USDA Natural Resources Conservation Service

Ecological site F116BY006MO
Chert Limestone Upland Woodland

Last updated: 10/06/2020
Accessed: 04/28/2024

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.

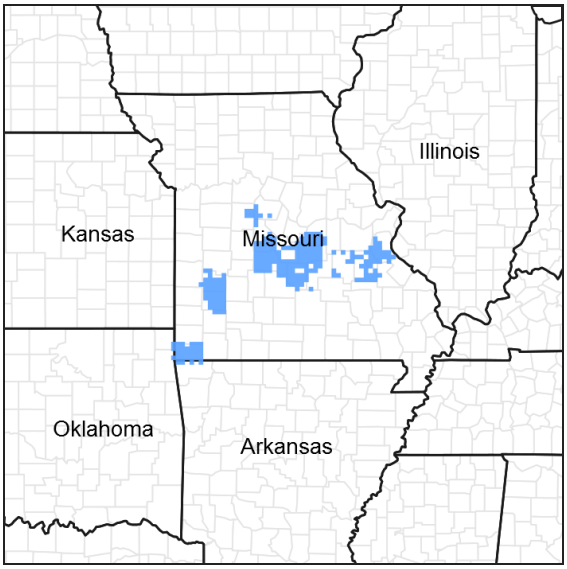


Figure 1. Mapped extent

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 Dry Limestone/Dolomite 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 Limestone/Dolomite Woodland.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Quercus stellata - Quercus marilandica - Quercus

velutina - Carya texana / Schizachyrium scoparium Woodland (CEGL002149).

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
Stockton Prairie/Savanna Dissected Plain

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”.

Chert Limestone Upland Woodlands occur on rolling hillslopes along the Sac River and around Stockton Lake in Dade and Cedar counties in Missouri. Soils are typically moderately deep over limestone bedrock, with gravelly surfaces. The reference plant community is woodland with an overstory dominated by post oak and chinkapin oak and a ground flora of native grasses and forbs.

Associated sites

F116BY003MO	**Chert Upland Woodland** Chert Upland Woodlands are often upslope, where depth to limestone is greater than 40 inches.
F116BY011MO	**Chert Limestone Protected Backslope Forest** Chert Limestone Protected Backslope Forests are often downslope on steep northern and eastern aspects.
F116BY034MO	**Chert Limestone Exposed Backslope Woodland** Chert Limestone Exposed Backslope Woodlands are often downslope on steep southern and western aspects.
R116BY024MO	**Shallow Limestone Upland Glade/Woodland** Shallow Limestone Upland Glade/Woodlands are often adjacent or downslope, where the depth to limestone bedrock is less than 20 inches.

Similar sites

F116BY003MO	**Chert Upland Woodland** Chert Upland Woodlands are on similar slope positions with gravelly surfaces but soil profiles are generally deeper.

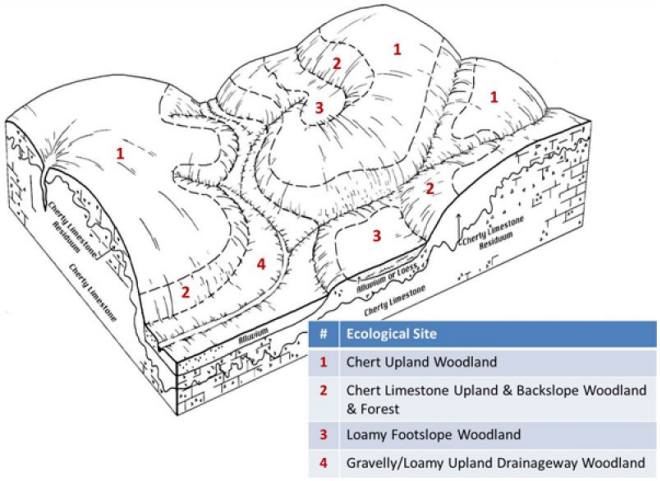
Table 1. Dominant plant species

Tree	(1) *Quercus muehlenbergii* (2) *Quercus stellata*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium*

Physiographic features

This site is on upland summits, shoulders and backslopes with slopes of 3 to 15 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Aldrich, 2003) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. The site is within the area labeled “2”, on upper backslopes. Lower, steeper slopes within the area are in the Chert Limestone Backslope ecological sites. In the figure, the thickness of the residuum increases on the shoulders and crests, resulting in Chert Upland ecological sites, labeled “1”.



