Ecological site F116AY062MO
Chert Exposed Backslope Woodland

Last updated: 9/24/2020
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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): 116A–Ozark Highland

The Ozark Highland constitutes the Salem Plateau of the Ozark Uplift. Elevation ranges from about 300 feet on the southeast edge of the Ozark escarpment, to about 1,600 feet in the west, adjacent to the Burlington Escarpment of the Springfield Plateau. The underlying bedrock is mainly horizontally bedded Ordovician-aged dolomites and sandstones that dip gently away from the uplift apex in southeast Missouri. Cambrian dolomites are exposed on deeply dissected hillslopes. In some places, Pennsylvanian and Mississippian sediments overlie the plateau. Relief varies, from the gently rolling central plateau areas to deeply dissected hillslopes associated with drainageways such as the Buffalo, Current, Eleven Point and White Rivers.

Classification relationships

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

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

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

The reference state for this ecological site is most similar to a Quercus alba - Quercus stellata - Quercus velutina / Schizachyrium scoparium Woodland (CEGL002150).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site is widespread across the Ozark Highlands Section.

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”.

The Chert Exposed Backslope Woodlands occupy the southerly and westerly aspects of steep, dissected slopes, and are mapped in complex with the Chert Protected Backslope Forest ecological site. Chert Backslope ecological sites are common throughout the Ozark Highland where major streams have dissected deeply into the Salem Plateau. Soils are typically very deep, with an abundance of chert fragments. The reference plant community is a woodland with an overstory dominated by black oak and white oak and a ground flora of native grasses and forbs.

Associated sites

F116AY002MO	**Chert Protected Backslope Forest** Chert Protected Backslope Forests are mapped in complex with this ecological site, on steep backslopes with northern to eastern aspects.
F116AY004MO	**Fragipan Upland Woodland** Fragipan Upland Woodlands are upslope, on summit crests that have a fragipan in the subsoil.
F116AY008MO	**Loamy Upland Woodland** Loamy Upland Woodlands are upslope, on summits and shoulders.
F116AY011MO	**Chert Upland Woodland** Chert Upland Woodlands are upslope, on gently sloping shoulders and upper backslopes.
F116AY037MO	**Gravelly/Loamy Upland Drainageway Forest** Gravelly/Loamy Upland Drainageway Forests are downslope.
F116AY048MO	**Chert Dolomite Exposed Backslope Woodland** Chert Dolomite Exposed Backslope Woodlands are downslope in places, on steep lower backslopes.

Similar sites

F116AY002MO	**Chert Protected Backslope Forest** Chert Protected Backslope Forests are mapped in complex with this ecological site, on steep backslopes with northern to eastern aspects.

Table 1. Dominant plant species

Tree	(1) *Quercus velutina* (2) *Quercus alba*
Shrub	(1) *Rhus aromatica*
Herbaceous	(1) *Carex* (2) *Schizachyrium scoparium*

Physiographic features

This site is on upland backslopes with slopes of 15 to 70 percent. It is on exposed aspects (south, southwest, and west), which receive significantly more solar radiation than the protected 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 Larsen and Cook, 2002) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “2” on the figure, on lower backslopes with southerly to westerly exposures. Chert Protected Backslope Forest sites are on the corresponding northerly to easterly exposures. Upper slopes and shoulders within the area are in the Chert Upland Woodland ecological site. In one area of the figure, the thickness of the residuum decreases downslope, resulting in Chert Dolomite Backslope ecological sites, labeled “3”. Upslope crests that have a layer of loess may be Loamy Upland Woodland sites, labeled “1”, or Fragipan Upland Woodland sites.

