

Ecological Site Description

Shallow Limestone Backslope Glade/Woodland

R109XY023MO

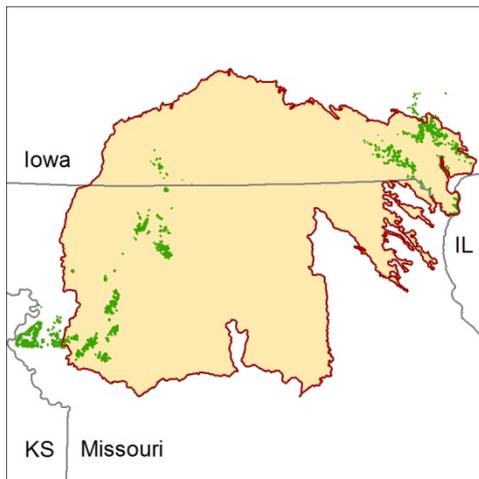
- (*Quercus muehlenbergii*/*Rhus copallina*/*Schizachyrium scoparium* - *Bouteloua curtipendula*)
- (chinkapin oak/winged sumac/little bluestem – sideoats grama)

An Ecological Site Description (ESD) is a reference document of ecological knowledge regarding a particular land area (ecological site). An ESD describes ecological potential and ecosystem dynamics of land areas and their potential management. Ecological sites are linked to soil survey map unit components, which allows for mapping of ecological sites. *(NOTE: This is a “provisional” ESD, and is subject to change. It contains basic ecological information sufficient for conservation planning and land management in Missouri. After additional information is developed and reviewed, a “Correlated” ESD will be published and will be available via the Web Soil Survey <http://websoilsurvey.nrcs.usda.gov>.)*

Major Land Resource Area: 109 – Iowa and Missouri Heavy Till Plain

Introduction

The Iowa and Missouri Heavy Till Plain (area outlined in red on the map) is an area of rolling hills interspersed with interfluvial divides and alluvial valleys. Elevation ranges from about 660 feet along the lower reaches of rivers, to about 980 feet on stable interfluvial summits in southern Iowa. Relief is about 80 to 160 feet between major streams and adjacent interfluvial summits. Most of the till plain drains south to the Missouri River via the Grand and Chariton River systems, but the northeastern portion drains southeast to the Mississippi River. Loess caps the pre-Illinoian aged till on interfluvial divides, whereas the till is exposed on side slopes. Mississippian aged limestone and Pennsylvanian aged sandstone and shale crop out on lower slopes in some areas.

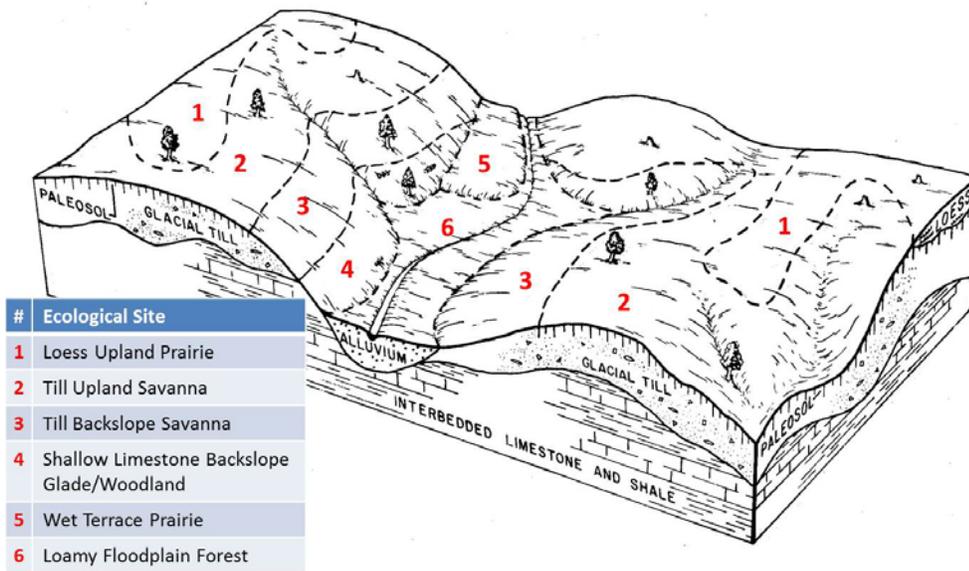


Shallow Limestone Backslope Glade/Woodlands are within the green areas on the map. They primarily occupy the southerly and westerly aspects of steep, dissected slopes.

