USDA Natural Resources
Conservation Service

Ecological site F116BY011MO
Chert Limestone Protected Backslope Forest

Last updated: 10/06/2020
Accessed: 05/19/2024

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 Quercus alba - Quercus rubra - Quercus muehlenbergii

/ Cercis canadensis Forest (CEGL002070).

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 Protected Backslope Forests occur on steep backslopes with northern and eastern aspects along the Sac River and around Stockton Lake in Dade Countiy and Cedar County, Missouri. This site is mapped in complex with the Chert Limestone Exposed Backslope Woodland ecological site. Soils are typically moderately deep over limestone bedrock, with gravelly surfaces. The reference plant community is forest dominated by chinkapin oak, with occasional northern red oak and hickory species, with a well-developed understory and a rich herbaceous ground flora.

Associated sites

F116BY017MO	**Gravelly/Loamy Upland Drainageway Woodland** Gravelly/Loamy Upland Drainageway Woodlands are downslope.
F116BY034MO	**Chert Limestone Exposed Backslope Woodland** Chert Limestone Exposed Backslope Woodlands are mapped in complex with this ecological site, 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.
F116BY003MO	**Chert Upland Woodland** Chert Upland Woodlands are often upslope on convex summits and shoulders, where depth to limestone is greater than 40 inches.
F116BY006MO	**Chert Limestone Upland Woodland** Chert Limestone Upland Woodlands are upslope, on shoulders and upper backslopes.
F116BY013MO	**Loamy Footslope Woodland** Loamy Footslope Woodlands are downslope.

Similar sites

F116BY006MO	**Chert Limestone Upland Woodland** Chert Limestone Upland Woodlands are similar in species composition but are upslope, on shoulders and upper backslopes and are generally more productive.

Table 1. Dominant plant species

Tree	(1) *Quercus muehlenbergii* (2) *Carya ovata*
Shrub	(1) *Cercis canadensis*
Herbaceous	(1) *Elymus virginicus*

Physiographic features

This site is on backslopes with slopes of 15 to 35 percent. It is on protected aspects (north, northeast, and east), which receive significantly less solar radiation than the exposed aspects. 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 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 northerly to easterly exposures of lower backslopes. Chert Limestone Exposed Backslope Woodland sites are on the corresponding southerly to westerly exposures. Shoulders and upper slopes within the area are in the Chert Limestone Upland Woodland ecological site. In the figure, the thickness of the residuum increases on the shoulders and crests, resulting in Chert Upland ecological sites, labeled “1”.

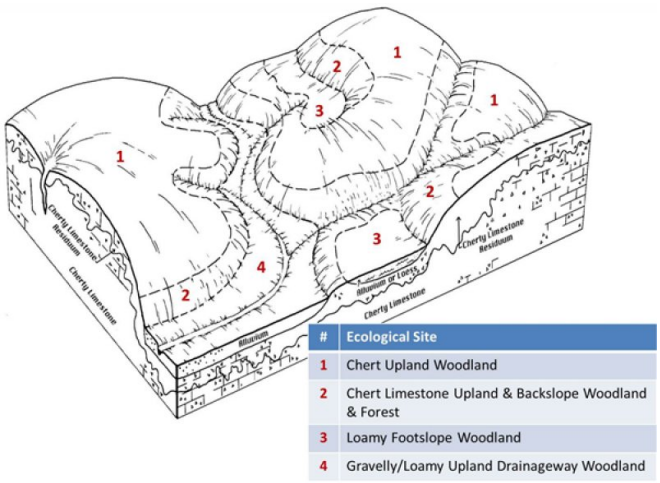


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hillslope
Flooding frequency	None
Ponding frequency	None
Slope	15–35%
Water table depth	152 cm
Aspect	N, NE, E

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

Influencing water features

This ecological site is not influenced by wetland or riparian water features. This site generates runoff to adjacent, downslope ecological sites. 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. 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. 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) Gravelly silt loam (2) Cobbly silt loam
Family particle size	(1) Clayey
Drainage class	Well drained
Soil depth	51–102 cm
Surface fragment cover <=3"	20–30%
Surface fragment cover >3"	5–20%
Available water capacity (0-101.6cm)	5.08–10.16 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)	5.1–6.5
Subsurface fragment volume <=3" (Depth not specified)	30–50%
Subsurface fragment volume >3" (Depth not specified)	20–30%

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 Protected Backslope Forest has a well-developed forest canopy (65 to 80 feet tall and 80 to 100 percent canopy cover) dominated by chinkapin oak with occasional northern red oak and hickory, a structurally diverse understory and an abundant forest ground flora. Variation in soil depths causes variability in the structure, ranging from dense a multi-layered forest to more open woodland.