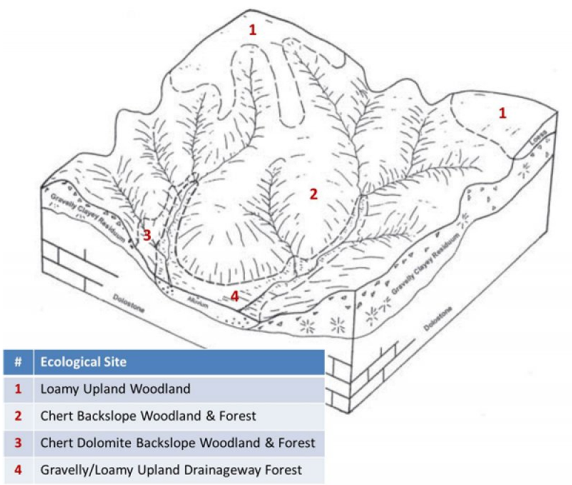


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Slope	15–70%
Water table depth	27–60 in
Aspect	W, SE, S, SW

Climatic features

The Ozark Highland 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 Ozark Highland experiences regional differences in climates, but these differences do not have obvious geographic boundaries. Regional climates grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line crossing the MLRA from northwest to southeast.
The average annual precipitation in almost all of this area is 38 to 45 inches. Snow falls nearly every winter, but the snow cover lasts for only a few days. The average annual temperature is about 53 to 60 degrees F. The lower temperatures occur at the higher elevations in the western part of the MLRA. Mean January minimum temperature follows a stronger north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the MLRA. Mean July maximum temperatures have a range of only two or three degrees across the area.

Mean annual precipitation varies along a northwest to southeast 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)	143-155 days
Freeze-free period (characteristic range)	181-195 days
Precipitation total (characteristic range)	44-50 in
Frost-free period (actual range)	142-180 days
Freeze-free period (actual range)	177-214 days
Precipitation total (actual range)	44-50 in
Frost-free period (average)	153 days
Freeze-free period (average)	190 days
Precipitation total (average)	47 in

Climate stations used

- (1) HARDY [USC00033132], Hardy, AR
- (2) SEDALIA WTP [USC00237632], Sedalia, MO
- (3) EVENING SHADE 1 NNE [USC00032366], Evening Shade, AR
- (4) POTOSI 4 SW [USC00236826], Potosi, MO
- (5) GRAVETTE [USC00032930], Gravette, AR

Influencing water features

Water features associated with this upland ecological site are influenced by karst landscapes throughout the area (see diagram). Rainfall enters the groundwater system through the soil or by flowing into sinkholes and streams. Springs form where land drops low enough to meet underground water tables. Dissolution of carbonate rocks along fractures and faults has produced cave systems, sinkholes (closed and open), springs, and natural tunnels in the region. These sinkholes and losing streams can rapidly transfer water from upland recharge areas to spring outlets. The most common mechanism for groundwater recharge occurs by the relatively slow downward movement of water through soil and carbonate bedrock over a large area known as diffuse recharge, which maintains a high storage volume providing a consistent supply of water to springs. In addition to diffuse recharge, aquifers in karst terrain receive the relatively rapid transfer of water through sinkholes or losing streams connected by subsurface conduits. Surface water entering the aquifer in this fashion has very little contact with soil or rock and consequently the chemical nature of the water changes little in route. Discharge variability does not seem to be controlled by drainage area, but rather the conduit capacity of losing stream sections that can transport the entire volume of base-flow during dry periods in the year. High variability in base ?ow shows the impact of karst in the form of losing and gaining stream sections (Owen and Pavlowsky 2010).

The accompanying map depicts the distribution of these karst-related features in the state of Missouri. Relative cave density per USGS 7.5" quadrangle is depicted by shades of red, deeper red signifying a larger number of caves in the quadrangle. Stretches of losing streams are shown in yellow. Known springs are shown as blue dots. Image from Wikimedia Commons developed from the Missouri Department of Natural Resources, Division of Geology and Land Survey.

