USDA Natural Resources Conservation Service

Ecological site R116BY025MO
Shallow Sandstone Upland Glade/Woodland

Last updated: 10/07/2020
Accessed: 05/03/2024

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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 116B–Springfield Plain

The Springfield Plain is in the western part of the Ozark Uplift. It is primarily a smooth plateau with some dissection along streams. Elevation is about 1,000 feet in the north to over 1,700 feet in the east along the Burlington Escarpment adjacent to the Ozark Highlands. The underlying bedrock is mainly Mississippian-aged limestone, with areas of shale on lower slopes and structural benches, and intermittent Pennsylvanian-aged sandstone deposits on the plateau surface.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to a Sandstone Glade.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to Schizachrium scoparium-Aristida dichotoma-Croton willdenowii/Lichens Wooded Herbaceous Vegetation (CEGL002242).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily within the following Land Type Associations:

Upper Sac River Oak Savanna/Woodland Low Hills
Upper Pommee de Terre Oak Savanna/Woodland Dissected Plain
James River Oak Savanna/Woodland Low Hills

Ecological site concept

NOTE: This is a “provisional” Ecological Site Description (ESD) that is under development. It contains basic ecological information that can be used for conservation planning, application and land management. After additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Shallow Sandstone Upland Glade/Woodland occur in areas where the underlying Pennsylvanian-aged sandstone deposits are at the surface, primarily in the Sac and James River watersheds. An isolated area also occurs in the far south of the area in Barry county, on Mississippian-aged sandstone. Soils are very shallow to sandstone bedrock. The reference plant community ranges from open areas of grasses and forbs interspersed with bare bedrock, to areas with shrubs and widely scattered blackjack oak and post oak.

Associated sites

F116BY007MO	**Dry Sandstone Upland Woodland** Dry Sandstone Upland Woodlands are adjacent and often upslope, where soils are 20 to 40 inches to sandstone bedrock.
F116BY017MO	**Gravelly/Loamy Upland Drainageway Woodland** Gravelly/Loamy Upland Drainageway Woodlands are downslope.

Similar sites

R116BY024MO	**Shallow Limestone Upland Glade/Woodland** Shallow Limestone Upland Glade/Woodlands are glade communities but on limestone. Community structures are similar but species composition does vary.

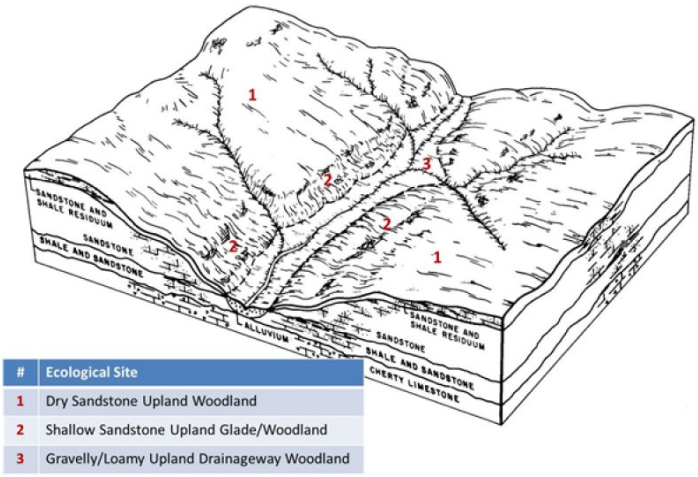
Table 1. Dominant plant species

Tree	(1) *Quercus marilandica*
Shrub	(1) *Rhus copallina*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Crotonopsis elliptica*

Physiographic features

This site is on upland crests, shoulders and backslopes with slopes of 2 to 35 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Dodd, 1985) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. In this figure, there is no demarcation between the Dry Sandstone Upland Woodland, labeled “1”, and the Shallow Sandstone Upland Glade/Woodland, labeled “2”. In general the Dry Sandstone Upland sites are upslope, on summits, shoulders and upper backslopes, whereas the Shallow Sandstone sites are on lower slopes above the Drainageway sites. Dry Sandstone Upland Woodlands and Shallow Sandstone Upland Glade/Woodland sites are intermingled in places.



