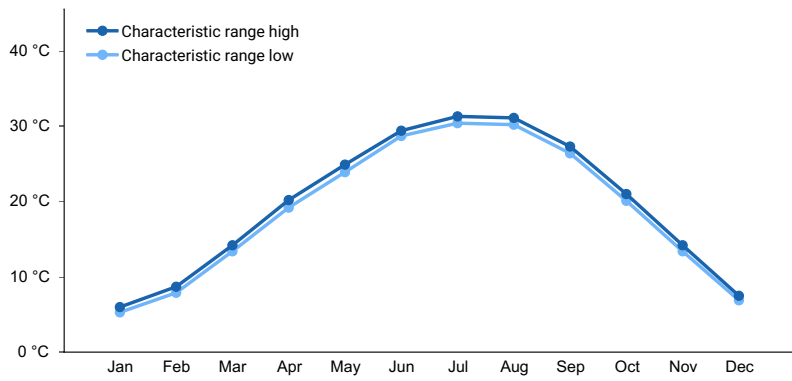


Figure 3. Monthly maximum temperature range

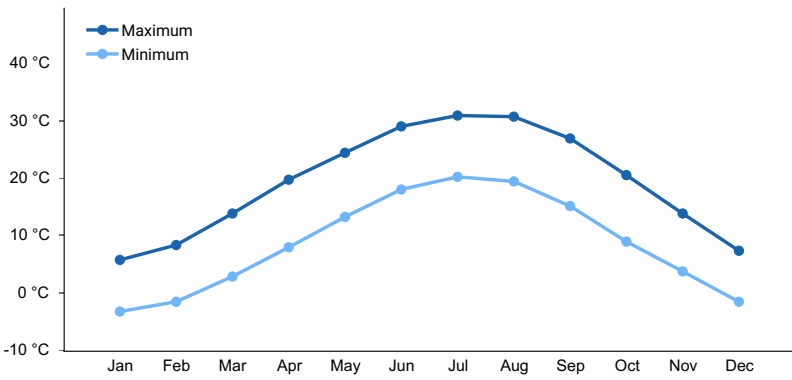


Figure 4. Monthly average minimum and maximum temperature

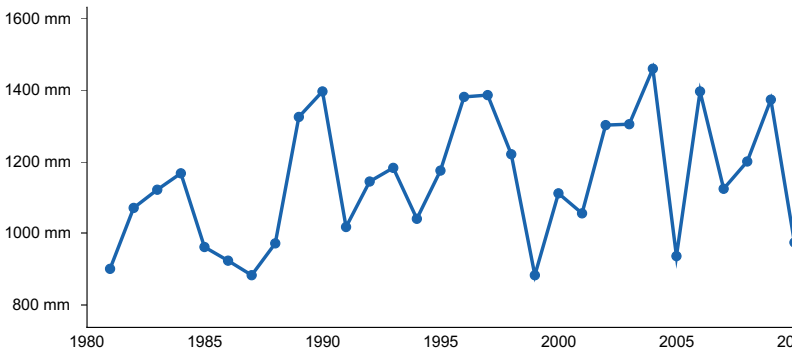


Figure 5. Annual precipitation pattern

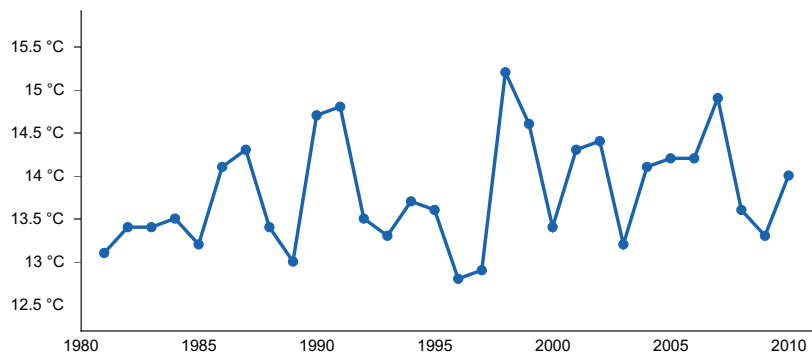


Figure 6. Annual average temperature pattern

Climate stations used

- (1) LEXINGTON BLUEGRASS AP [USW00093820], Lexington, KY
- (2) LOUISVILLE INTL AP [USW00093821], Louisville, KY

Influencing water features

These sites are influenced by shallow to moderately deep water tables and may incur brief flooding.