These sites are in scattered locations mainly in the western part and northeastern parts of the MLRA and adjacent areas. Shallow Limestone Backslope Glade/Woodlands are rather rare and scattered. They occur below loess or till savanna and woodland ecological sites on mid to lower backslopes. Soils are shallow to limestone bedrock.

Physiographic Features

This site is on upland backslopes with slopes of 14 to 50 percent. The site receives runoff from upslope summit and shoulder sites, and generates runoff to adjacent, downslope ecological sites. This site does not flood.



#	Ecological Site
1	Loess Upland Prairie
2	Till Upland Savanna
3	Till Backslope Savanna
4	Shallow Limestone Backslope Glade/Woodland
5	Wet Terrace Prairie
6	Loamy Floodplain Forest

The adjacent figure (adapted from Minor & Davis, 1983) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites of the uplands and adjacent floodplains. The site is within the area labeled “4”, and is typically

downslope from Till Upland and Backslope Savanna ecological sites. In most areas, Upland Drainageway or Terrace and Floodplain ecological sites are directly downslope.

Soil Features

These soils are underlain with limestone bedrock at less than 20 inches. The soils were formed under prairie vegetation, and have dark, organic-rich surface horizons. Parent material is limestone residuum. These soils are clayey and are skeletal, with high amounts of limestone gravel, channers and flagstones. They are not affected by seasonal wetness. Soil series associated with this site include Gasconade.

Ecological Dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Limestone glades are open, rocky areas with very shallow soils dominated by drought-adapted herbaceous flora, generally occurring on south-and west-facing slopes of otherwise wooded sites (Nelson 2010). One of the most striking aspects of dolomite glades is their unique and characteristic flora. Many plants have an affinity for calcareous dolomite substrates. Glade plants in general possess many adaptations enabling them to survive in a harsh environment often subject to widely fluctuating extremes of temperature and moisture. The following conditions are general characteristic of most limestone glades (Nelson and Ladd 1983; Nelson et al. 2013):

- Calcareous limestone bedrock at or near the surface as a result of major erosional activity and resistance to weathering;

- Moderate to steep slopes in deeply dissected drainages or hilly to mountainous terrain with a southern or western exposure with intense solar radiation;
- Extremely thin soil cover interspersed with abundant rock fragments and rock outcrops;
- Exceptionally dry conditions throughout much of the growing season, although soils may be seasonally saturated in spring, winter, and fall;
- Peripheral areas and sometimes large expanses of the glades themselves characterized by a mosaic of stunted, often gnarled trees and shrubs.

Shallow Limestone Backslope Glade/Woodland ecological sites harbor a wide diversity of plants and animals. Grasses such as little bluestem, Indian grass, and sideoats grama, are also found on upland prairies. The shallow soils of this ecological site limit the growth and abundance of trees and support the native grasses and forbs that dominate these systems. Fire played an important role in the maintenance of these systems, as well. It is likely that these sites burned at least once every five years.

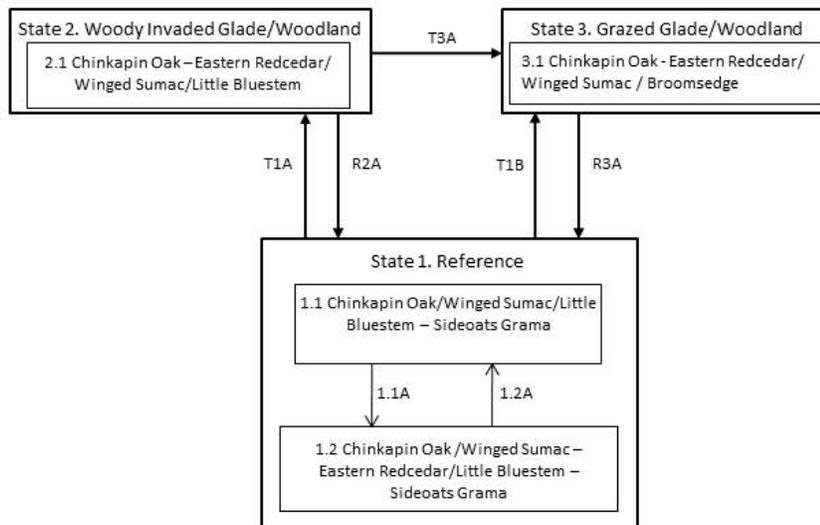
These periodic fires removed the litter and stimulated the growth and flowering of the grasses and forbs. They also further limited the growth and dominance of trees, especially eastern redcedar. Fire tolerant chinkapin oak and post oak occupied islands and edges where the deeper range of the soil component occurred, creating a complex mosaic of open glade and low-density woodland. During fire-free intervals, woody species increased, but not to densities on over-grazed glades.