#	Ecological Site
1	Dry Sandstone Upland Woodland
2	Shallow Sandstone Upland Glade/Woodland
3	Gravelly/Loamy Upland Drainageway Woodland

Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Interfluve (3) Ridge
Flooding frequency	None
Ponding frequency	None
Slope	2–35%
Water table depth	152 cm
Aspect	W, SE, S, SW

Climatic features

The Springfield Plain has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce abundant amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over the region, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

The Springfield Plain experiences few regional differences in climates. The average annual precipitation in this area is 41 to 45 inches. Snow falls nearly every winter, but the snow cover lasts for only a few days. The average annual temperature is about 55 to 58 degrees F. The lower temperatures occur at the higher elevations. Mean July maximum temperatures have a range of only one or two degrees across the area.
Mean annual precipitation varies along a west to east gradient. Seasonal climatic variations are more complex. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages three to four times greater than January precipitation. Most of the rainfall occurs as high-intensity, convective thunderstorms in summer.

During years when precipitation comes in a fairly normal manner, moisture is stored in the top layers of the soil during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Drought directly affects plant and animal life by limiting water supplies, especially at times of high temperatures and high evaporation rates.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. In regions of appreciable relief, for example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Deep sinkholes often have a

microclimate significantly cooler, moister, and shadier than surrounding surfaces, a phenomenon that may result in a strikingly different ecology. Higher daytime temperatures of bare rock surfaces and higher reflectivity of these unvegetated surfaces may create distinctive environmental niches such as glades and cliffs. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier than adjacent north- and-east-facing slopes. Finally, the climate within a canopied forest is measurably different from the climate of a more open grassland or savanna areas.

Source: University of Missouri Climate Center - http://climate.missouri.edu/climate.php; Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - http://soils.usda.gov/survey/geography/mlra/

Table 3. Representative climatic features

Frost-free period (characteristic range)	151-162 days
Freeze-free period (characteristic range)	185-192 days
Precipitation total (characteristic range)	1,168-1,194 mm
Frost-free period (actual range)	146-162 days
Freeze-free period (actual range)	182-194 days
Precipitation total (actual range)	1,168-1,194 mm
Frost-free period (average)	156 days
Freeze-free period (average)	188 days
Precipitation total (average)	1,168 mm

Climate stations used

- (1) SELIGMAN [USC00237645], Seligman, MO
- (2) STOCKTON DAM [USC00238082], Stockton, MO
- (3) SPRINGFIELD [USW00013995], Springfield, MO

Influencing water features

This ecological site is not influenced by wetland or riparian water features. High temperatures, intense solar radiation, and dry conditions prevail throughout much of the growing season, although soils may be saturated in spring, winter and late fall. Frost upheaval frequently disrupts these shallow soils during the dominant season. While evapotranspiration remains the most constant water feature, evapotranspiration rates typically peak in the summer and become dominant. The surface runoff pulse is greatly influenced by extreme weather events.

Soil features

These soils are underlain by sandstone bedrock at less than 20 inches. The soils were formed under prairie vegetation, and have dark, organic-rich surface horizons. Parent material is sandstone residuum. They have fine sandy loam surface layers, with loamy subsoils that may contain some sandstone gravel. They are not affected by seasonal wetness. Soil series associated with this site include Basehor and Ramsey.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone
Surface texture	(1) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate
Soil depth	25–51 cm

Surface fragment cover <=3"	0–8%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–7.62 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	3.5–4.5
Subsurface fragment volume <=3" (Depth not specified)	0–25%
Subsurface fragment volume >3" (Depth not specified)	0–6%

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.

Shallow Sandstone Upland Glade/Woodlands harbor a wide diversity of lichens, plants and animals. The dominant grasses include little bluestem1, broomsedge and Indiangrass. Large areas of lichen covered bedrock are flanked and have islands of grasses and forbs on very shallow soils and blackjack and post oak woodlands on slightly deeper soils. The federally listed tinytim (*Geocarpon minimum*) is known only from these glades in Missouri. While most have suffered from grazing and fire suppression, a few good examples can still be found.

