Ecological site F109XY015MO
Loamy Backslope Woodland

Accessed: 04/26/2024

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): 109X–Iowa and Missouri Heavy Till Plain

The Iowa and Missouri Heavy Till Plain (area outlined in red on the map) is an area of rolling hills interspersed with interfluve divides and alluvial valleys. Elevation ranges from about 660 feet along the lower reaches of rivers, to about 980 feet on stable interfluve summits in southern Iowa. Relief is about 80 to 160 feet between major streams and adjacent interfluve 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-Illinoisan aged till on interfluves, 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.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to a Dry-Mesic Loess/Glacial Till Woodland.

Missouri Department of Conservation Forest and Woodland Communities (Missouri Department of Conservation, 2006):
The reference state for this ecological site is most similar to a Mixed Oak Loess/Glacial Till Woodland.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):

The reference state for this ecological site is most similar to a Quercus alba - Quercus rubra - Acer saccharum - Carya cordiformis / Lindera benzoin Forest (CEGL002058).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily within the Trenton Woodland/Forest Scarped Hills Land Type Association of the Grand River Hills Subsection.

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. As additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Loamy Backslope Woodlands are within the green areas on the map. They are not extensive, occurring mainly in NW Livingston county, and NE Clark county along the bluffs of the Des Moines River. Soils are deep over limestone bedrock. The reference plant community is forest dominated by white and chinkapin oaks, with an open understory and a rich herbaceous ground flora.

Associated sites

F109XY004MO	**Loamy Upland Drainageway Woodland** Loamy Upland Drainageway Woodlands, and other floodplain sites, are downslope.
R109XY002MO	**Loess Upland Prairie** Loess Upland Prairies are upslope in prairie areas, on summits and shoulders.

Similar sites

F109XY013MO	**Interbedded Sedimentary Protected Backslope Forest** Interbedded Sedimentary Protected Backslope Forests are similar in composition on protected landscape positions and effective rooting depths due to fractured nature of the bedrock.
F109XY025MO	**Interbedded Sedimentary Exposed Backslope Woodland** Interbedded Sedimentary Exposed Backslope Woodlands are similar in composition, on exposed landscape positions, and effective rooting depths due to fractured nature of the bedrock.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus muehlenbergii*
Shrub	(1) *Cercis canadensis*
Herbaceous	(1) *Elymus virginicus* (2) *Schizachyrium scoparium*

Physiographic features

This site is on upland backslopes with slopes of 18 to 35 percent. The site receives runoff from upslope summit and shoulder sites, and generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Abney, 2002) shows the typical landscape position of this ecological site, labeled “2” on the figure. The site is typically downslope from the Loess Upland Prairie ecological site. Upland Drainageway ecological sites are directly downslope (not shown on the diagram).

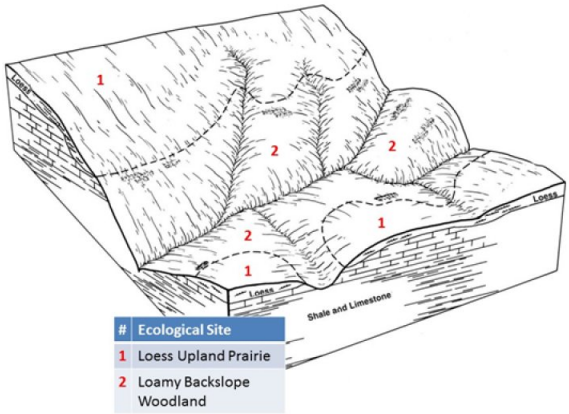


Figure 2. Landscape relationships for this ecological site

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Slope	18–35%
Water table depth	24–72 in
Aspect	N, NE, E

Climatic features

The Iowa and Missouri Heavy Till Plain MLRA 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.

This MLRA experiences small regional differences in climates that grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line from north to south. Both mean annual temperature and precipitation exhibit fairly minor gradients along this line.
Mean January minimum temperature follows the north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the region. Mean July maximum temperatures have a range of only two to three degrees across the region.

