USDA Natural Resources Conservation Service

Ecological site F115XC001IL Limestone Glade

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Accessed: 05/11/2025

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): 115X–Central Mississippi Valley Wooded Slopes

This MLRA is characterized by deeply dissected, loess-covered hills bordering well defined valleys of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers and their tributaries. It is used to produce cash crops and livestock. About one-third of the area is forested, mostly on the steeper slopes. This area is in Illinois (50 percent), Missouri (36 percent), Indiana (13 percent), and Iowa (1 percent) in two separate areas. It makes up about 25,084 square miles (64,967 square kilometers).

Most of this area is in the Till Plains section and the Dissected Till Plains section of the Central Lowland province of the Interior Plains. The Springfield-Salem plateaus section of the Ozarks Plateaus province of the Interior Highlands occurs along the Missouri River and the Mississippi River south of the confluence with the Missouri River. The nearly level to very steep uplands are dissected by both large and small tributaries of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers. The Ohio River flows along the southernmost boundary of this area in Indiana. Well defined valleys with broad flood plains and numerous stream terraces are along the major streams and rivers. The flood plains along the smaller streams are narrow. Broad summits are nearly level to undulating. Karst topography is common in some parts along the Missouri and Mississippi Rivers and their tributaries. Well-developed karst areas have hundreds of sinkholes, caves, springs, and losing streams. In the St. Louis area, many of the karst features have been obliterated by urban development.

Elevation ranges from 90 feet (20 meters) on the southernmost flood plains to 1,030 feet (320 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters) but can be 50 to 150 feet (15 to 45 meters) in the steep, deeply dissected hills bordering rivers and streams. The bluffs along the major rivers are generally 200 to 350 feet (60 to 105 meters) above the valley floor.

The uplands in this MLRA are covered almost entirely with Peoria Loess. The loess can be more than 7 feet (2 meters) thick on stable summits. On the steeper slopes, it is thin or does not occur. In Illinois, the loess is underlain mostly by Illinoian-age till that commonly contains a paleosol. Pre-Illinoian-age till is in parts of this MLRA in Iowa and Missouri and to a minor extent in the western part of Illinois. Wisconsin-age outwash, alluvial deposits, and sandy eolian material are on some of the stream terraces and on dunes along the major tributaries. The loess and glacial deposits are underlain by several bedrock systems. Pennsylvanian and Mississippian bedrock are the most extensive. To a lesser extent are Silurian, Devonian, Cretaceous, and Ordovician bedrock. Karst areas have formed where limestone is near the surface, mostly in the southern part of the MLRA along the Mississippi River and some of its major tributaries. Bedrock outcrops are common on the bluffs along the Mississippi, Ohio, and Wabash Rivers and their major tributaries and at the base of some steep slopes along minor streams and drainageways.

The annual precipitation ranges from 35 to 49 inches (880 to 1,250 millimeters) with a mean of 41 inches (1,050 millimeters). The annual temperature ranges from 48 to 58 degrees F (8.6 to 14.3 degrees C) with a mean of 54 degrees F (12.3 degrees C). The freeze-free period ranges from 150 to 220 days with a mean of 195 days.

Soils The dominant soil orders are Alfisols and, to a lesser extent, Entisols and Mollisols. The soils in the area have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or smectitic mineralogy. They are shallow to very deep, excessively drained to poorly drained, and loamy, silty, or clayey.

The soils on uplands in this area support natural hardwoods. Oak, hickory, and sugar maple are the dominant species. Big bluestem, little bluestem, and scattered oak and eastern redcedar grow on some sites. The soils on flood plains support mixed forest vegetation, mainly American elm, eastern cottonwood, river birch, green ash, silver maple, sweetgum, American sycamore, pin oak, pecan, and willow. Sedge and grass meadows and scattered trees are on some low-lying sites. (United States Department of Agriculture, Natural Resources Conservation Service, 2022)

LRU notes

The Central Mississippi Valley Wooded Slopes, Northern part (Land Resource Unit (LRU) (115XC) encompasses the Wyaconda River Dissected Till Plains, Mississippi River Hills, and Mississippi River Alluvial Plain (Schwegman et al. 1973; Nelson 2010). It spans three states – Illinois (73 percent), Iowa (6 percent), and Missouri (21 percent) – comprising about 13,650 square miles (Figure 1). The elevation ranges from 420 feet above sea level (ASL) along the Mississippi River floodplains to 885 feet on the upland ridges. Local relief varies from 10 to 20 feet but can be as high as 50 to 100 feet along drainageways and streams and the bluffs on the major rivers reaching 250 feet above valley floors. Wisconsin-aged loess covers the uplands, while Illinoian glacial drift lies directly below. The loess and drift deposits are underlain by several bedrock systems, including the Cretaceous, Pennsylvania, Mississippian, Silurian, Devonian, and Ordovician Systems. Wisconsin outwash deposits and sandy eolian material occur along stream terraces of major tributaries (USDA-NRCS 2006).