#	Ecological Site
1	Chert Upland Woodland
2	Chert Limestone Upland & Backslope Woodland & Forest
3	Loamy Footslope Woodland
4	Gravelly/Loamy Upland Drainageway Woodland

Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Flooding frequency	None
Ponding frequency	None
Slope	3–15%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

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)	164-168 days
Freeze-free period (characteristic range)	192-194 days
Precipitation total (characteristic range)	1,118-1,194 mm
Frost-free period (actual range)	162-170 days
Freeze-free period (actual range)	192-194 days
Precipitation total (actual range)	1,118-1,219 mm
Frost-free period (average)	166 days
Freeze-free period (average)	193 days
Precipitation total (average)	1,168 mm

Climate stations used

- (1) ASH GROVE 4S [USC00230304], Ash Grove, MO
- (2) STOCKTON DAM [USC00238082], Stockton, MO
- (3) LOCKWOOD [USC00235027], Lockwood, MO

Influencing water features

The site generates runoff to adjacent, downslope ecological sites. This site does not flood.
The water features of this upland ecological site include evapotranspiration, surface runoff, and drainage. Each water balance component fluctuates to varying extents from year-to-year. Evapotranspiration remains the most constant. Precipitation and drainage are highly variable between years. Seasonal variability differs for each water component. Precipitation generally occurs as single day events. Evapotranspiration is lowest in the winter and peaks in the summer. Water stored as ice and snow decreases drainage and surface runoff rates throughout the winter and increases these fluxes in the spring. The surface runoff pulse is greatly influenced by extreme events. Conversion to cropland or other high intensities land uses tends to increase runoff, but also decreases evapotranspiration. Depending on the situation, this might increase groundwater discharge, and decrease baseflow in receiving streams.

Soil features

These soils are underlain with limestone bedrock at 20 to 40 inches. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons that are moderately alkaline to neutral. Parent material is slope alluvium over residuum weathered from limestone, overlying limestone bedrock. They have gravelly or cobbly silt loam surface layers, with clayey subsoils that have moderate to high amounts of chert gravel and cobbles and are slightly acid to neutral. These soils are not affected by seasonal wetness. Soil series associated with this site include Sonsac.

Table 4. Representative soil features

Parent material	(1) Residuum–cherty limestone (2) Slope alluvium

Surface texture	(1) Very cobbly silt loam
Family particle size	(1) Clayey
Soil depth	51–102 cm
Surface fragment cover <=3"	10–20%
Surface fragment cover >3"	35–50%
Available water capacity (0-101.6cm)	5.08 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)	5.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	10–15%
Subsurface fragment volume >3" (Depth not specified)	35–45%

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.

Chert Limestone Upland Woodlands are found on ridges, gentle backslope or benches with limestone glades and woodlands below them. Woodlands are distinguished from forest, by their relatively open understory, and the presence of sun-loving ground flora species. 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.

The somewhat shallow, cherty soils of Chert Limestone Upland Woodlands limit the growth of trees and support an abundance of native grasses and forbs in the understory. Fire also played an important role in the maintenance of these systems. It is likely that these sites, along with adjacent glades and woodlands burned at least once every 5 years.

These periodic fires kept woodlands open, 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 red cedar. Fire tolerant post oak and chinkapin oak, dominated an open overstory. During fire free intervals, woody species, such as especially eastern redcedar and black hickory, would have increased and the herbaceous understory diminished. The return of fire would have opened the woodlands up again and stimulated the abundant ground flora.