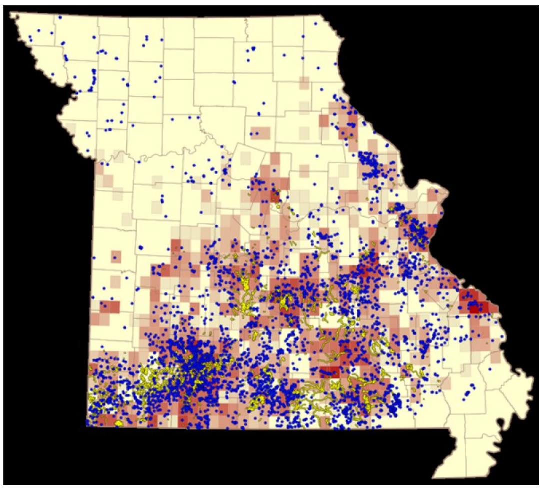


Figure 9. Distribution of karst-related features in Missouri. Image from Wikimedia Commons developed from the Missouri Department of Natural Resources, Division of Geology and Land Survey.

Soil features

These soils have no rooting restriction and the subsoils are not low in bases. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is slope alluvium over residuum weathered from limestone and dolomite. They have gravelly or very gravelly silt loam surface horizons, and skeletal subsoils with high amounts of chert gravel and cobbles. They are not affected by seasonal wetness. Some soils have bedrock between 40 and 60 inches, but this does not significantly affect native vegetation or production. Soil series associated with this site include Alred, Beemont, Gepp, Gobbler, Goss, Hailey, Mano, Niangua, Ocie, Rueter, and Swiss.

The accompanying picture of the Goss series shows a thin, light-colored surface horizon underlain by very cobbly reddish clay. Scale is in inches. Picture from Henderson (2004).

Figure 10. Goss series

Table 4. Representative soil features

Parent material	(1) Slope alluvium–limestone and dolomite (2) Residuum–limestone and dolomite
Surface texture	(1) Gravelly silt loam (2) Very gravelly loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to somewhat excessively drained
Permeability class	Very slow to moderately slow
Soil depth	40–72 in
Surface fragment cover <=3"	15–50%
Surface fragment cover >3"	0–39%
Available water capacity (0-40in)	2–6 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)	35–60%
Subsurface fragment volume >3" (Depth not specified)	2–30%

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.

The reference plant community is well developed woodland dominated by an overstory of black oak and white oak. It is very similar to Chert Upland Woodlands, except that this ecological site may be slightly less dense allowing more afternoon sunlight getting to the woodland floor. The canopy is moderate in height (60 to 75 feet) and less dense (65 to 85 percent cover) than protected slopes. The understory is fairly open with less structural diversity. Increased light from the open canopy causes a diversity of ground flora species to flourish. In addition, proximity to shallow soil glades and open woodlands provides additional opportunity for increased species diversity. 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.

Fire played an important role in the maintenance of these systems. It is likely that these ecological sites burned at least once every 5 to 10 years. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. During fire free intervals, woody understory species increased and the herbaceous understory diminished. The return of fire would open the woodlands up again and stimulate the abundant ground flora.

Chert Exposed 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 white-tailed 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.

Today, these ecological sites have been cleared and converted to pasture or have undergone repeated timber harvest and domestic grazing. Most existing forested ecological sites have a younger (50 to 80 years) canopy layer whose species composition and quality has been altered by timber harvesting practices. In the long term absence of fire, woody species, especially hickory, encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration means.

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 coralberry, gooseberry, and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and soil erosion can be a problem and lower productivity.