The vegetation across the region has undergone drastic changes over time. At the end of the last glacial episode – the Wisconsinan glaciation – the evolution of vegetation began with the development of tundra habitats, followed by a phase of spruce and fir forests, and eventually spruce-pine forests. Not until approximately 9,000 years ago did the climate undergo a warming trend which prompted the development of deciduous forests

Classification relationships

Major Land Resource Area (MLRA) (USDA-NRCS, 2022):
115X–Central Mississippi Valley Wooded Slopes

USFS Subregions: Central Dissected Till Plains (251C)Section; Western Mississippi River Hills (251Ce), Mississippi River and Illinois Alluvial Plains (251Cf), Eastern Mississippi River Hills (251Ci), Galesburg Dissected Till Plain (251Cj), and Wyaconda River Dissected Till Plain (251Cm) Subsections (Cleland et al. 2007)

U.S. EPA Level IV Ecoregion: Upper Mississippi River Alluvial Plain (72d), River Hills (72f), and Western Dissected Illinoian Till Plain (72i) (USEPA 2013)

National Vegetation Classification – Ecological Systems: Central Interior Highlands Calcareous Glade and Barrens (CES202.691) (NatureServe 2018)

National Vegetation Classification - Plant Associations: Quercus muehlenbergii/Schizachyrium scoparium – Bouteloua curtipendula Wooded Grassland (CEGL005284) (Nature Serve 2018)

Biophysical Settings: Central Interior Highlands Calcareous Glade and Barrens (BpS 4314010) (LANDFIRE 2009)

Illinois Natural Areas Inventory: Dry barren (White and Madany 1978)

Iowa Department of Natural Resources: Limestone Glade (INAI 1984)

Missouri Terrestrial Natural Communities: Limestone glade (Nelson 2010)

Ecological site concept

Limestone Glades are located within the green areas on the map. They occur on upland sideslopes. The soils are Mollisols and Alfisols that are well to somewhat excessively drained and shallow, formed in a thin layer of loess over limestone or calcareous shale bedrock.

The historic pre-European settlement vegetation on this ecological site was dominated by stunted woody and herbaceous plants tolerant of very dry conditions (INAI 1984; LANDFIRE 2009). Blackjack oak (Quercus marilandica Münchh.) and post oak (Quercus stellata Wangenh.) are the dominant trees, and little bluestem (Schizachyrium scoparium (Michx.) Nash) and poverty oatgrass (Danthonia spicata (L.) P. Beauv. ex Roem. & Schult.) are the dominant understory grass species (White and Madany 1978; Nelson 2010). Various lichens often inhabit the exposed bedrock, including sarcogyne lichen (Sarcogyne regularis Körb), fischscale lichen (Psora decipiens (Hedwig) Hoffm.), and wart lichen (Verrucaria marmoreal (Scop.) Arnold) (Nelson 2010). Overall vegetation cover ranges from sparse to continuous and bedrock occasionally occurs at the surface. Fire is the primary disturbance factor that maintains this site, while seasonal saturation, drought, and storm damage are secondary factors (LANDFIRE 2009; Nelson 2010; NatureServe 2018).

Associated sites

F115XC007IL	**Loess Protected Backslope Forest** Loess or loess-covered substrates on backslopes not shallow to bedrock including Atlas, Baylis, Fayette, Hennepin, Hickory, Keswick, Menfro, Seaton, Stookey, Sylvan, Timula, and Ursa soils
F115XC008IL	**Loess Exposed Backslope Woodland** Loess or loess-covered substrates on backslopes not shallow to bedrock including Atlas, Baylis, Fayette, Hennepin, Hickory, Keswick, Menfro, Seaton, Stookey, Sylvan, Timula, and Ursa soils
F115XC005IL	**Loess Upland Forest** Loess or loess-covered substrates not shallow to bedrock including Atlas, Baylis, Bunkum, Caseyville, Creal, Derinda, Dodge, Fayette, Fishhook, Hickory, Kendall, Keomah, Keswick, Menfro, Metea, Navlys, Rozetta, Seaton, Stookey, Stronghurst, Sylvan, Thebes, Timula, Ursa, and Winfield soils

Table 1. Dominant plant species

Tree	(1) *Quercus marilandica* (2) *Quercus stellata*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Danthonia spicata*

Physiographic features

Limestone Glades occur on upland sideslopes. They are situated on elevations ranging from approximately 512 to 1499 feet ASL. The site does not experience flooding but rather generates runoff to adjacent, downslope ecological sites.

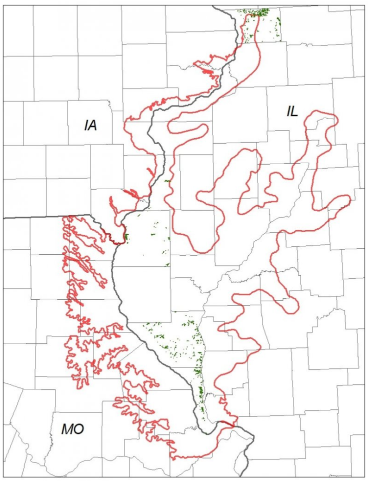


Figure 1. Location of Limestone Glade ecological site within LRU 115XC.