These sites are not productive. In the absence of fire, woody species, especially eastern redcedar, quickly occupy the site. This is especially true after grazing has reduced grass cover and exposed more surface to the dispersal of cedar seeds by birds. Once established, cedars can quickly fill in a glade/woodland system, especially if grazing has diminished the vigor of the diverse flora. Many glades have been heavily grazed and suffer substantial redcedar invasion. Removal of the redcedar and the application of prescribed fire have proven to be an effective way to manage these systems.

A State and Transition Diagram is depicted in Figure 1. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Figure 1: State and Transition Diagram

Shallow Limestone Backslope Glade/Woodland, R109XY023MO



Code	Event/Activity
T1A	Fire suppression (>20 years)
T1B	Uncontrolled grazing; fire suppression
T3A	Uncontrolled grazing
R2A	Cedar removal; prescribed fire
R3A	Grazing exclusion; prescribed fire; woody removal
1.1A	Fire-free interval (10-20 years)
1.2A	Fire interval (3-10 years)

Ecological States

State 1: Reference State

Glade/Woodland Reference sites harbor a wide diversity of plants and animals. Many, like little bluestem, Indian grass, and sideoats grama, are also found on upland prairies. The glade/woodland complexes range from wide open grassy areas with shallow soils and bare bedrock, to areas with widely scattered chinkapin and post oaks on locations with soil depths at the deeper extreme of the range for this soil component. On protected slopes, open woodlands with chinkapin and post oaks are more common. Here the deeper soil depth range for this soil component and protected aspects allow more woody components to dominate. As fire frequencies decrease invasion by woody species such as eastern redcedar will begin to increase and occupy more space on the site. Return to normal historical fire frequencies will reduce this woody increase and re-open up the site. While many glades have suffered from grazing and fire suppression, good examples can still be found.

State 2: Woody Invaded Glade/Woodland

This state is dominated by eastern redcedar with large increases of oak density due to extended periods of fire suppression. This State can form relatively even-age stands, dating to when fire suppression became the dominant management characteristic on the site. Canopy closures can

approach 100 percent with little or no ground flora. Transition back to the Reference State may require a number of prescribed fire events and thinning out of excess woody species. This state also can transition to a grazed state (State 3) with the introduction of domestic livestock.

State 3: Grazed Glade/Woodland

The Grazed Glade/Woodland State has reduced cover, diversity and vigor of native glade/woodland flora. Woody species encroachment, particularly by eastern redcedar, has also increased in this State. Potential physical site damage by uncontrolled livestock grazing may further degrade this State.

Reference State Plant Community

Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
CHINKAPIN OAK	<i>Quercus muehlenbergii</i>	5-20	30
EASTERN REDCEDAR	<i>Juniperus virginiana</i>	5-20	20
POST OAK	<i>Quercus stellata</i>	5-20	30

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
FRAGRANT SUMAC	<i>Rhus aromatica</i>	5-10	3
DWARF HACKBERRY	<i>Celtis tenuifolia</i>	5-10	5
WINGED SUMAC	<i>Rhus copallina</i>	5-20	4

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	10-30
WOODLAND BROME	<i>Bromus pubescens</i>	10-20
SIDEOATS GRAMA	<i>Bouteloua curtipendula</i>	10-30
SLENDER WOOD SEDGE	<i>Carex digitalis</i>	10-20
INDIANGRASS	<i>Sorghastrum nutans</i>	5-20
PUFFSHEATH DROPSEED	<i>Sporobolus neglectus</i>	5-10
MEAD'S SEDGE	<i>Carex meadii</i>	5-10

Forbs

Common Name	Botanical Name	Cover % (low-high)
HOARY PUCCOON	<i>Lithospermum canescens</i>	10-20
BRISTLY SUNFLOWER	<i>Helianthus hirsutus</i>	10-20
SILKY ASTER	<i>Aster sericeus</i>	10-20
CAROLINA LARKSPUR	<i>Delphinium carolinianum</i>	10-20
BUTTERFLY WEED	<i>Asclepias tuberosa</i>	10-20
SCURFY PEA	<i>Psoraleidium tenuiflorum</i>	10-20
BLAZING STAR	<i>Liatris aspera</i>	10-20
YELLOW STAR GRASS	<i>Hypoxis hirsuta</i>	10-20
NARROW-LEAVED BLUETS	<i>Hedyotis nigricans</i>	10-20
PRAIRIE DOCK	<i>Silphium terebinthinaceum</i>	10-20
RUSHFOIL	<i>Crotonopsis elliptica</i>	10-20
PRAIRIE TEA	<i>Croton mananthogynus</i>	10-20