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

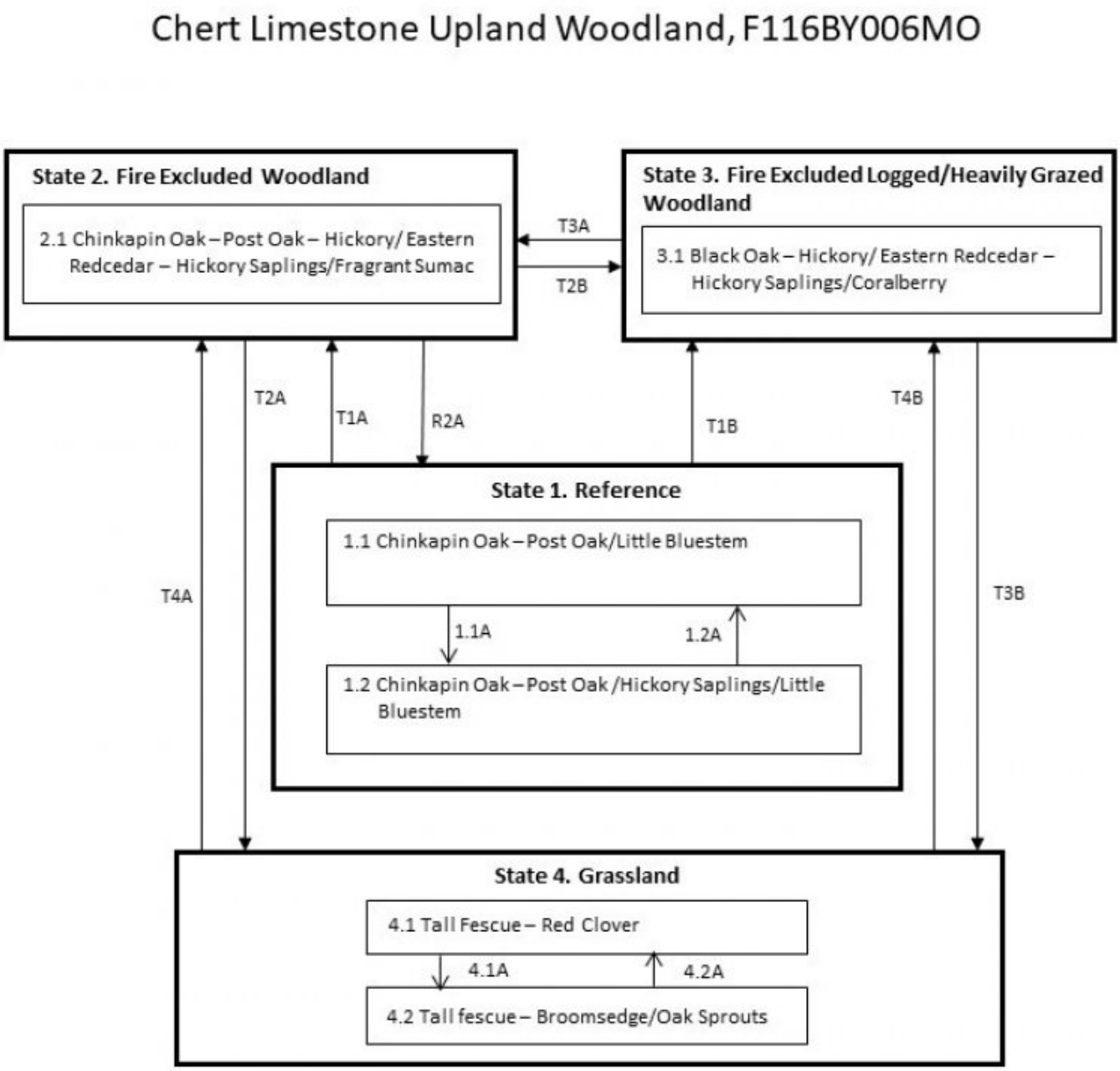
In the long term absence of fire, woody species, especially eastern red cedar, hickory, and black oak. This is especially true after grazing has reduced grass cover and exposed more surface to the dispersal of seeds by birds.

Once established, these woodies can quickly fill the woodland system.

Chert Limestone Upland Woodlands are not productive. Most sites today are dense and shady with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective management tools. Timber harvest is very limited on these sites because of short tree stature and lower tree quality. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration management practices.

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-free interval (20+ years)
T1B	Fire suppression; heavy grazing by livestock; logging
T3A	Livestock removal
T2B	Heavy grazing by livestock; logging
T2A, T3B	Clearing; grassland seeding; grassland management
T4A	Tree planting; long term succession (50+ years); no grazing
T4B	Long term succession (50+ years); light periodic grazing
R2A	Understory removal; prescribed fire
1.1A	Fire-free interval 10-20 years
1.2A	Fire 3-10 year cycle
4.1A	Over grazing; no fertilization
4.2A	Brush management; grassland seeding; grassland management

Figure 9. Ecological site state and transition diagram.