Soil features

Soils in this group are well-drained, deep, alluvium. The representative soils include: Allegheny, Ashton, Brushcreek, Chavies, Elk, Elkinsville, Lakin, Licking, Markland, Morehead, Uniontown, Wheeling.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Sandy loam (2) Loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to rapid
Soil depth	152–259 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–22.86 cm
Soil reaction (1:1 water) (0-101.6cm)	3.5–8.4
Subsurface fragment volume ≤3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

This group includes soils generally found on terraces but on a number of differing aspects, slope shapes, profile positions and geomorphic components. The natural vegetation of these sites will vary in relationship to the setting, patterns of drainage, disturbances and previous vegetation communities. Individual sites deserve a detailed understanding before conservation and restoration practices are implemented. The provisional ecological site

communities described in the following narratives reflect plant communities found on these sites but do not encompass the entire complexity or diversity of these sites. Field work is required to delineate and develop a full ecological site description in the future for conservation uses.

State 1. (Reference): Provisional Ecological Site (PES)

State 1, Phase 1.1: Plant species dominants: *Quercus rubra*-*Liriodendron tulipifera*/*Lindera benzoin*/*Podophyllum peltatum*-*Asarum canadense* (Red oak-tulip poplar/ spicebush/ mayapple-wild ginger).

Narrative: These sites are found on well drained and moderately well drained terraces with deep soils. Most sites are now in agriculture. Generally mesic throughout the year, these sites are naturally dominated by a tall and closed tree canopy, a well-developed shrub layer with a developed and a diverse understory layer. Vines are also common. Some sites may be subject to short-duration flooding

Other common tree species may include: *Quercus alba* (white oak), *Acer saccharum* (sugar maple), *Fagus grandifolia* (beech), *Fraxinus* spp. (ash), *Juglans nigra* (black walnut), *Tilia americana* and *Carya cordiformis* (bitternut hickory). Tree species vary depending on site conditions, disturbances, and micro-topography. Other tree species may include: *Quercus* spp., *Carya laciniata*, *Acer nigrum*, *Acer negundo*, *Gymnocladus dioica*, *Ulmus americana*, Liquidambar, *Aesculus glabra*, *Magnolia acuminata* and *Nyssa sylvatica*. Shrub may include *Asimina triloba*, *Lindera benzoin* and *Arundinaria gigantea*.

Without disturbances, a rich herb and forb layer is often present and may include the following:

Adiantum pedatum (northern maidenhair fern),
Actaea racemosa L. var. *racemosa* (black bugbane),
Actaea pachypoda (doll's eyes, baneberry)
Amphicarpaea bracteata (hogpeanut)
Anemone thalictroides (rue anemone)
Aralia racemosa (spikenard).
Asarum canadense (wild ginger),
Botrychium virginianum (rattlesnake-fern),
Carex platyphylla (flat-leaved sedge),
Carex plantaginea (plantain-leaved sedge),
Carex pensylvanica (Pennsylvania sedge)
Caulophyllum thalictroides (blue cohosh),
Claytonia spp. (springbeauty)
Collinsia verna (blue eyed Mary) locally abundant in the Inner Bluegrass
Circaea lutetiana (enchanter's nightshade)
Cypripedium pubescens (large yellow lady's-slipper)
Dicentra canadensis (squirrel-corn),
Dicentra cucullaria (Dutchman's breeches),
Eupatorium rugosum (white snakeroot),
Erythronium spp. (trout lilies)
Gallium aparine (bedstraw)
Geranium maculatum (wild geranium)
Hydrastis canadensis (goldenseal) now uncommon due to collection
Osmorhiza claytonia (sweet cicely)
Panax quinquefolius (ginseng)
Phlox divaricata (blue phlox)
Podophyllum peltatum (mayapple)
Polemonium reptans (Jacob's ladder)
Prenanthes spp. (rattlesnake root)
Sanguinaria canadensis (bloodroot),
Sanicula gregaria (clustered snakeroot)
Smilacina racemosa (false Solomon's seal)
Smilax spp.
Tradescantia virginiana (early spiderwort, Virginia spiderwort)
Trillium spp.