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 sandstone glades:
• Bedrock at or near the surface as a result of major erosional activity;
• 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.

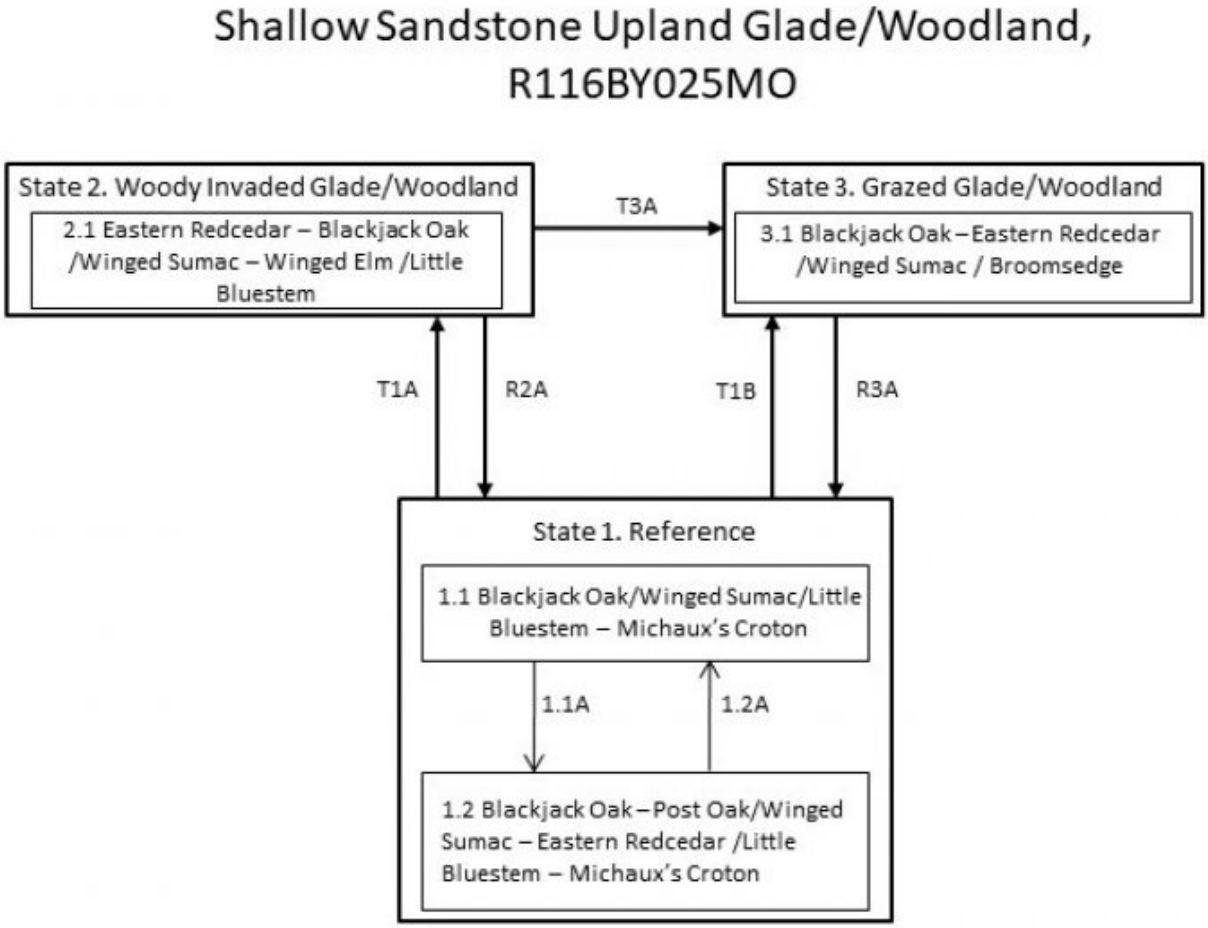
The shallow soils of the Shallow Sandstone Upland Glade/Woodlands limit the growth of trees and support the native grasses and forbs that dominate these systems. Trees found on and near glades are often stunted and express poor development because of shallow droughty soils and poor growing conditions. Like the adjacent prairies, fire also played an important role in the maintenance of these systems. These systems typically burned at least once every three 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.