Table 2. Representative physiographic features

Geomorphic position, hills	(1) Side Slope
Slope shape across	(1) Convex
Slope shape up-down	(1) Convex
Landforms	(1) Upland
Runoff class	High to very high
Elevation	512–1,499 ft
Slope	15–60%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

The Central Mississippi Valley Wooded Slopes, Northern Part falls into the humid subtropical (Cfa) and hot-summer humid continental climate (Dfa) Köppen-Geiger climate classifications (Peel et al. 2007). The two main factors that drive the climate of the MLRA are latitude and weather systems. Latitude, and the subsequent reflection of solar input, determines air temperatures and seasonal variations. Solar energy varies across the seasons, with summer receiving three to four times as much energy as opposed to winter. Weather systems (air masses and cyclonic storms) are responsible for daily fluctuations of weather conditions. High-pressure systems are responsible for settled weather patterns where sun and clear skies dominate. In fall, winter, and spring, the polar jet stream is responsible for the creation and movement of low-pressure systems. The clouds, winds, and precipitation associated with a low-pressure system regularly follow high-pressure systems every few days (Angel n.d.).

The soil temperature regime of LRU 115XC is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 195 days, while the frost-free period is about 158 days. The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 38 inches, which includes rainfall plus the water equivalent from snowfall. The average annual low and high temperatures are 43 and 62°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	156-160 days
Freeze-free period (characteristic range)	194-195 days
Precipitation total (characteristic range)	38 in
Frost-free period (actual range)	154-162 days
Freeze-free period (actual range)	193-196 days
Precipitation total (actual range)	37-39 in
Frost-free period (average)	158 days
Freeze-free period (average)	195 days
Precipitation total (average)	38 in