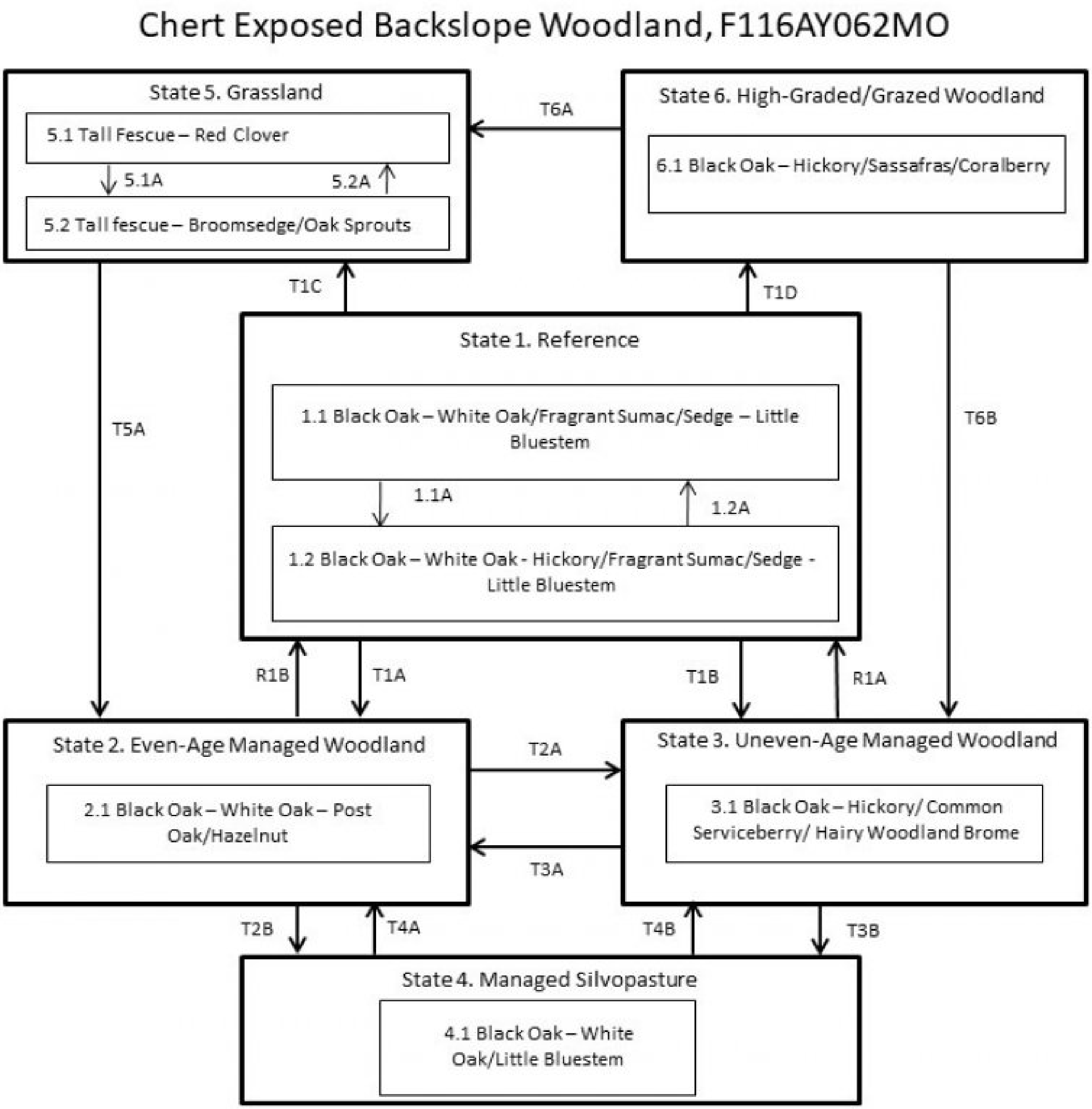
These ecological sites are only moderately productive, especially when compared to adjacent protected slopes and deeper loess covered units. Oak regeneration is typically problematic. Sugar maple, red elm, and hickories are often dominant competitors in the understory. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects.

Single tree selection timber harvests are common in this region 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 most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands, and periodic fires, the ground flora diversity can be shaded out and diversity of the stand may suffer.

A state-and-transition model 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/Process
T1A	Fire suppression; even-aged management
T1B	Fire suppression; uneven-age management
T2B; T3B	Prescribed fire; thinning; grazing management
T1C, T6A	Clearing; pasture planting; grassland management
T1D	Poorly planned harvest & uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T5A	Tree planting; long-term succession; no grazing
T6B	Uneven-age management; no grazing; access control
T4A	Uneven-age management; no grazing; access control
T4B	Even-age management; no grazing

Code	Event/Process
1.1A	No disturbance (10+ yrs)
1.2A	Disturbance (fire, wind, ice) < 10 yrs
5.1A	Over grazing; no fertilization
5.2A	Brush management; grassland seeding; grassland management

Code	Event/Process
R1A; R1B	Prescribed fire; extended rotations

Figure 11. State and Transition Model for this ecological site.