Fire tolerant blackjack oak occupied islands and edges of deeper soils, creating a complex mosaic of open glade and low-density woodland. During fire-free intervals, woody species increased, especially on protected slopes. Once established, blackjack oak, eastern redcedar and sumac 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 woody invasion. Removal of the woodies and the application of prescribed fire have proven to be effective management tools.

A State and Transition Diagram follows. 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.

State and transition model



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 (5-10 years)
1.2A	Fire interval (3-5 years)

Figure 9. State and Transition Model for this ecological site.

State 1

Reference

The historic Shallow Sandstone Upland Glade/Woodland reference site harbors a wide diversity of plants and animals. Many, like little bluestem, Indiangrass, and sideoats grama are also found on prairies. The glade/woodland complexes range from wide open grassy areas with shallower soil profiles and bare bedrock, to areas with widely scattered blackjack and post oaks on locations with soil depths at the deeper extreme of the range for this soil component. On protected slopes, open woodlands are more common. Here the deeper soil depth range for this soil component and protected aspects allow more woody components to dominate. While many have suffered from grazing and fire suppression, good examples can still be found.

Community 1.1
Blackjack Oak/Winged Sumac/Little Bluestem – Michaux's Croton

Forest overstory. The Overstory Species list is based on field reconnaissance as well as commonly occurring species listed in Nelson 2010; names and symbols are from USDA PLANTS database.

Forest understory. The Understory Species list is based on field reconnaissance as well as commonly occurring species listed in Nelson 2010; names and symbols are from USDA PLANTS database.

Community 1.2
1.2 Blackjack Oak – Post Oak/Winged Sumac – Eastern Redcedar /Little Bluestem – Michaux's Croton

Pathway P1.1A
Community 1.1 to 1.2

Fire-free interval (5-10 years)

Pathway P1.2A
Community 1.2 to 1.1

Fire interval (3-5 years)

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.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates

Community 2.1
Eastern Redcedar – Blackjack Oak /Winged Sumac – Winged Elm /Little Bluestem

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.

Dominant resource concerns

- Ephemeral gully erosion
- Compaction
- Nutrients transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

Community 3.1
Blackjack Oak-Eastern Redcedar-Winged Sumac/Broomsedge

Transition T1A
State 1 to 2

Fire suppression (> 20 years)