Chert Limestone Protected Backslope Forest occur in rather protected landscape positions on steep slopes in the deeper valleys furthest from the prairie and savanna uplands. While the upland prairies and savannas had an estimated fire frequency of 1 to 3 years, this ecological site burned less frequently (estimated 10 to 25 years) and with lower intensity. The moderately deep soils and occasional fires make this community transitional between forest and woodland, with more open woodland conditions being created briefly after the periodic fires. Site conditions overall, however, favor shade and moisture loving forest species that quickly redevelop after fire.

These ecological sites would have also been subjected to occasional disturbances from wind and ice, as well as grazing by large native herbivores, such as bison, elk, and white-tailed deer. Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees. Such canopy

disturbances allowed more light to reach the ground and favored reproduction of the dominant oak species. Grazing by native large herbivores would have kept understory conditions more open, also creating conditions more favorable to oak reproduction.

Today, these communities have been cleared and converted to pasture, or have undergone repeated timber harvest and domestic grazing. Most existing occurrences have a younger (50 to 80 years) canopy layer whose composition has been altered by timber harvesting practices. An increase in hickory over historic conditions is common. In addition, in the absence of fire, the canopy, sub-canopy and woody understory layers are better developed. The absence of periodic fire has allowed more shade-tolerant tree species, such as sugar maple, white ash, or hickories to increase in abundance.

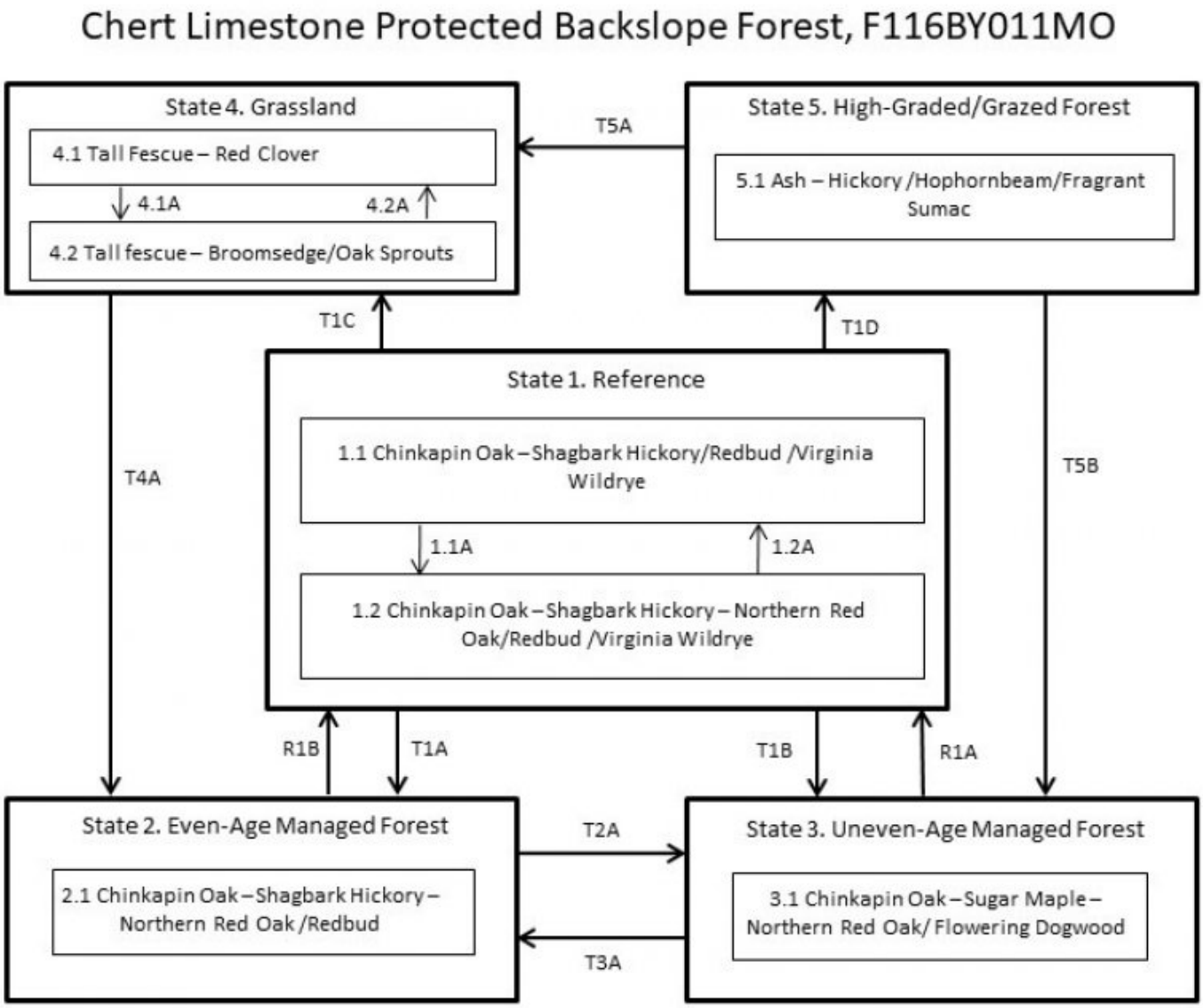
Uncontrolled domestic grazing has diminished the diversity and cover of woodland ground flora species, and has introduced weedy species such as gooseberry, coralberry, poison ivy and Virginia creeper created a more open understory and increased soil compaction.
Chert Limestone Protected Backslope Forests are moderately productive timber sites.