State 1

Reference

The restricted soil depth, droughty conditions, and native grasses made these woodlands susceptible to frequent fires, once every 3 to 5 years. Consequently, fire-tolerant post oak and chinkapin oak dominated the open-canopy overstory, and the understory consisted of a dense cover of native grasses and forbs (community phase 1.1). Tree height was 50 to 60 feet, and canopy closure 40 to 80 percent. During fire-free intervals, eastern red cedar, along with hickories and oak sprouts, increased in abundance and competed with the herbaceous ground flora, creating brushy woodland (community phase 1.2). However, the return of fire would re-open the woodland and promote the ground flora.

Community 1.1
Chinkapin Oak - Post Oak/Little Bluestem

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
Chinkapin Oak – Post Oak /Hickory Saplings/Little Bluestem

Pathway P1.1A
Community 1.1 to 1.2

Fire-free interval 10-20 years

Pathway P1.2A
Community 1.2 to 1.1

Fire 3-10 year cycle

State 2
Fire Excluded Woodland

Fire suppression has allowed these previously open woodlands to become dense with less fire-tolerant trees and saplings such as eastern redcedar, black oak, and hickory. The dense, shaded conditions and lack of fire has caused the ground flora to decrease in cover and diversity. Aromatic sumac often forms a dense shrub understory under these conditions. However, many of the original herbaceous species persist as small plants or in the seed bank. Consequently, thinning of the woody species and the re-introduction of fire has shown these communities to be exceptionally resilient, and a return, after a period of many years, to the reference condition is possible.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

Community 2.1
Chinkapin Oak - Post Oak – Hickory/ Eastern Redcedar - Hickory Saplings/Aromatic Sumac

State 3
Fire Excluded Logged/Heavily Grazed Woodland

In addition to fire exclusion, many of these sites have been subjected to heavy grazing by domestic livestock and periodic logging. Like State 2, these areas are dense and shady with a diminished ground flora. In addition, grazed areas exhibit a lower diversity of native ground flora species and an increased abundance of eastern redcedar and other invasive natives such as coralberry. Like State 2, restoration using thinning and fire is possible, but will take

longer and require more effort. Restricting livestock access and eliminating logging will be necessary for successful restoration.

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates

Community 3.1
Black Oak – Hickory/ Eastern Redcedar –Hickory Saplings/Buckbrush

State 4
Grassland

Conversion of other states to non-native cool season species such as tall fescue, orchard grass, and red clover has been common. Occasionally, these pastures will have scattered oaks. Long term uncontrolled grazing can cause significant soil erosion and compaction. A return to the reference state may be impossible, requiring a very long term series of management options. If oak sprouting is left unchecked and grazing is eliminated or reduced then over time this state will transition to a fire excluded woodland or to a high-graded/grazed woodland.

Community 4.1
Tall Fescue - Red Clover

Dominant resource concerns

- Terrestrial habitat for wildlife and invertebrates

Community 4.2
Tall fescue - Broomsedge/Oak Sprouts

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Nutrients transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

Pathway P4.1A
Community 4.1 to 4.2

Over grazing; no fertilization

Pathway P4.2A
Community 4.2 to 4.1

Brush management; grassland seeding; grassland management

Transition T1A
State 1 to 2

Fire-free interval (20+ years)