Mean annual precipitation varies along the same gradient as temperature – lower annual precipitation in the north, higher in the south. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages four to five times greater than January precipitation.
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 influences ecological communities by limiting water supplies, especially at times of high temperatures and high evaporation rates. Drought indirectly affects ecological communities by increasing plant and animal susceptibility to the probability and severity of fire. Frequent fires encourage the development of grass/forb dominated communities and understories.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. 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. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier, supporting more grass dominated communities than adjacent north- and-east-facing slopes that are cooler and moister that support more woody dominated communities. Finally, the cooler microclimate within a canopied forest is measurably different from the climate of a more open and warmer grassland or savanna area.

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 (average)	167 days
Freeze-free period (average)	194 days
Precipitation total (average)	42 in

Climate stations used

- (1) TRENTON [USC00238444], Trenton, MO
- (2) KEOKUK LOCK DAM 19 [USC00134381], Keokuk, IA

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

These soils are underlain with limestone bedrock at 40 to 60 inches deep. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is slope alluvium and residuum weathered from limestone, overlying limestone bedrock. They have silt loam surface layers, with loamy or clayey subsoils that have low to moderate amounts of chert gravel and cobbles. They are not affected by seasonal wetness. Soil series associated with this site include Bucklick.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–dolomite (2) Residuum–dolomite
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to slow
Soil depth	40–60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–10%
Available water capacity (0-40in)	3–6 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm

Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	3–50%

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.

The soils of Loamy Backslope Woodlands limits the growth of trees and supports an abundance of native grasses and forbs in the understory. They may contain small glade complexes. While more productive than adjacent glades these sites have only a moderately tall (50 to 70 feet) white oak and chinkapin oak dominated semi-open overstory, with an occasional northern red oak. Shrubs were scattered within a dense matrix of native grasses and forbs. Characteristic plants in the ground flora can be used to gauge the restoration potential of a stand along with remnant open-grown old-age trees, and tree height growth. Protected slopes are generally more productive and have higher densities of white oak and northern red oak in the canopy.

Fire played an important role in the maintenance of these systems. It is likely that these ecological sites, along with adjacent glades and woodlands burned at least once every 5 years. The protected slopes site burned less frequently (estimated 10 to 25 years) and with lower intensity. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. They would have also further limited the growth and dominance of trees, especially eastern redcedar. During fire free intervals, woody species would have increased and the herbaceous understory diminished. But the return of fire would have re-opened the woodlands and stimulated the ground flora. In the long term absence of fire, woody species, especially hickory and eastern red cedar have encroached into these ecological sites. Most of these ecological sites today are dense, and shady with a greatly diminished ground flora. Removal of the younger understory by chainsaw and the application of prescribed fire have proven to be effective restoration methods.

Loamy Backslope Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison, elk, and deer. Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees. Grazing by native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and sun-loving ground flora species.