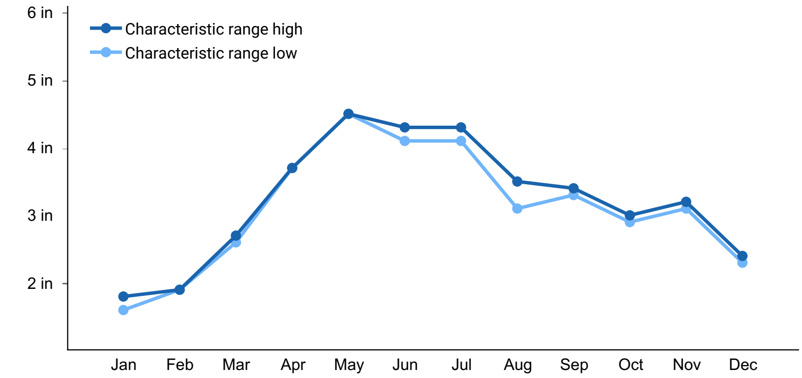


Figure 2. Monthly precipitation range

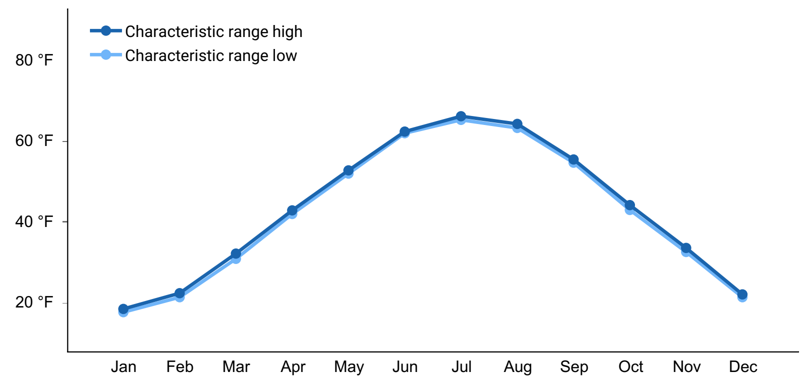


Figure 3. Monthly minimum temperature range

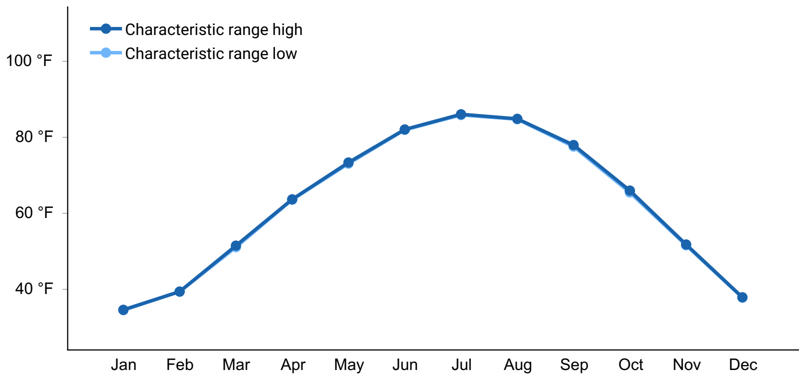


Figure 4. Monthly maximum temperature range

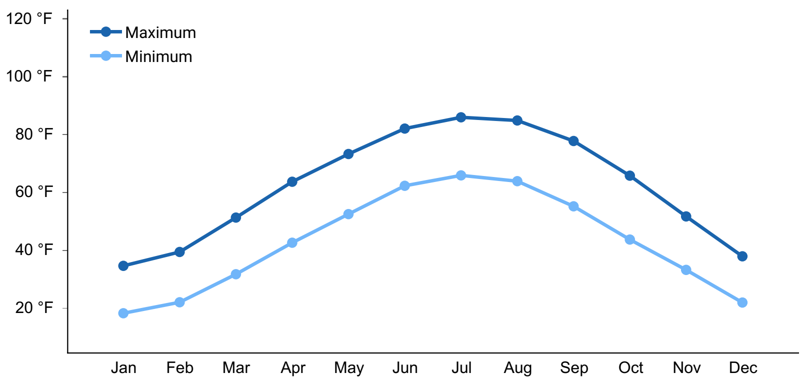


Figure 5. Monthly average minimum and maximum temperature

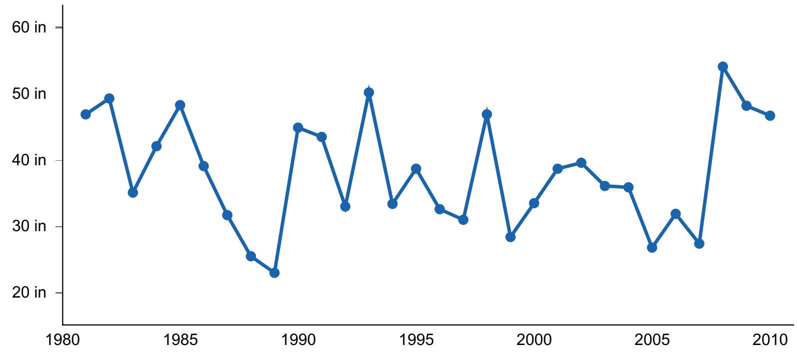


Figure 6. Annual precipitation pattern

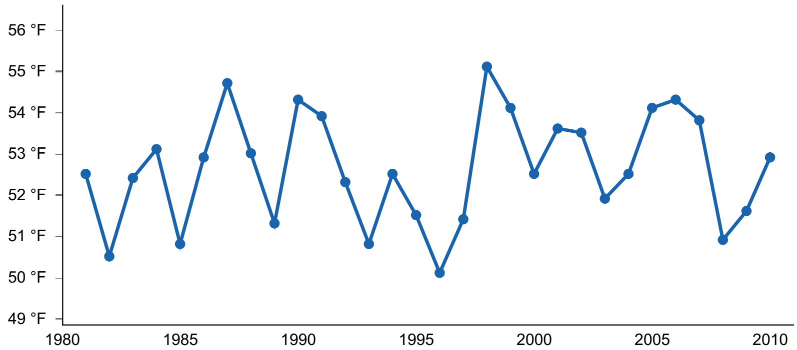


Figure 7. Annual average temperature pattern

Climate stations used

- (1) GRIGGSVILLE [USC00113717], Griggsville, IL
- (2) QUINCY RGNL AP [USW00093989], Quincy, IL

Influencing water features

Limestone Glades are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is very slow (Hydrologic Group D), and surface runoff is high to very high. Surface runoff contributes some water to downslope ecological sites.

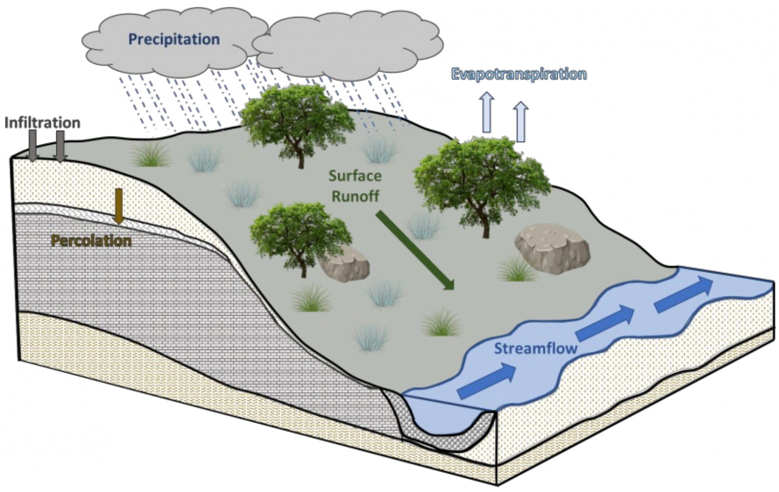


Figure 8. Hydrologic cycling in Limestone Glade ecological site.

Soil features

Soils of Limestone Glades are in the Mollisols and Alfisols orders, further classified as Lithic Hapludolls, Lithic Hapludalfs, and Oxyaquic Hapludalfs with very slow infiltration and high to very high runoff potential. The soil series associated with this site includes Derinda, Dunbarton, and Elizabeth. The parent material is a thin layer of loess over limestone or calcareous shale bedrock, and the soils are well to somewhat excessively drained and shallow. Soil pH classes are moderately acid to moderately alkaline. A shallow depth to bedrock is noted as a rooting restriction for the soils of this ecological site.