Transition T1B
State 1 to 3

Fire suppression; heavy grazing by livestock; logging

Restoration pathway R2A
State 2 to 1

Understory removal; prescribed fire

Transition T2B
State 2 to 3

Heavy grazing by livestock; logging

Transition T2A
State 2 to 4

Clearing; grassland seeding; grassland management

Transition T3A
State 3 to 2

Livestock removal; forest stand improvement

Transition T3B
State 3 to 4

Clearing; grassland seeding; grassland management

Transition T4A
State 4 to 2

Tree planting; long term succession (50+ years); no grazing

Transition T4B
State 4 to 3

Long term succession (50+ years); light periodic grazing

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	–	–	–	–
black oak	QUVE	*Quercus velutina*	Native	–	–	–	–
black hickory	CATE9	*Carya texana*	Native	–	–	–	–
chinquapin oak	QUMU	*Quercus muehlenbergii*	Native	–	–	–	–
white ash	FRAM2	*Fraxinus americana*	Native	–	–	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	–	–	–
blue ash	FRQU	*Fraxinus quadrangulata*	Native	–	–	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	–
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	–
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	–
Bebb's sedge	CABE2	*Carex bebbii*	Native	–	–
sideoats grama	BOCU	*Bouteloua curtipendula*	Native	–	–
whitetinge sedge	CAAL25	*Carex albicans*	Native	–	–
poverty oatgrass	DASP2	*Danthonia spicata*	Native	–	–
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	–
Forb/Herb					
crowpoison	NOBI2	*Nothoscordum bivalve*	Native	–	–
hoary puccoon	LICA12	*Lithospermum canescens*	Native	–	–
groundplum milkvetch	ASCRT	*Astragalus crassicarpus var. trichocalyx*	Native	–	–
Ozark milkvetch	ASDI4	*Astragalus distortus*	Native	–	–
Curtis' star-grass	HYCU5	*Hypoxis curtissii*	Native	–	–
butterfly milkweed	ASTU	*Asclepias tuberosa*	Native	–	–
downy pagoda-plant	BLCI	*Blephilia ciliata*	Native	–	–
tall blazing star	LIAS	*Liatris aspera*	Native	–	–
yellow pimpernel	TAIN	*Taenidia integerrima*	Native	–	–
smooth rockcress	ARLA	*Arabis laevigata*	Native	–	–
Atlantic camas	CASC5	*Camassia scilloides*	Native	–	–
groovestem Indian plantain	ARPL4	*Arnoglossum plantagineum*	Native	–	–
wild quinine	PAAU7	*Parthenium auriculatum*	Native	–	–
widowsfrill	SIST	*Silene stellata*	Native	–	–
purple meadowparsnip	THTR	*Thaspium trifoliatum*	Native	–	–
golden zizia	ZIAU	*Zizia aurea*	Native	–	–
western rough goldenrod	SORA	*Solidago radula*	Native	–	–
Canadian blacksnakeroot	SACAG2	*Sanicula canadensis var. grandis*	Native	–	–
spiked crested coralroot	HESP3	*Hexalectris spicata*	Native	–	–
slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	Native	–	–
Shrub/Subshrub					
dwarf hackberry	CETE	*Celtis tenuifolia*	Native	–	–
Carolina buckthorn	FRCA13	*Frangula caroliniana*	Native	–	–
gum bully	SILAL3	*Sideroxylon lanuginosum ssp. lanuginosum*	Native	–	–
saw greenbrier	SMBO2	*Smilax bona-nox*	Native	–	–
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	–
Vine/Liana					
oldfield milkvine	MADE3	*Matelea decipiens*	Native	–	–

Animal community

Wildlife (MDC 2006):
Wild turkey, white-tailed deer, and eastern gray squirrel depend on hard and soft mast food sources and are typical upland game species of this type.

Oaks provide hard mast; scattered shrubs provide soft mast; frequent bedrock outcrops provide reptile habitat and a more patchy ground flora.

Sedges and native cool-season grasses provide green browse; native warm-season grasses on dry sites provide cover and nesting habitat and forbs provide a diversity and abundance of insects.

Birds associated with Limestone/Dolomite Woodland/Glades are 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 this ecological type 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 (NRCS 2002; 2014):
Management: Estimated site index values range from 50 to 55 for oak. Timber management opportunities are fair. 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 can be an effective management tool for restoration.

Limitations: Large amounts of coarse fragments throughout profile; bedrock may be within 40 inches. Surface stones and rocks are problems for efficient and safe equipment operation and will make equipment use somewhat difficult. Disturbing the surface excessively in harvesting operations and building roads increases soil losses, which leaves a greater amount of coarse fragments on the surface. Hand planting or direct seeding may be necessary. Seedling mortality due to low available water capacity may be high. Mulching or providing shade can improve seedling survival. Mechanical tree planting will be limited. Erosion is a hazard when slopes exceed 15 percent.

Inventory data references

Potential Reference Sites: Low-Base Loamy Upland Woodland

No quality reference sites are known to exist

Other references

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Contributors

Doug Wallace
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Approval

Nels Barrett, 10/06/2020

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	09/14/2020
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:**

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

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

decadence):

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

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

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

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17. **Perennial plant reproductive capability:**