Transition T1B
State 1 to 3

Uncontrolled grazing; fire suppression

Restoration pathway R2A
State 2 to 1

Redcedar removal; prescribed fire

Transition T3A
State 2 to 3

Uncontrolled grazing

Restoration pathway R3A
State 3 to 1

Grazing exclusion; prescribed fire; woody removal

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
post oak	QUST	*Quercus stellata*	Native	–	0–10	–	–
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	0–10	–	–
eastern redcedar	JUVI	*Juniperus virginiana*	Native	–	0–10	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Great Plains flatsedge	CYLU2	*Cyperus lupulinus*	Native	–	5–10
poverty oatgrass	DASP2	*Danthonia spicata*	Native	–	5–10
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	5–10
Indiangrass	SONU2	*Sorghastrum nutans*	Native	–	5–10
broomsedge bluestem	ANVI2	*Andropogon virginicus*	Native	–	5–10
tapered rosette grass	DIACA	*Dichanthelium acuminatum var. acuminatum*	Native	–	5–10
purple lovegrass	ERSP	*Eragrostis spectabilis*	Native	–	5–10
sixweeks fescue	VUOC	*Vulpia octoflora*	Native	–	5–10
Bush's sedge	CABU5	*Carex bushii*	Native	–	5–10
lopsided rush	JUSE	*Juncus secundus*	Native	–	5–10
Forb/Herb					
orangegrass	HYGE	*Hypericum gentianoides*	Native	–	1–5
Texas saxifrage	SATE4	*Saxifraga texana*	Native	–	1–5
spoonleaf purple everlasting	GAPU3	*Gamochaeta purpurea*	Native	–	1–5
kiss me quick	POPI3	*Portulaca pilosa*	Native	–	1–5
Michaux's croton	CRMI8	*Croton michauxii*	Native	–	1–5
poorjoe	DITE2	*Diodia teres*	Native	–	1–5
Virginia dwarfdandelion	KRVI	*Krigia virginica*	Native	–	1–5
tiny bluet	HOPU3	*Houstonia pusilla*	Native	–	1–5
mealy fumewort	COCR2	*Corydalis crystallina*	Native	–	1–5
tinytim	GEMI	*Geocarpon minimum*	Native	–	1–5
scaly blazing star	LISQ	*Liatris squarrosa*	Native	–	1–5
Virginia tephrosia	TEVI	*Tephrosia virginiana*	Native	–	1–5
roundstem false foxglove	AGGA	*Agalinis gattingeri*	Native	–	1–5
fringeleaf wild petunia	RUHU	*Ruellia humilis*	Native	–	1–5
Texas saxifrage	SATE4	*Saxifraga texana*	Native	–	1–5
narrowleaf pinweed	LETE	*Lechea tenuifolia*	Native	–	1–5
dwarf plantain	PLPU	*Plantago pusilla*	Native	–	1–5
golden selenia	SEAU	*Selenia aurea*	Native	–	1–5
Fern/fern ally					
northern selaginella	SERU	*Selaginella rupestris*	Native	–	1–5
hairy lipfern	CHLA2	*Cheilanthes lanosa*	Native	–	1–5
Shrub/Subshrub					
winged elm	ULAL	*Ulmus alata*	Native	–	1–10
winged sumac	RHCO	*Rhus copallinum*	Native	–	1–10
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	1–10
farkleberry	VAAR	*Vaccinium arboreum*	Native	–	1–10
Nonvascular					
greygreen reindeer lichen	CLRA60	*Cladina rangiferina*	Native	–	1–5
cup lichen	CLMA17	*Cladonia mateocyatha*	Native	–	1–5

Animal community

Wildlife
Wildlife habitat: oaks provide hard mast; numerous native legumes provide high-quality wildlife food; native warm-season grasses provide extensive 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:
Breeding Birds: Field Sparrow, Yellow-breasted Chat, Blue-winged Warbler, Brown Thrasher, Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Summer Tanager 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), flat-headed snake (Tantilla gracilis), eastern coachwhip (Masticophis flagellum flagellum), red milk snake (Lampropeltis triangulum syspila), ground snake (Snora semiannulata) and prairie ring-necked snake (Diadophis punctatus arnyi).

Small mammals likely associated with this ecological site's reference state condition: eastern woodrat (Neotoma floridana) and peromyscus species.

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.

Insect species likely associated with this ecological site's reference state condition: lichen grasshopper (Trimerotropis saxatilis), a prickly pear borer moth (Melitara prodenialis), native ants (Pheidole tysoni, Formica schaufussi), and native bees (Colletes aestivalis, Andrena helianthiformis, Protandrena rudbeckiae, Lasioglossum coreopsis, Anthidium psoraleae and Dianthidium subrufulum).

(This section prepared by Mike Leahy, Natural Areas Coordinator, Missouri Department of Conservation, 2013. References for this section: Fitzgerald and Pashley 2000b; Heitzman and Heitzman 1996; Jacobs 2001; Johnson 2000; Pitts and McGuire 2000; Schwartz and others 2001)

Other information

Forestry
Management:
estimated site index values are less than 30 for eastern redcedar and generally less than 40 for oak. Productivity is very low. No 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%, traction problems increase and equipment use is not recommended.

Inventory data references

Potential Reference Sites: Shallow Sandstone Upland Glade/Woodland

Plot BOGLCE05 – Basehor soil
Located Bona Glade NA, Greene County, MO
Latitude: 37.546466
Longitude: -93.691597

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Contributors

Doug Wallace
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Approval

Nels Barrett, 10/07/2020

Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support in the development of this ecological site.

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	10/06/2020
Approved by	Nels Barrett
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:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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

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

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

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17. **Perennial plant reproductive capability:**