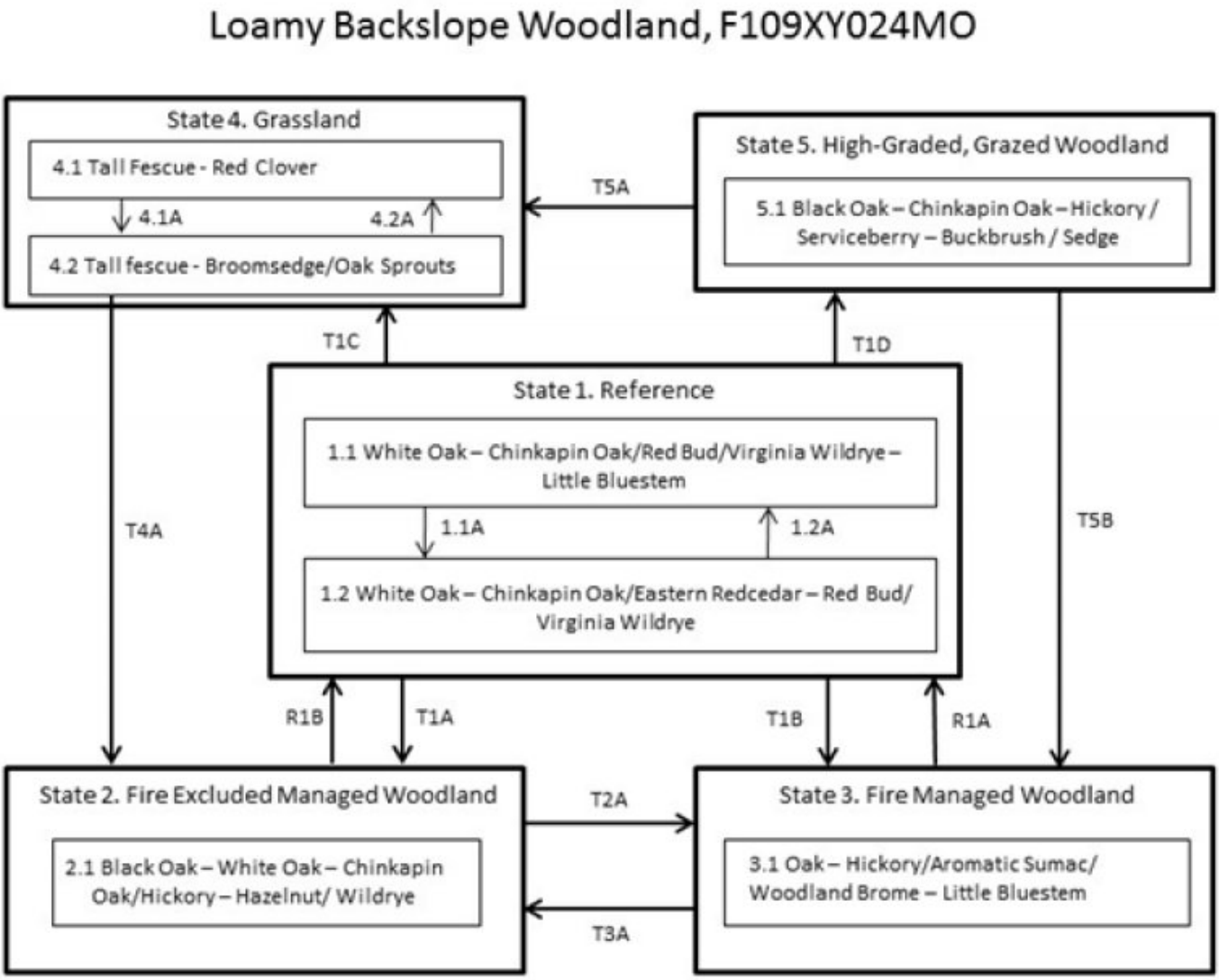
Uncontrolled domestic grazing has also impacted these communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as buckbrush, gooseberry, and Virginia creeper. It also promotes the invasion of Eastern red cedar. Grazed sites have a more open understory. In addition, soil compaction and soil erosion from grazing can be a problem and lower site productivity.
These ecological sites are moderately productive, especially when compared to loess covered units. Oak regeneration is typically problematic. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects.

Single tree selection timber harvests are common for this ecological site and often results in removal of the most productive trees (high grading) in the stand leading to poorer quality timber and a shift in species composition away from more valuable oak species. Better planned single tree selection or the creation of group openings can help regenerate and maintain more desirable oak species and increase vigor on the residual trees. Clearcutting also occurs and results in dense, even-aged stands dominated by oak. This may be beneficial for existing stands whose

composition has been highly altered by past management practices. However, without some thinning of the dense stands and application of prescribed fire, the ground flora diversity can be shaded out and diversity of the stand may suffer.

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	Activity/Event/Process
T1A	Even-aged management
T1B	Fire suppression; uneven-age management
T2B	Prescribed fire; thinning; grazing management
T1C, T5A	Clearing; pasture planting
T1D	Poorly planned harvest; uncontrolled grazing
T2A	Prescribed fire; forest stand improvement
T3A	Even-age management; fire exclusion
T4A	Tree planting; long-term succession; no grazing
T5B	Forest management; no grazing; fire

Code	Activity/Event/Process
1.1A	No disturbance (10+ years)
1.2A	Disturbance (fire, wind, ice) < 10 years
4.1A	Over grazing; no fertilization
4.2A	Brush management; grassland seeding; grassland management

Code	Activity/Event/Process
R1A	Prescribed fire; extended rotations
R1B	Forest stand improvement; extended rotations; prescribed fire

Figure 7. STM for this ecological site

State 1

Reference

The historical reference state for this ecological site was old growth, oak woodland. The reference state was dominated by white oak and chinkapin oak. Maximum tree age was likely 150 to 200 years. Periodic disturbances from fire, wind or ice maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species. Two community phases are recognized in the reference state, with shifts between phases based on disturbance frequency. Reference states are rare today. Many sites have been converted to grassland (State 4). Others have been subject to repeated, high-graded timber harvest coupled with uncontrolled domestic livestock grazing (State 5). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Some former reference states have been managed as woodlands with fire (State 2) or without fire (State 3).