State 1

Reference

The historical reference state for this ecological site was dominated by black oak, post oak and white oak. 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 uncommon today. Many sites have been converted to grassland (State 5). Others have been subject to repeated, high-graded timber harvest coupled with domestic livestock grazing (State 6). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Many sites have been managed effectively for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) woodlands.

Community 1.1
Black Oak – White Oak/Fragrant sumac/Sedge – Little Bluestem

Figure 12. Chert Exposed Backslope Woodland at HaHa Tonka State Park, Camden County, Missouri; photo credit MDC.

The southern and western exposure limits tree density and provides enough light for woodland ground flora species to persist. The tree canopy is dominated by a mix of black oak, post oak and white oak, and the understory is relatively open with scattered oak and sassafras saplings. This woodland community has a two-tiered structure. Historically, these exposed slopes likely burned every 5 to 10 years, so ground flora cover was greater than 75 percent. During long, fire-free intervals the density of trees and saplings increased, as did fire-intolerant tree species such as hickory.

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
Black Oak – White Oak - Hickory/Fragrant Sumac/Sedge - Little Bluestem

The tree canopy is dominated by a denser mix of black oak, post oak, white oak, and hickory species. The understory is also denser, with scattered hickory, oak and sassafras saplings. This woodland community has a multi-tiered structure, and a more closed canopy.

Pathway 1.1A
Community 1.1 to 1.2

This pathway is a gradual transition that results from extended, disturbance-free periods of roughly 10 years or longer.

Pathway 1.2A
Community 1.2 to 1.1

This pathway results from ecological disturbances returning such as fire, ice storms, or wind storms. Historically, native grazers such as bison provided disturbance events as well.

State 2
Even-Aged Managed Woodland

Even-Age Managed Woodlands 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 and white oak will become less dominant. Even-Age Managed Woodland is also denser because of fire suppression, but less so than the Uneven-Age Managed Woodland State. Consequently, the woodland ground flora is less suppressed and structural diversity is better maintained. Without periodic disturbance, stem density and fire intolerant species, like hickory, increase in abundance.

Community 2.1
Black Oak – White Oak – Post Oak/Hazelnut

State 3
Uneven-Age Managed Woodland

These woodlands tend to be rather dense, with a depauperate 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. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) woodlands. Prescribed fire along with a more open canopy and prescribed grazing can transition this state to a Managed Silvopasture state (State 4).

Community 3.1
Black Oak – Hickory/ Common Serviceberry/ Hairy Woodland Brome

State 4
Managed Silvopasture

The Managed Silvopasture state results from managing woodland communities (States 2 or 3) with prescribed fire, canopy thinning, and controlled grazing. This state can resemble the reference state, but with younger maximum tree ages, more open canopies, and lower ground flora diversity. Sensation of grazing and controlled harvesting will allow transition to various managed woodland states.

Community 4.1
Black Oak-White Oak/Little Bluestem

State 5
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, and low organic matter contents 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 5.2 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 5.1
Tall Fescue - Red Clover

Community 5.2
Tall Fescue - Broomsedge/Oak Sprouts

Pathway P5.1A
Community 5.1 to 5.2

Poor management will result in a shift to Community 5.2 that shows an increase in oak sprouting and increases in broomsedge densities. Over grazing; no fertilization; site degradation

Pathway P5.2A
Community 5.2 to 5.1

Brush management; grassland seeding; grassland management

State 6
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 6.1
Black Oak-Hickory/Sassafras/Buckbrush

Transition T1A
State 1 to 2

This transition typically results from fire suppression and even-aged management.

Transition T1B
State 1 to 3

Transition activities include fire suppression; uneven-age management; forest stand improvement

Transition T1C
State 1 to 5

This transition is the result of clearing; pasture planting; grassland management

Transition T1D
State 1 to 6

This transition is the result of poorly planned timber harvest techniques such as high-grading, accompanied by unmanaged livestock grazing. Soil erosion and compaction often result from livestock grazing after the understory has been damaged.