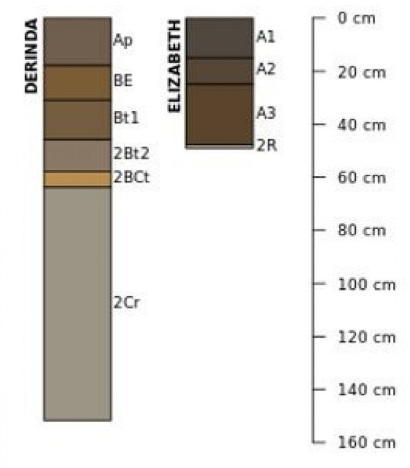


Figure 9. Profile sketches of soil series associated with Limestone Glade.

Table 4. Representative soil features

Parent material	(1) Loess (2) Residuum
Surface texture	(1) Silt loam (2) Silty clay loam (3) Silty clay
Family particle size	(1) Clayey (2) Loamy-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Very slow
Depth to restrictive layer	8–19 in
Soil depth	8–19 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	2–3 in
Calcium carbonate equivalent (Depth not specified)	0–40%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	6–10%
Subsurface fragment volume >3" (Depth not specified)	2–33%

Ecological dynamics

The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in a landscape that historically supported upland hardwood forests, lowland mixed forests, and scattered grass and sedge meadows. Limestone Glades form an aspect of this vegetative continuum. This ecological site occurs on upland sideslopes on shallow, well to somewhat excessively drained soils. Species characteristic of this ecological site consist of sparse, stunted, woody and herbaceous vegetation adapted to dry, root-restricting conditions.

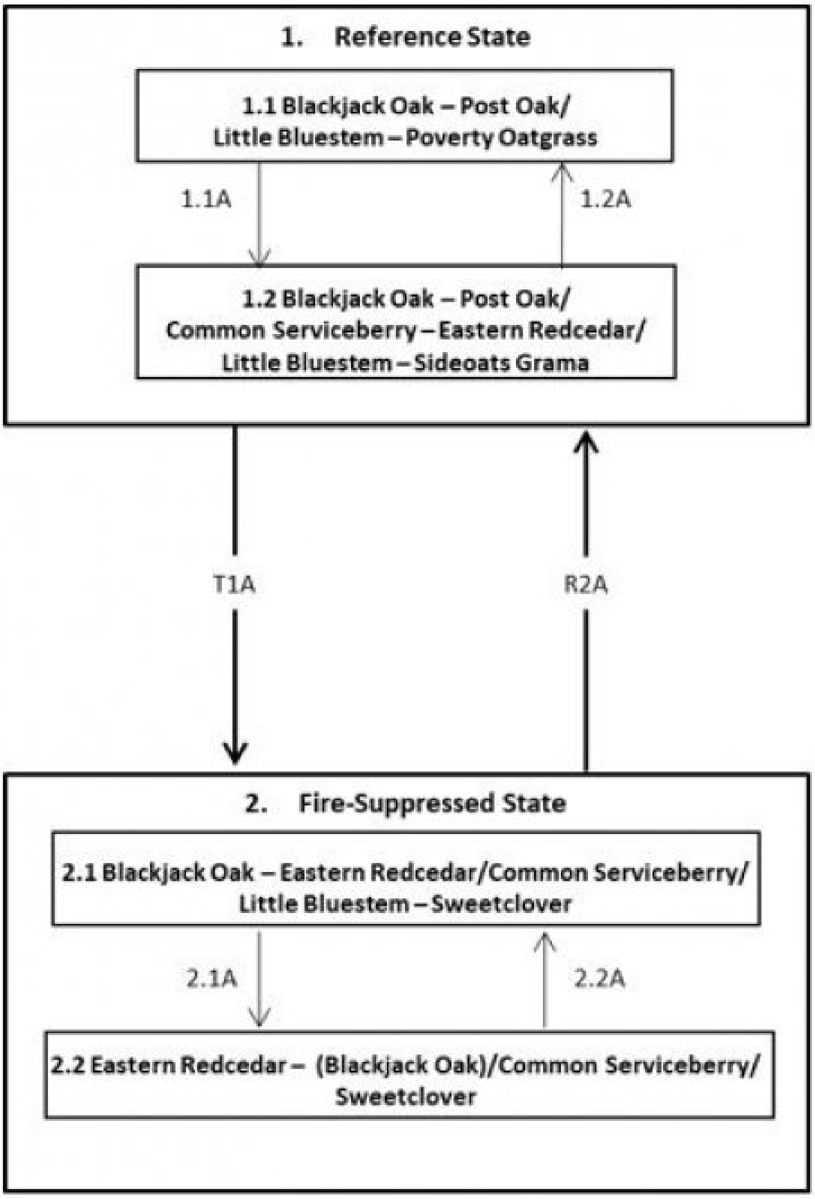
Fire is the dominant ecosystem driver for maintaining the vegetation of Limestone Glades. Fire intensity typically comprised mixed, surface, and replacement fires occurring approximately every 5 to 88 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and possibly, to a more limited extent, human-driven ignitions.