Community 1.1
White Oak – Chinkapin Oak/Red Bud/Virginia Wildrye – Little Bluestem

Forest overstory. The Forest Overstory Species list is based on commonly occurring species listed in Nelson (2010).

Forest understory. The Forest Understory list is based commonly on occurring species listed in Nelson (2010).

Community 1.2
White Oak – Chinkapin Oak/Eastern Redcedar – Red Bud/ Virginia Wildrye

State 2
Fire Excluded Managed Woodland

These stands will slowly increase in more shade tolerant species and white oak will become less dominant. These woodlands tend to be rather dense, with a sparse understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. However, in the absence of fire, the diversity and cover of the ground flora is still diminished. Without periodic disturbance, stem density and fire intolerant species, like sassafras and hickory, increase in abundance. Prescribed fire along with a more open canopy can transition this state to a Fire Managed Woodland state (State 3).

Community 2.1
Black Oak – White Oak – Chinkapin Oak/Hickory – Hazelnut/ Wildrye

State 3
Fire Managed Woodland

The Fire Managed Woodland state results from managing woodland communities (States 2) with prescribed fire and canopy thinning,. This state can resemble the Reference State, but with younger maximum tree ages, more open canopies and lower ground flora diversity. Cessation of prescribed fire will allow transition to various managed woodland states. If controlled grazing is introduced to this state, a silvopasture system can be created. Opening of the canopy may need to occur to allow sufficient light levels to exist for suitable grazing needs.

Community 3.1
Oak – Hickory/Aromatic Sumac/ Woodland Brome – Little Bluestem

State 4
Grassland

Conversion of woodlands to planted, non-native cool season grassland species such as tall fescue is common for this region. Steep slopes, surface fragments, low organic matter contents and soil acidity make grasslands harder to maintain in a healthy, productive state on this ecological site. Two community phases are recognized in the grassland state, with shifts between phases based on types of management. Poor management will result in a shift to Community 4.2 that shows an increase in oak sprouting and increases in broomsedge densities. If grazing and

active pasture management is discontinued, the site will eventually transition to State 2 from this phase.

Community 4.1
Tall Fescue-Red Clover

This phase is a well managed grassland, composed of non-native cool season grasses and legumes. Grazing and haying is occurring. The effects of long-term liming on soil pH, and calcium and magnesium content, is most evident in this phase. Studies show that these soils have higher pH and higher base status in soil horizons as much as two feet below the surface, relative to poorly managed grassland (phase 4.2) and to woodland communities (where liming is not practiced).

Community 4.2
Tall Fescue-Broomsedge/Oak Sprouts

This phase is the result of poor grassland management. Over grazing and inadequate or no fertility application has allowed tall fescue, multi-flora rose, broomsedge, thistle and other weedy species to increase in cover and density reducing overall forage quality and site productivity. White clovers such as ladino and alsike will decrease or go away with no fertilization and overgrazing although Dutch white clover will leave last. Soil pH and bases such as calcium and magnesium are lower, relative to well-managed pastures (Phase 4.1).

State 5
High-Graded, Grazed Woodland

States that were subjected to repeated, high-grading timber harvests and uncontrolled domestic grazing transitioned to a High-Graded, Grazed Woodland state. This state exhibits an over-abundance of hickory and other less desirable tree species, and weedy understory species such as buckbrush, gooseberry, poison ivy and Virginia creeper. The existing vegetation offers little nutritional value for cattle, and excessive cattle stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Two common transitions from this state are woody clearing and conversion to State 5, grassland or removing livestock, limited harvesting, and allowing long term succession to occur to some other woodland state.