Lichens

Common Name	Botanical Name	Cover % (low-high)
FISHSCALE LICHEN	<i>Psora decipiens</i>	5-20
SARCOGYNE LICHEN	<i>Sarcogyne regularis</i>	5-20
RUSSELL'S LICHEN	<i>Psora russellii</i>	5-20
JELLY STRAP	<i>Thyrea confusa</i>	5-20

Site Interpretations*Wildlife**

- Oaks provide hard mast; scattered shrubs provide soft mast; frequent bedrock outcrops provide reptile habitat and a patchier groundflora; sedges and native cool-season grasses provide green browse; native warm-season grasses on dry sites provide cover and nesting habitat; and a diversity of forbs provides a diversity and abundance of insects. Post-burn areas can provide temporary bare-ground – herbaceous cover habitat important for turkey poults and quail chicks.
- Game species that utilize this ecological site include: Northern Bobwhite will utilize this ecological site for food (seeds, insects), cover needs (escape, nesting and roosting cover) and brood-rearing habitat.

Cottontail rabbits will utilize this ecological site for food (seeds, soft mast) and cover needs.

Turkey will utilize this ecological site for food (seeds, green browse, soft mast, and insects) and nesting and brood-rearing cover. Turkey poults feed heavily on insects provided by this site type.

White-tailed Deer will utilize this ecological site for browse (plant leaves in the growing season, seeds and soft mast in the fall/winter). This site type also can provide escape cover.

- Bird species associated with this ecological site's reference state condition: Field Sparrow, Yellow-breasted Chat, Brown Thrasher, Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, and Eastern Wood-Pewee.
- Amphibian and reptile species that may be associated with this ecological site's reference state: Five-lined Skink (*Eumeces fasciatus*), Six-lined Racerunner (*Cnemidophorus sexlineatus*), and Prairie Ring-necked Snake (*Diadophis punctatus arnyi*).
- Invertebrates – Many native insect species are likely associated with this phase of this ecological site's reference state condition, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydids. However we don't have enough information on these groups to assign them to this ecological site's reference state condition at this time.

*This section prepared by Mike Leahy, Natural Areas Coordinator, Missouri Department of Conservation, 2013

Forestry

- **Management:** Site index values are less than 30 for eastern redcedar and generally less than 40 for oak. Productivity is very low. Very limited timber management opportunities exist. These sites are valuable for wildlife purposes and watershed protection. Severely reduced rooting depth restricts tree growth and increases windthrow hazards. These sites respond well to prescribed fire as a management tool.
- **Limitations:** Surface stones and surface rock; very shallow soil depth. Surface stones and rocks are problems for efficient and safe equipment operation. Severe seedling mortality due to high soil surface temperatures and low available water holding capacity is possible. Machine planting and mechanical site preparation is not recommended. Hard bedrock at shallow depths may interfere with equipment operation. Rock outcrops may cause breakage of timber when harvesting. Surface stones and rocks will make equipment use extremely difficult. Erosion is a hazard when slopes exceed 15 percent. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

Glossary

Backslope – a hillslope profile position that forms the steepest and generally linear, middle portion of the slope.

Backswamp – marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces

Calcareous – the presence of calcium carbonate in the soil parent material within the rooting zone; relatively alkaline

Claypan – a dense, compact, slowly permeable layer in the subsoil having much higher clay content than the overlying material

Chert – hard, extremely dense or compact crystalline sedimentary rock, consisting dominantly of interlocking crystals of quartz

Cliff – a significant vertical, or near vertical, rock exposure

Dolomite – a type of sedimentary rock that is a carbonate mineral composed of calcium magnesium carbonate

Drainageway – the upper most reach of a stream channel system characterized by little meandering

Dry – a site where soil moisture is limiting during the growing season; low available water capacity

Dune – a low mound, ridge, bank or hill of loose, wind-blown sand

Exposed – steep, south and west-facing slopes, which are warmer and drier than other slope aspects

Flatwoods – a type of woodland that occurs on soils with a root restricting subsoil layer within 20 to 30 inches, resulting in very slow runoff and ponding that remains saturated for most of the winter and early spring months but dries out and becomes very dry in the summer months; plants that grow there must be adapted to both conditions

Floodplain – the nearly level plain that borders a stream and is subject to inundation under flood-stage conditions

Footslope – a hillslope position at the base of a slope where hillslope sediment (colluvium) accumulates

Forest – a vegetative community dominated by trees forming a closed canopy and interspersed with shade-tolerant understory species

Fragipan – a dense, brittle subsoil horizon that is extremely hard and compact when dry

Glade – open, rocky, barren vegetative community dominated by drought-adapted forbs and grasses, typically with scattered, stunted woody plants

Igneous – bedrock formed by cooling and solidification of magma. Granite and rhyolite are typical igneous bedrocks in Missouri

Limestone – a type of sedimentary rock composed largely of calcium carbonate

Loess – material transported and deposited by wind and consisting predominantly of silt-size particles

Loamy – soil material containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay

Marsh – a type of wetland that is dominated by herbaceous rather than woody plant species

Moist – a site that is moderately well to well drained and has high available water capacity, resulting in a well-balanced supply of moisture (neither too dry nor too wet).