Seasonal saturation, drought, wind, and ice damage have also played a role in shaping this ecological site (LANDFIRE 2009). Saturation in the spring and winter creates conditions that lead to frost upheaval and subsequent weathering and erosion (Nelson 2010). The periodic episodes of reduced soil moisture in conjunction with the well-drained, shallow soils have favored the proliferation of plant species tolerant of such conditions. Drought can slow the growth of plants and result in dieback of certain species. Damage to trees from storms can vary from minor, patchy effects of individual trees to stand effects that temporarily affect community structure and species richness and diversity (Irland 2000; Peterson 2000). When coupled with fire, periods of drought and seasonal storms can eliminate or greatly reduce the occurrence of woody vegetation, substantially altering the extent of shrubs and trees (Pyne et al. 1996).

Today, Limestone Glades are limited in their extent, having been degraded as a result of invasion by non-native invasive species and eastern redcedar (*Juniperus virginiana* L.) encroachment from long-term fire suppression. The state-and-transition model that follows provides a detailed description of each state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

F115CY001IL Limestone Glade



Code	Process
T1A	Fire suppression (+70 years), invasive species encroachment
1.1A	Reduced fire return interval
1.2A	Increased fire return interval
R2A	Restore natural fire regime, control invasive species
2.1A	Woody species succession as fire suppression continues
2.2A	Single disturbance event

MLRA 115C Key to Ecological Sites

- I. Upland and high stream terraces
  - A. Bedrock limestone <50cm (20")
  - B. Bedrock >50cm (20")
    - 1 Loess, loess over glacial till/paleosol, glacial till parent material
      - i. Dark surface (mollic epipedon) >25cm (10")
        - a. Slopes >18 percent
        - b. Slopes >18 percent
      - ii. Dark surface (mollic intergrade) 15-25cm (6-10")
      - iii. Light surface (ochric epipedon) or dark surface <15cm (6")
        - a. Slopes <18 percent
          - 1) Depth to water table >30cm (12")
          - 2) Depth to water table <30cm (12")
        - b. Slopes >18 percent
          - 1) N-E aspects
          - 2) S-W aspects
    - 2 Residuum weathered from cherty limestone
      - i. Slopes >18 percent N-E aspects
      - ii. Slopes >18 percent S-W aspects
    - 3 Sandy eolian deposits, outwash
      - i. Dark surface (mollic epipedon) >25cm (10")
        - a. Depth to water table >30cm (12")
        - b. Depth to water table <30cm (12")
      - ii. Light colored surface (ochric epipedon) or dark surface <15cm (6")
- II. Floodplains and low stream terraces subject to flooding
  - A. Low stream terrace rare to occasionally flooded
    - 1 Depth to water table >30cm (12")
    - 2 Depth to water table <30cm (12")
  - B. Floodplains occasionally to frequently flooded
    - 1 Site experiences flooding and ponding for long duration....Ponded Floodplain Marsh
    - 2 Site experiences flooding only
      - i. Not directly adjacent to the stream channel
        - a. Depth to the water table >30cm (12")
        - b. Depth to the water table <30cm (12")
      - ii. Directly adjacent to stream channel
        - a. Clayey alluvium, P drained
        - b. Silty or loamy alluvium SWP-W drained
        - c. Sandy or gravelly alluvium W-E drained

State 1
Reference State

The reference plant community is categorized as a barren community, dominated by scrubby woody and herbaceous vegetation. The two community phases within the reference state are dependent on a combination of surface, mixed, and replacement fires. Low intensity surface fires are the dominant fire regime, comprising more than 80 percent of all fires and occurring every 2 to 7 years. Mixed and replacement fires comprise the remaining 20 percent, occurring approximately every 88 and 37 years, respectively (LANDFIRE 2009). Fire intensity and return intervals alter species composition, cover, and extent, while regular fire intervals keep woody species from closing the canopy. Episodic droughts and storm damage have more localized impacts in the reference phases, but do contribute to overall species composition, diversity, cover, and productivity.

Dominant plant species

- blackjack oak (*Quercus marilandica*), tree
- post oak (*Quercus stellata*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- poverty oatgrass (*Danthonia spicata*), grass

Community 1.1
Blackjack Oak - Post Oak/Little Bluestem - Poverty Oatgrass

Sites in this reference community phase consist of an open canopied woodland, with blackjack oak and post oak as the dominant trees. White oak (*Quercus alba* L.) may be a common canopy associate. Tree size class is typically medium (9 to 21-inch DBH) and heights are less than 30 feet tall (LANDFIRE 2009). The understory is also sparse with a relatively simple species composition. Common understory species include little bluestem, poverty oatgrass, Pennsylvania sedge (Carex pansylvanica Lam.), prairie junegrass (*Koeleria macrantha* (Ledeb.) Schult.), hoary puccoon (*Lithospermum canescens* (Michx.) Lehm.), and purple prairie clover (*Dalea purpurea* Vent.) (White and Madany 1978; Nelson 2010). Areas of exposed sandstone can occur across the site, often inhabited by various lichen species.