Restoration pathway R1B
State 2 to 1

Prescribed fire; extended rotations; forest stand improvement

Transition T2A

State 2 to 3

This transition typically results from uneven-age timber management practices, such as single tree or group selection harvest.

Transition T2B
State 2 to 4

This transition is the result of the systematic application of prescribed fire; thinning; grazing management

Restoration pathway R1A
State 3 to 1

Restoration activities include prescribed fire; extended rotations; forest stand improvement

Transition T3A
State 3 to 2

This transition typically results from even-age timber management practices, such as clear-cut, seed tree or shelterwood harvest.

Transition T3B
State 3 to 4

This transition is the result of the systematic application of prescribed fire; thinning; grazing management

Transition T4A
State 4 to 2

This transition typically results from even-age timber management practices, such as clear-cut, seed tree or shelterwood harvest.

Transition T4B
State 4 to 3

This transition typically results from uneven-age timber management practices, such as single tree or group selection harvest.

Transition T5A
State 5 to 2

This transition results from the cessation of cattle grazing and associated pasture management such as mowing and brush-hogging. Herbicide application, tree planting and timber stand improvement techniques can speed up this otherwise very lengthy transition.

Transition T6B
State 6 to 3

This transition is the result of uneven-age management; no grazing; access control

Transition T6A
State 6 to 5

This transition is the result of clearing; pasture planting; grassland management

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							
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	–	–	–
black oak	QUVE	*Quercus velutina*	Native	–	–	–	–
black hickory	CATE9	*Carya texana*	Native	–	–	–	–
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	–	–	–
sassafras	SAAL5	*Sassafras albidum*	Native	–	–	–	–
post oak	QUST	*Quercus stellata*	Native	–	–	–	–
white oak	QUAL	*Quercus alba*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Muhlenberg's sedge	CAMU4	*Carex muehlenbergii*	Native	–	–
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	–
whitetinge sedge	CAAL25	*Carex albicans*	Native	–	–
oval-leaf sedge	CACE	*Carex cephalophora*	Native	–	–
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	–
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	–
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	–
Forb/Herb					
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	–
smooth small-leaf ticktrefoil	DEMA2	*Desmodium marilandicum*	Native	–	–
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	–
nakedflower ticktrefoil	DENU4	*Desmodium nudiflorum*	Native	–	–
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	–
Virginia spiderwort	TRVI	*Tradescantia virginiana*	Native	–	–
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	Native	–	–
bristly buttercup	RAHI	*Ranunculus hispidus*	Native	–	–
fire pink	SIVI4	*Silene virginica*	Native	–	–
Arkansas bedstraw	GAAR4	*Galium arkansanum*	Native	–	–
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	–
manyray aster	SYAN2	*Symphyotrichum anomalum*	Native	–	–
spotted geranium	GEMA	*Geranium maculatum*	Native	–	–
gray goldenrod	SONE	*Solidago nemoralis*	Native	–	–
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	–
Virginia snakeroot	ARSE3	*Aristolochia serpentaria*	Native	–	–
cutleaf toothwort	CACO26	*Cardamine concatenata*	Native	–	–
wild quinine	PAIN3	*Parthenium integrifolium*	Native	–	–
longleaf summer bluet	HOLO	*Houstonia longifolia*	Native	–	–
Virginia tephrosia	TEVI	*Tephrosia virginiana*	Native	–	–
terrestrial water-starwort	CATE19	*Callitriche terrestris*	Native	–	–