Mudstone – blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are approximately equal

Natric – a soil horizon that displays a blocky, columnar, or prismatic structure and has a subhorizon with an exchangeable-sodium saturation of over 15%

Outwash – stratified sediments of sand and gravel removed or “washed out” from a glacier by melt-water streams

Prairie – a vegetative community dominated by perennial grasses and forbs with scattered shrubs and very few trees

Protected – steep, north- and east-facing slopes, which are cooler and moister than other slope aspects

Residuum - unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place

Riser – a component of terraces and flood-plain steps consisting of the steep side slope; the escarpment

Riverfront – a vegetative community in the floodplain immediately adjacent and generally parallel to a river or stream channel

River hills – a geographic area characterized by thick, dissected loess deposits, formed immediately adjacent to the edges of the Missouri and Mississippi River floodplains

Sandy – a coarse-sized soil containing a large mixture of sand and gravels and a somewhat smaller proportion of silts and clays with excessive drainage

Sandstone – a sedimentary rock containing dominantly sand-size particles

Savanna – grasslands interspersed with open-grown scattered trees, groupings of trees, and shrubs

Shale – a sedimentary rock formed from clay, silty clay, or silty clay loam deposits and having the tendency to split into thin layers

Shallow – a site with bedrock within 20 inches of the surface

Shoulder – the slope profile position that forms the convex surface near the top of a hill slope; it comprises the transition zone from summit to backslope

Sinkhole – a closed, circular or elliptical depression, commonly funnel-shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock or by collapse of underlying caves within bedrock

Summit – the top or highest area of a hillslope

Swale – shallow, closed depressions irregularly spaced across a floodplain or terrace with an irregularly undulating surface.

Swamp – an area of low, saturated ground, intermittently or permanently covered with water, and predominantly vegetated by shrubs and trees.

Talus – rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope.

Terrace – a step-like surface, bordering a valley floor that represents the former position of a flood plain

Till – dominantly unsorted and unstratified soil material deposited directly by a glacier

Upland – a general term for the higher ground of a region, in contrast with a low-lying, adjacent land such as a valley or floodplain

Wet – a somewhat poorly, poorly or very poorly drained site that has an oversupply of moisture during the growing season

Woodland – a highly variable vegetative community with a canopy of trees ranging from 30 to 100 percent closure with a sparse midstory and a dense ground flora of grasses, sedges and forbs

References

Fitzgerald, J.A. and D.N. Pashley. 2000b. Partners in Flight bird conservation plan for the Dissected Till Plains. American Bird Conservancy.

Heitzman, J.R. and J.E. Heitzman. 1996. Butterflies and moths of Missouri. 2nd ed. Missouri Department of Conservation, Jefferson City.

Jacobs, B. 2001. Birds in Missouri. Missouri Department of Conservation, Jefferson City.

Johnson, T.R. 2000. The amphibians and reptiles of Missouri. 2nd ed. Missouri Department of Conservation, Jefferson City.

Minor, Paul E., & Keith O. Davis. 1983. Soil Survey of Clinton County, Missouri. U.S. Dept. of Agric. Soil Conservation Service.

Nelson, Paul W. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

Nelson, Paul W and Douglas Ladd. 1980. "Preliminary report on the identification, distribution and classification of Missouri glades".

Nelson, P. W., J. A. Fitzgerald, K. Larson, R. McCoy, A. Schotz, J. Taft, T. Witsell, B. Yahn. 2013. Central Hardwoods Joint Venture Glade Conservation Assessment for the Interior Highlands and Interior Low Plateaus of the Central Hardwoods Region. Central Hardwoods Joint Venture.

Nigh, Timothy A., and Walter A. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri.

Pitts, D.E. and W.D. McGuire. 2000. Wildlife management for Missouri landowners. 3rd ed. Missouri Department of Conservation, Jefferson City.

Schwartz, C.W., E.R. Schwartz and J.J. Conley. 2001. The wild mammals of Missouri. University of Missouri Press, Columbia and Missouri Department of Conservation, Jefferson City.