Dominant plant species

- blackjack oak (*Quercus marilandica*), tree
- post oak (*Quercus stellata*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- poverty oatgrass (*Danthonia spicata*), grass
- Pennsylvania sedge (*Carex pensylvanica*), other herbaceous
- prairie Junegrass (*Koeleria macrantha*), other herbaceous
- hoary puccoon (*Lithospermum canescens*), other herbaceous
- purple prairie clover (*Dalea purpurea*), other herbaceous

Community 1.2
Blackjack Oak - Post Oak/Common Serviceberry - Eastern Redcedar/Little Bluestem - Poverty Oatgrass

This reference community phase can occur when the average fire return intervals are extended such as from drought. Under a reduced fire return interval, common serviceberry (*Amelanchier arborea* (Michx. f.) Fernald) and eastern redcedar become prominent in the shrub layer, overtopping the herbaceous component. Tree size class remains stunted due to the severe edaphic conditions, but shrubs can reach heights nearly 10 feet tall (LANDFIRE 2009). The return of fire will top-kill the shrubs, returning the community to phase 1.2 (Snyder 1992).

Dominant plant species

- blackjack oak (*Quercus marilandica*), tree
- post oak (*Quercus stellata*), tree
- common serviceberry (*Amelanchier arborea*), shrub
- eastern redcedar (*Juniperus virginiana*), shrub
- little bluestem (*Schizachyrium scoparium*), grass
- poverty oatgrass (*Danthonia spicata*), grass

Pathway 1.1A
Community 1.1 to 1.2

Reduced fire return interval.

Pathway 1.2A
Community 1.2 to 1.1

Increased fire return interval.

State 2
Fire-Suppressed State

Fire suppression can transition the reference plant community into a closed canopy state dominated by eastern redcedar (Briggs et al. 2002; Anderson 2003). Eastern redcedar is a species native to the eastern half of North America with a range spanning from Ontario east to Nova Scotia, south across the Great Plains into eastern Texas, and east to the Atlantic coast (Lawson 1990; Lee 1996). It is a long-lived (450+ years), slow-growing, fire-intolerant dioecious conifer historically found in areas that were protected from fire (e.g., bluffs, rocky hillsides, sandstone cliffs, granite outcrops, etc.) (Ferguson et al. 1968; Anderson 2003). Today, however, decades of fire suppression have allowed this species to spread, and it can now be found occupying sites with highly variable aspects, topography, soils, and formerly stable plant communities (Anderson 2003). Non-native invasive species also contribute to the degradation of this site from the reference state.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree

Community 2.1
Blackjack Oak - Eastern Redcedar/Common Serviceberry/Little Bluestem - Sweetclover

This community phase represents the early stages of eastern redcedar invasion and maturity. In the long-term absence of fire, eastern redcedar can become highly competitive, co-dominating with the hardwoods. The native understory may persist in pockets that haven't been completely shaded out, but non-native invasive species begin to encroach including sweetclover (Melilotus Mill.) and sericea lespedeza (*Lespedeza cuneata* (Dum. Cours.) G. Don) (Nelson 2010).

Dominant plant species

- blackjack oak (*Quercus marilandica*), tree
- eastern redcedar (*Juniperus virginiana*), tree
- common serviceberry (*Amelanchier arborea*), shrub
- little bluestem (*Schizachyrium scoparium*), grass
- sweetclover (*Melilotus*), other herbaceous

Community 2.2
Eastern Redcedar - Blackjack Oak/Common Serviceberry/Sweetclover

Sites falling into this community phase have an established eastern redcedar tree canopy following numerous years of fire suppression. Eastern redcedar is the dominant tree, and blackjack oak and post oak either become minor components or non-existent as these species are fire-dependent (Carey 1992).

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- blackjack oak (*Quercus marilandica*), tree
- post oak (*Quercus stellata*), tree
- common serviceberry (*Amelanchier arborea*), shrub
- sweetclover (*Melilotus*), other herbaceous

Pathway 2.1A
Community 2.1 to 2.2

Woody species succession as fire suppression continues.

Pathway 2.2A
Community 2.2 to 2.1

A large disturbance event transitions the community to a more redcedar dominated site.

Transition T1A
State 1 to 2

Fire suppression in excess of 70 years will transition the site to the fire-suppressed state (2).

Restoration pathway R2A
State 2 to 1

Selective removal of eastern rescedars and re-establishing the natural fire regime will transition the site to the reference state (1).

Additional community tables

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in this ecological site description.

Other references

Anderson, M.D. 2003. *Juniperus virginiana*. In: Fire Effects Information System [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available at: https://www.feis-crs.org/feis/. (Accessed 12 February 2018).

Angel, J. No date. Climate of Illinois Narrative. Illinois State Water Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign. Available at https://www.isws.illinois.edu/statecli/General/Illinois-climate-narrative.htm. Accessed 8 November 2018.

Briggs, J.M., A.K. Knapp, and B.L. Brock. 2002. Expansion of woody plants in tallgrass prairie: a fifteen-year study of fire and grazing-interactions. The American Midland Naturalist 147: 287-294.