Uvularia grandiflora (large-flowered bellwort)
Viola canadensis (Canada violet),
Viola pubescens (downy yellow violet),

State: 2. Pasture

State 2, Phase 2.1: Managed Pasture. Plant species dominant: *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. Plant species dominants depend on landowner objectives and site characteristics, but may include: switchgrass (*Panicum virgatum*), little bluestem (*Andropogon scoparius*), indianagrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), and eastern gamagrass (*Tripsacum dactyloides*).

Landowners may choose to plant a variety of forbs and herbs in these pasture to benefit wildlife and pollinators.

Commonly species include:

Partridge Pea (*Cassia fasciculata*)

Illinois Bundleflower (*Desmanthus illinoensis*)

False Sunflower (*Heliopsis helianthoides*)

Purple Coneflower (*Echinacea purpurea*)

Blackeyed Susan (*Rudbeckia hirta*)

Purple Coneflower (*Echinacea purpurea*)

Roundhead Lespedeza (*Leavedeza capitata*)

The pasture phase is feasible for lower sloping sites included within this PES. Plant species within pasture depend on seeding, level of management post-seeding, and concurrent land uses. As with all sites, soil characteristics and management will influence production levels.

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

State: 3 – Transitional Field

State 3, Phases 3.1: Plant species dominants: *Juniperus virginiana*-*Liriodendron tulipifera*/ *Rubus* spp. - *Rosa multiflora*/ *Vernonia gigantea* -*Schedonorus arundinaceus*. (Eastern red cedar- tulip poplar/ berries-multiflora rose/ ironweed-tall fescue)

State 3 is a successional state that would occur after pasture management ceases. Typified by a variety of grasses, forbs, herbs, and young trees, these sites are usually wildlife friendly, pollinator beneficial, and are often maintained by landowners to maximize wildlife habitat.

Trees found on site are a mix depending on seed sources and age of the site. Eastern red cedar is often present as the upper limestone hills are usually a good seed source. Hardwood seedlings and saplings are abundant depending on seed sources. Multiflora rose, briars, berries and brambles a frequent component. Common non-native herbaceous species included Queen Anne's lace, thistles, lespedeza, lambs quarters, horse nettle, mullein, and pigweed. Common native herbaceous species are ironweed, common milkweed, goldenrods, yellow crownbeard, and sunflowers.

Transitioning this state to a reference condition will require management inputs including timber stand improvement practices and control of non-native vegetation. Invasion of *Lonicera* spp. will transition the community to State 4.

State: 4. Honeysuckle invaded

State 4, Phase 4.1: Plant species dominants: *Acer saccharum* –*Liriodendron tulipifera* /*Lonicera maackii*.

Narrative: Woodland with dense bush honeysuckle (usually *Lonicera maackii*) in the understory and midstory are fundamentally altered from a natural state. This non-native, invasive plant is aggressive, adaptable, persistent, and currently is negatively impacting thousands of acres of oak-hickory forests. Found on many different ecological sites, this plant fundamentally alters the natural ecological pathways and transition mechanisms due to its dense growth form and aggressive growth/reproduction capabilities. Ecological sites in state 4 require substantial and long-term management inputs, including multi-year restoration activities, to transition to another ecological state or

phase.