Community 5.1
Black Oak – Chinkapin Oak – Hickory / Serviceberry – Buckbrush / Sedge

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
black oak	QUVE	*Quercus velutina*	Native	–	30–60	–	–
white oak	QUAL	*Quercus alba*	Native	–	30–50	–	–
post oak	QUST	*Quercus stellata*	Native	–	10–30	–	–
chinquapin oak	QUMU	*Quercus muehlenbergii*	Native	–	10–30	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	5–20	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	5–20	–	–
hophornbeam	OSVI	*Ostrya virginiana*	Native	–	0–10	–	–
flowering dogwood	COFL2	*Cornus florida*	Native	–	0–10	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	0–10	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	5–20
slender looseflower sedge	CAGR8	*Carex gracilescens*	Native	–	5–20
oval-leaf sedge	CACE	*Carex cephalophora*	Native	–	5–20
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	5–20
hairy wildrye	ELVI	*Elymus villosus*	Native	–	5–20
slender woodland sedge	CADI5	*Carex digitalis*	Native	–	5–10
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	5–10
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	5–10
Forb/Herb					
wild blue phlox	PHDI5	*Phlox divaricata*	Native	–	5–20
yellow pimpernel	TAIN	*Taenidia integerrima*	Native	–	5–20
Ozark milkvetch	ASDI4	*Astragalus distortus*	Native	–	5–20
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	5–20
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	5–20
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	5–20
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	5–20
Virginia snakeroot	ARSE3	*Aristolochia serpentaria*	Native	–	5–20
Virginia springbeauty	CLVI3	*Claytonia virginica*	Native	–	5–20
harbinger of spring	ERBU	*Erigenia bulbosa*	Native	–	5–20
mayapple	POPE	*Podophyllum peltatum*	Native	–	5–20
tall blazing star	LIAS	*Liatris aspera*	Native	–	5–20
Shrub/Subshrub					
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	5–20
American hazelnut	COAM3	*Corylus americana*	Native	–	5–20
eastern redbud	CECA4	*Cercis canadensis*	Native	–	5–20
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	10–20
summer grape	VIAE	*Vitis aestivalis*	Native	–	10–20

Table 7. Community 2.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
chinquapin oak	QUMU	*Quercus muehlenbergii*	Native	–	–	–	–
eastern redcedar	JUVI	*Juniperus virginiana*	Native	–	–	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	–	–	–

Table 8. Community 2.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Shrub/Subshrub					
Carolina buckthorn	FRCA13	*Frangula caroliniana*	Native	–	–

Animal community

Wildlife (MDC 2006):

Oaks provide hard mast for wildlife; scattered shrubs provide soft mast; frequent bedrock outcrops provide reptile habitat and a patchier ground flora.

Sedges and native grasses provide green browse; native 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.

Bird species associated with Loamy Limestone Woodlands include Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Summer Tanager, Eastern Wood-Pewee, Whip-poor-will, Chuck-will's widow, and Red-eyed Vireo.

Reptiles and amphibians associated with mature Loamy Limestone Woodlands include: ornate box turtle, northern fence lizard, five-lined skink, coal skink, broad-headed skink, six-lined racerunner, western slender glass lizard, prairie ring-necked snake, flat-headed snake, rough earth snake, red milk snake, western pygmy rattlesnake, and timber rattlesnake.

Other information

Forestry
Management: Site index values range from 55 to 60 for oak. Timber management opportunities are fair to good. These groups respond well to management. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. Using prescribed fire as a management tool could have a negative impact on timber quality, may not be fitting, or should be used with caution on a particular site if timber management is the primary objective. Favor white oak, chinkapin oak, northern red oak, and black oak.

Limitations: No major equipment restrictions or limitations exist. 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.

Inventory data references

Plot ELBECA01 – Bucklick soil (reference)
Located in Elam Bend CA, Gentry County, MO
Latitude: 40.078982
Longitude: -94.014327

Plot BAATHS01 – Bucklick soil (reference)
Located in Battle of Athens State Historic Site, Clark County, MO
Latitude: 40.59182
Longitude: -91.709651

Other references

Abney, Mark A. 2002. Soil Survey of Livingston County, Missouri. U.S. Dept. of Agric. Natural Resources

Conservation Service.

Missouri Department of Conservation. 2006. Missouri Forest and Woodland Community Profiles. Missouri Department of Conservation, Jefferson City, Missouri.

NatureServe, 2010. Vegetation Associations of Missouri (revised). NatureServe, St. Paul, Minnesota.

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

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

Contributors

Doug Wallace
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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	
Approved by	
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:**

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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:**