Carey, J.H. 1992. Quercus marilandica. In: Fire Effects Information System [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at https://www.crs-feis.org/feis/. (Accessed 19 February 2018).

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Coterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 92 pps.

Ferguson, E.R., E.R. Lawson, W.R. Maple, and C. Mesavage. 1968. Managing Eastern Redcedar. Research paper SO-37. U.S. Department of Agriculture, Forest Service, Southern Forest Experimental Station, New Orleans, LA. 14 pps.

Iowa Natural Areas Inventory [INAI]. 1984. An Inventory of Significant Natural Areas in Iowa: Two year Progress Report of the Iowa natural Areas Inventory. Iowa Natural Areas Inventory, Iowa Department of Natural Resources, Des Moines, IA.

Irland, L.C. 2000. Ice storms and forest impacts. The Science of the Total Environment 262:231-242.

LANDFIRE. 2009. Biophysical Setting 4313630 Central Interior Highlands Dry Acidic Glade and Barrens. In: LANDFIRE National Vegetation Dynamics Models. USDA Forest Service and US Department of Interior. Washington, DC.

Lawson, E.R. 1990. *Juniperus virginiana* L. eastern redcedar. In: R.M. Burns and B.H. Honkala, technical coordinators. Silvics of North America, Volume I: Conifers. Agricultural Handbook 654. Washington, DC: U.S. Department of Agriculture, Forest Service.

Lee, S.A. 1996. Propagation of Juniperus for conservation plantings in the Great Plains. M.S. Thesis. University of Nebraska, Lincoln, NE. 91 pps.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1 NatureServe, Arlington, VA. Available at http://explorer.natureserve.org. (Accessed 4 December 2019).

Nelson, P. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Natural Resources, Missouri Natural Areas Committee. 550 pps.

Peel, M.C., B.L. Finlayson, and T.A. McMahon. 2007. Updated world map of the Köppen-Geiger climate classification. Hydrology and Earth System Sciences 11: 1633-1644.

Peterson, C.J. 2000. Catastrophic wind damage to North American forests and the potential impact of climate change. The Science of the Total Environment 262: 287-311.

Pyne, S.J., P.L. Andrews, and R.D. Laven. 1996. Introduction to Wildland Fire, Second Edition. John Wiley and Sons, Inc. New York, New York. 808 pps.

Schwegman, J.E., G.B. Fell, M. Hutchinson, G. Paulson, W.M. Shepherd, and J. White. 1973. Comprehensive Plan for the Illinois Nature Preserves System, Part 2 The Natural Divisions of Illinois. Illinois Nature Preserves Commission, Rockford, IL. 32 pps.

Taft, J.B., R.C. Anderson, L.R. Iverson, and W.C. Handel. 2009. Chapter 4: Vegetation ecology and change in terrestrial ecosystems. In: C.A. Taylor, J.B. Taft, and C.E. Warwick (eds.). Canaries in the Catbird Seat: The Past, Present, and Future of Biological Resources in a Changing Environment. Illinois Natural Heritage Survey Special Publication 30, Prairie Research Institute, University of Illinois at Urbana-Champaign. 306 pps.

Snyder, S.A. 1992. *Amelanchier arborea*. In: Fire Effects Information System [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at https://www.crs-feis.org/feis/. (Accessed 19 February 2018).

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. 682 pps.

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

U.S. Environmental Protection Agency [EPA]. 2013. Level III and Level IV Ecoregions of the Continental United States. Corvallis, OR, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000. Available at http://www.epa.gov/eco-research/level-iii-andiv-ecoregions-continental-united-states. (Accessed 1 March 2017).

White, J. and M.H. Madany. 1978. Classification of natural communities in Illinois. In: J. White. Illinois Natural Areas Inventory Technical Report. Illinois Natural Areas Inventory, Department of Landscape Architecture, University of Illinois at Urbana/Champaign. 426 pps.

Contributors

Lisa Kluesner
Rick Francen

Approval

Suzanne Mayne-Kinney, 12/30/2024

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List of primary contributors and reviewers.
Organization Name Title Location
Iowa Department of Natural Resources Kevin Andersen State Private Lands Biologist Fairfield, IA
Natural Resources Conservation Service Patrick Chase State Soil Scientist Des Moines, IA
Ron Collman State Soil Scientist Champaign, IL
Tonie Endres Senior Regional Soil Scientist Indianapolis, IN
Rick Francen Soil Scientist Springfield, IL
Lisa Kluesner Ecological Site Specialist Waverly, IA
Jorge, Lugo-Camacho State Soil Scientist Columbia, MO
Kevin Norwood Soil Survey Regional Director Indianapolis, IN
Stanley Sipp Resource Inventory Specialist Champaign, IL
Jason Steele Area Resource Soil Scientist Fairfield, IA
Chris Tecklenberg Acting Regional Ecological Site Specialist Hutchinson, KS
Doug Wallace ACES Ecologist Columbia, MO

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)	LISA KLUESNER
Contact for lead author	
Date	05/11/2025
Approved by	Suzanne Mayne-Kinney
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):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**