terrestrial water-starwort	CATE10	*Callitriche terrestris*	Native		
scaly blazing star	LISQ	*Liatris squarrosa*	Native	–	–
Ontario blazing star	LICY	*Liatris cylindracea*	Native	–	–
hairy lespedeza	LEHI2	*Lespedeza hirta*	Native	–	–
flaxleaf whitetop aster	IOLI2	*Ionactis linariifolius*	Native	–	–
American alumroot	HEAM6	*Heuchera americana*	Native	–	–
stiff ticktrefoil	DEOB5	*Desmodium obtusum*	Native	–	–
Dillenius' ticktrefoil	DEGL4	*Desmodium glabellum*	Native	–	–
hairy small-leaf ticktrefoil	DECI	*Desmodium ciliare*	Native	–	–
stiff tickseed	COPA10	*Coreopsis palmata*	Native	–	–
longbract wild indigo	BABR2	*Baptisia bracteata*	Native	–	–
Shrub/Subshrub					
Carolina rose	ROCA4	*Rosa carolina*	Native	–	–
Blue Ridge blueberry	VAPA4	*Vaccinium pallidum*	Native	–	–
American hazelnut	COAM3	*Corylus americana*	Native	–	–
leadplant	AMCA6	*Amorpha canescens*	Native	–	–
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	–
Tree					
eastern redbud	CECA4	*Cercis canadensis*	Native	–	–
rusty blackhaw	VIRU	*Viburnum rufidulum*	Native	–	–

Animal community

Wildlife (MDC 2006):

Oaks provide hard mast for wildlife; scattered shrubs provide soft mast; occasional 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 Chert 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 Chert 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 (NRCS 2002, 2014):

Management: Field measured site index average values are 54 for white oak and black oak. Timber management opportunities are generally moderate. 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 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 and should be used with caution on a particular site if timber production 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 Exposed Backslope Woodland

Plot HATOSP07 - Alred soil
Located in HaHa Tonka State Park, Camden County, MO
Latitude: 37.972735
Longitude: -92.756362

Plot CAMOCA08 - Mano soil
Located Caney Mountain CA, Ozark County, MO
Latitude: 36.698989
Longitude: -92.452217

Plot HUZZCA01 - Goss soil
Located Huzzah CA, Crawford County, MO
Latitude: 38.034706
Longitude: -91.219147

Other references

Anderson, R.C. 1990. The historic role of fire in North American grasslands. Pp. 8-18 in S.L. Collins and L.L. Wallace (eds.). Fire in North American tallgrass prairies. University of Oklahoma Press, Norman.

Batek, M.J., A.J. Rebertus, W.A. Schroeder, T.L. Haithcoat, E. Compas, and R.P. Guyette. 1999. Reconstruction of early nineteenth-century vegetation and fire regimes in the Missouri Ozarks. Journal of Biogeography 26:397-412.

Harlan, J.D., T.A. Nigh and W.A. Schroeder. 2001. The Missouri original General Land Office survey notes project. University of Missouri, Columbia.

Henderson, Richard L. 2004. Soil Survey of Cedar County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

Ladd, D. 1991. Reexamination of the role of fire in Missouri oak woodlands. Pp. 67-80 in G.V. Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Larsen, Scott E., and Michael A. Cook. 2002. Soil Survey of Crawford County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

Missouri Department of Conservation. 2010. Missouri Forest and Woodland Community Profiles. Missouri Department of Conservation, Jefferson City, Missouri.

Natural Resources Conservation Service. 2002. Woodland Suitability Groups. Missouri FOTG, Section II, Soil Interpretations and Reports. 30 pgs.

Natural Resources Conservation Service. Site Index Reports. Accessed May 2014. https://esi.sc.egov.usda.gov/ESI_Forestland/pgFSWelcome.aspx

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. 550p.

Nigh, Timothy A., and Walter A. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri. 212p.

Owen, Marc R. and Robert T. Pavlowsky. 2010. Baseflow hydrology and water quality of an Ozarks spring and associated recharge area, southern Missouri, USA. Environ Earth Sci (2011) 64:169–183.

Schoolcraft, H.R. 1821. Journal of a tour into the interior of Missouri and Arkansas from Potosi, or Mine a Burton, in Missouri territory, in a southwest direction, toward the Rocky Mountains: performed in the years 1818 and 1819. Richard Phillips and Company, London.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. 682 pgs.

Contributors

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Approval

Nels Barrett, 9/24/2020

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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	04/27/2024
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):**

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

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

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:**

17. **Perennial plant reproductive capability:**