Carefully planned single tree selection or the creation of small group openings can help regenerate more desirable oak species and increase vigor on the residual trees. Clear-cutting does occur and results in dense, even-aged stands of primarily oak. This may be most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands, the ground flora diversity can be shaded out and productivity of the stand may suffer.

Prescribed fire can play a beneficial but limited role in the management of this ecological site. The higher productivity of these sites makes it more challenging than on other woodland sites in the region. Control of woody species will be more difficult. Protected aspect woodlands did evolve with some fire, and their composition and structure often reflects more open, woodland conditions than adjacent forest sites, with more woodland ground flora species that can respond to fire.

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	Harvesting; even-aged management; fire suppression
T1B	Harvesting; uneven-age management; fire suppression
T1C, T5A	Clearing; grassland planting; grassland management
T1D	High-grade harvesting; uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T4A	Tree planting; long-term succession; no grazing
T5B	Uneven-age management; tree planting; no grazing

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, R1B	Forest management; extended rotations; prescribed fire

Figure 9. State and transition diagram for this ecological site

State 1

Reference

The Reference State was dominated by shagbark hickory and chinkapin oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the dominance of oaks by opening up the canopy and allowing more light for oak reproduction. Long disturbance-free periods allowed an increase in more shade tolerant species such as hickory, white ash, northern red oak and sugar maple. Two community phases are recognized in this state, with shifts between phases based on disturbance frequency.

Community 1.1
Chinkapin Oak – Shagbark Hickory/Eastern Redbud /Virginia Wildrye

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

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

Community 1.2
Chinkapin Oak – Shagbark Hickory – Northern Red Oak/Eastern Redbud /Virginia Wildrye

Pathway P1.1A
Community 1.1 to 1.2

No disturbance (10+ years)

Pathway P1.2A
Community 1.2 to 1.1

Disturbance (fire, wind, ice) < 10 years

State 2
Even-Age Managed Forest

These forests tend to be rather dense, with an under developed understory and ground flora. Continual timber management along with fire suppression, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) forests.

Dominant resource concerns

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

Community 2.1
Chinkapin Oak – Shagbark Hickory – Northern Red Oak /Redbud

State 3
Uneven-Age Managed Forest

Uneven-Age Managed forests can resemble the reference state. The biggest difference is tree age, most being only 50 to 90 years old. Composition is also likely altered from the reference state depending on tree selection during harvest. In addition, without a regular 15 to 20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species such as sugar maple and northern red oak while white oak will become less dominant.

Community 3.1
Chinkapin Oak – Sugar Maple –Northern Red Oak/ Flowering Dogwood

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

- Plant structure and composition
- 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

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

State 5
High-Graded/Grazed Forest

Forested sites subjected to repeated, high-graded timber harvests and uncontrolled domestic grazing transition to this state. This state exhibits an over-abundance of hickory and other less desirable tree species, and weedy understory species such as fragrant sumac, gooseberry, poison ivy and Virginia creeper. The vegetation offers little nutritional value for cattle, and excessive stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Exclusion of livestock from sites in this state coupled with uneven-age management techniques will cause a transition to State 3 (Uneven-Age).