State: 5. Cropland

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

Narrative: This state can be transitioned to any of the other states with sufficient management inputs: forest restoration and timber stand management, pasture plantings, long-term weed control, etc. Transitioning this state to a reference condition will require extensive timber stand improvement practices to control non-native vegetation and manage for desired species.

State and transition model

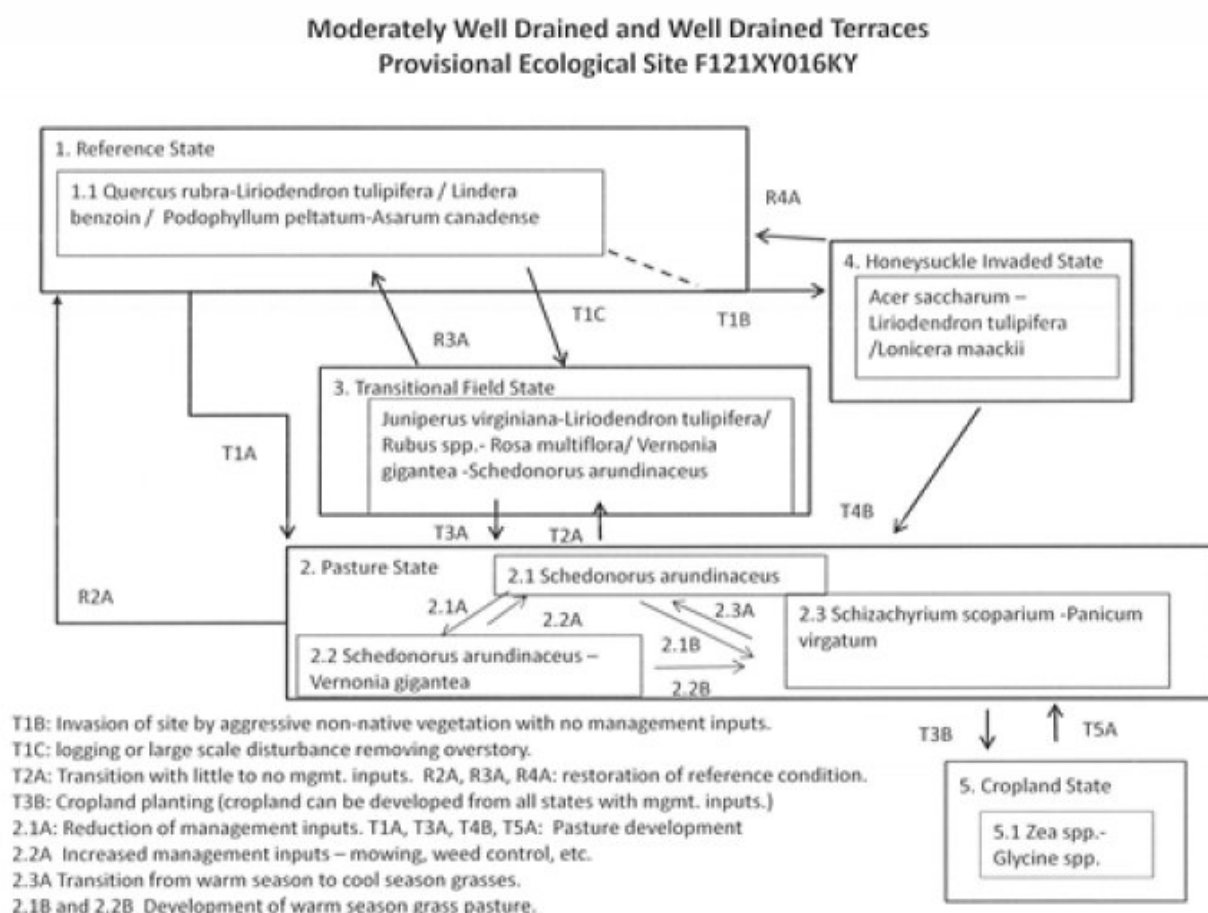


Figure 7. MLRA 121, Group 16

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.
- 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-Langendoen, 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	05/13/2025
Approved by	Greg Schmidt
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):
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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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