Dominant resource concerns

- 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

Transition T1A
State 1 to 2

Harvesting; even-aged management; fire suppression

Transition T1B
State 1 to 3

Harvesting; uneven-age management; fire suppression

Transition T1C
State 1 to 4

Clearing; grassland planting; grassland management

Transition T1D
State 1 to 5

High-grade harvesting; uncontrolled grazing

Restoration pathway R1B
State 2 to 1

Forest management; extended rotations; prescribed fire

Transition T2A
State 2 to 3

Uneven-age management

Restoration pathway R1A
State 3 to 1

Forest management; extended rotations; prescribed fire

Transition T3A
State 3 to 2

Even-age management

Restoration pathway T4A
State 4 to 2

Tree planting; long-term succession; no grazing

Transition T5B
State 5 to 3

Uneven-age management; tree planting; no grazing

Transition T5B
State 5 to 4

Clearing; grassland planting; grassland management

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							
shagbark hickory	CAOV2	*Carya ovata*	Native	–	5–20	–	–
white oak	QUAL	*Quercus alba*	Native	–	5–20	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	5–20	–	–
black oak	QUVE	*Quercus velutina*	Native	–	5–20	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	5–20	–	–
chinquapin oak	QUMU	*Quercus muehlenbergii*	Native	–	5–20	–	–
white ash	FRAM2	*Fraxinus americana*	Native	–	5–20	–	–
blue ash	FRQU	*Fraxinus quadrangulata*	Native	–	5–20	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
hairy wildrye	ELVI	*Elymus villosus*	Native	–	5–20
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	5–20
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	5–20
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	5–20
oval-leaf sedge	CACE	*Carex cephalophora*	Native	–	5–20
eastern star sedge	CARA8	*Carex radiata*	Native	–	5–20
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	5–20
whitegrass	LEVI2	*Leersia virginica*	Native	–	5–20
deertongue	DICL	*Dichanthelium clandestinum*	Native	–	5–20
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	5–20
Forb/Herb					
Carolina elephantsfoot	ELCA3	*Elephantopus carolinianus*	Native	–	5–20
white snakeroot	AGAL5	*Ageratina altissima*	Native	–	5–20
Canadian honewort	CRCA9	*Cryptotaenia canadensis*	Native	–	5–20
panicledleaf ticktrefoil	DEPA6	*Desmodium paniculatum*	Native	–	5–20
fragrant bedstraw	GATR3	*Galium triflorum*	Native	–	5–20
downy yellow violet	VIPU3	*Viola pubescens*	Native	–	5–20
white arrowleaf aster	SYUR	*Symphyotrichum urophyllum*	Native	–	5–20
threeflower melicgrass	MENI	*Melica nitens*	Native	–	5–20
heartleaf bittercress	CACO6	*Cardamine cordifolia*	Native	–	5–20
purple meadowparsnip	THTR	*Thaspium trifoliatum*	Native	–	5–20
meadow zizia	ZIAP	*Zizia aptera*	Native	–	5–20
Wood's bunchflower	VEWO3	*Veratrum woodii*	Native	–	5–20
downy pagoda-plant	BLCI	*Blephilia ciliata*	Native	–	5–20
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	5–20
eastern greenviolet	HYCO6	*Hybanthus concolor*	Native	–	5–20
wild comfrey	CYVI	*Cynoglossum virginianum*	Native	–	5–20

clustered blacksnakeroot	SAOD	*Sanicula odorata*	Native	–	5–20
Fern/fern ally					
ebony spleenwort	ASPL	*Asplenium platyneuron*	Native	–	5–20
rattlesnake fern	BOVI	*Botrychium virginianum*	Native	–	5–20
Shrub/Subshrub					
lanceleaf buckthorn	RHLA	*Rhamnus lanceolata*	Native	–	5–20
eastern redbud	CECA4	*Cercis canadensis*	Native	–	5–20
Tree					
slippery elm	ULRU	*Ulmus rubra*	Native	–	5–20
hophornbeam	OSVI	*Ostrya virginiana*	Native	–	5–20
Carolina buckthorn	FRCA13	*Frangula caroliniana*	Native	–	5–20
American bladdernut	STTR	*Staphylea trifolia*	Native	–	5–20
rusty blackhaw	VIRU	*Viburnum rufidulum*	Native	–	5–20
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	5–20

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.

Bird species associated with early-successional Forests are Prairie Warbler, Field Sparrow, Brown Thrasher, Blue-winged Warbler, White-eyed Vireo, Blue-gray Gnatcatcher, Yellow-breasted Chat, Indigo Bunting, and Eastern Towhee.

Birds associated with late-successional Forests include Worm-eating warbler, Whip-poor-will, Great Crested Flycatcher, Ovenbird, Pileated Woodpecker, Wood Thrush, Red-eyed Vireo, Northern Parula, and Broad-winged Hawk.

Reptile and amphibian species associated with mature White Oak Forests include: ringed salamander, spotted salamander, marbled salamander, central newt, long-tailed salamander, dark-sided salamander, southern red-backed salamander, three-toed box turtle, western worm snake, western earth snake, and American toad.

Other information

Forestry (NRCS 2002; 2014)
Management: Estimated site index values range from 50 to 65 for oak. Timber management opportunities are generally good. 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.

Limitations: Large amounts of coarse fragments throughout profile; bedrock may be within 60 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. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

Inventory data references

Potential Reference Sites: Chert Limestone Protected Backslope Forest

Plot STLACE08 – Sonsac soil
Located in Stockton Lake COE/CA, Cedar County, MO
Latitude: 37.574468
Longitude: -93.671235

Plot AVCRPV02 – Sonsac soil
Located in Aves Creek Glade PV, Cedar County, MO
Latitude: 37.843595
Longitude: -93.912935

Other references

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Contributors

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Approval

Nels Barrett, 10/06/2020

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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	09/21/2020
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):**

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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:**