USDA Natural Resources
Conservation Service

Ecological site F115XB048MO
Chert Exposed Backslope Woodland

Accessed: 05/08/2024

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): 115X–Central Mississippi Valley Wooded Slopes

The Central Mississippi Valley Wooded Slopes, Western Part (area outlined in red on the map) consists mainly of the deeply dissected, loess-covered hills bordering the Missouri and Mississippi Rivers as well as the floodplains and terraces of these rivers. It wraps around the northeast corner of the Ozark Uplift, and constitutes the southern border of the Pre-Illinoisan-aged till plain. Elevation ranges from about 320 feet along the Mississippi River near Cape Girardeau in the south to about 1,020 feet on the highest ridges near Hillsboro, MO in the east. Local relief varies from 10 to 20 feet in the major river floodplains, to 50 to 100 feet in the dissected uplands, with bluffs of 200 to 350 feet along the Mississippi and Missouri Rivers. Underlying bedrock is mainly Ordovician-aged dolomite and sandstone, with Mississippian-aged limestone north of the Missouri River.

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 occurs primarily in Land Type Associations of the following Subsections:
Outer Ozark Border
Mississippi River Hills

Ecological site concept

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

Chert Exposed Backslope Woodlands are within the green areas on the map. They occupy the southerly and westerly aspects of steep, dissected slopes, and are mapped in complex with the Chert Protected Backslope Forest

ecological site. These ecological sites are in the uplands in the Missouri and Mississippi River watersheds, but are not adjacent to the river floodplains. The Chert Backslope ecological sites are typically associated with Mississippian-aged limestone, but also occur in Ordovician-aged dolomite. Deep Loess Upland and Loamy Upland ecological sites are typically upslope. Areas of Limestone/Dolomite Glade/Woodlands are commonly associated with these sites. Soils are typically very deep, with an abundance of chert fragments. The reference plant community is woodland with an overstory dominated by black oak and white oak, and a ground flora of native grasses and forbs.

Associated sites

F115XB011MO	**Chert Protected Backslope Forest** Chert Protected Backslope Forests are mapped in a complex with this ecological site but on north and east aspects.
F115XB013MO	**Chert Upland Woodland** Chert Upland Woodlands are found on hillslope shoulders and upper backslopes above these ecological sites.
R115XB009MO	**Shallow Limestone/Dolomite Upland Glade/Woodland** Shallow Limestone/Dolomite glade sites are common downslope.

Similar sites

F115XB011MO	**Chert Protected Backslope Forest** Chert Protected Backslope Forests are mapped in complex with this ecological site on north and east aspects.

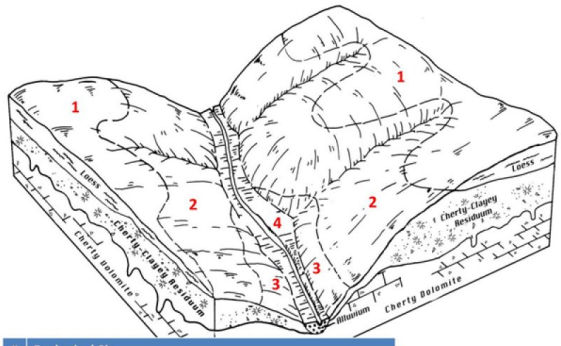
Table 1. Dominant plant species

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 adjacent figure (adapted from Skaer, 2004) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the uplands. The site is within the area labeled “2”, on steep backslopes with southerly and westerly aspects. Chert Upland Woodland sites, on hillslope shoulders and upper backslopes, and included in the area. Sites that are shallower to limestone or dolomite bedrock are typically downslope, such as the Chert Limestone/Dolomite Backslope sites shown in the figure. Shallow Limestone/Dolomite glade sites are also common downslope.



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

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	69–152 cm
Aspect	S, SW, W

Climatic features

The Central Mississippi Valley Wooded Slopes, Western Part 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 Central Mississippi Valley Wooded Slopes, Western Part 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 diagonally crossing the MLRA from northwest to southeast. Both mean annual temperature and precipitation exhibit gradients along this line.

The average annual precipitation in most of this area is 38 to 48 inches. The average annual temperature is 53 to 57 degrees F. Mean January minimum temperature follows the northwest-to-southeast 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 the same gradient as temperature. 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. Snowfall is common in winter.

During years when precipitation is normal, moisture is stored in the soil profile 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. Higher daytime temperatures of bare rock surfaces and higher reflectivity of these unvegetated surfaces create characteristic glade and cliff ecological sites. 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 ecological site is measurably different from the climate of the more open grassland or savanna ecological sites.

Source:
University of Missouri Climate Center - http://climate.missouri.edu/climate.php;

Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - http://soils.usda.gov/survey/geography/mlra/

Table 3. Representative climatic features

Frost-free period (average)	177 days
Freeze-free period (average)	201 days
Precipitation total (average)	1,194 mm

Climate stations used

- (1) FESTUS [USC00232850], Crystal City, MO
- (2) FULTON [USC00233079], Fulton, MO
- (3) UNION [USC00238515], Union, MO
- (4) ANNA 2 NNE [USC00110187], Anna, IL

Influencing water features

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 (Vano 2005).

Soil features

These soils have no rooting restriction, and subsoils are not low in bases. A few areas have dolomite or limestone bedrock within 60 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 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. Soil series associated with this site include Beemont, Goss, and Rueter.

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 7. Goss series

Table 4. Representative soil features

Parent material	(1) Slope alluvium–dolomite (2) Residuum–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	102–183 cm
Surface fragment cover <=3"	15–50%
Surface fragment cover >3"	0–39%
Available water capacity (0-101.6cm)	5.08–15.24 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)	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 it may be slightly less dense with more afternoon sunlight getting to the woodland floor. The canopy is moderately tall (60 to 75 feet) but less dense (65 to 85 percent cover) than protected slopes and the understory canopy is poorly developed with less structural diversity. Increased light causes a diversity of ground flora species to flourish. In addition, proximity to shallow soil glades and open woodlands provides additional opportunity for increased light and 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 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 buckbrush, gooseberry, and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and soil erosion can be a problem creating a lower site productivity.

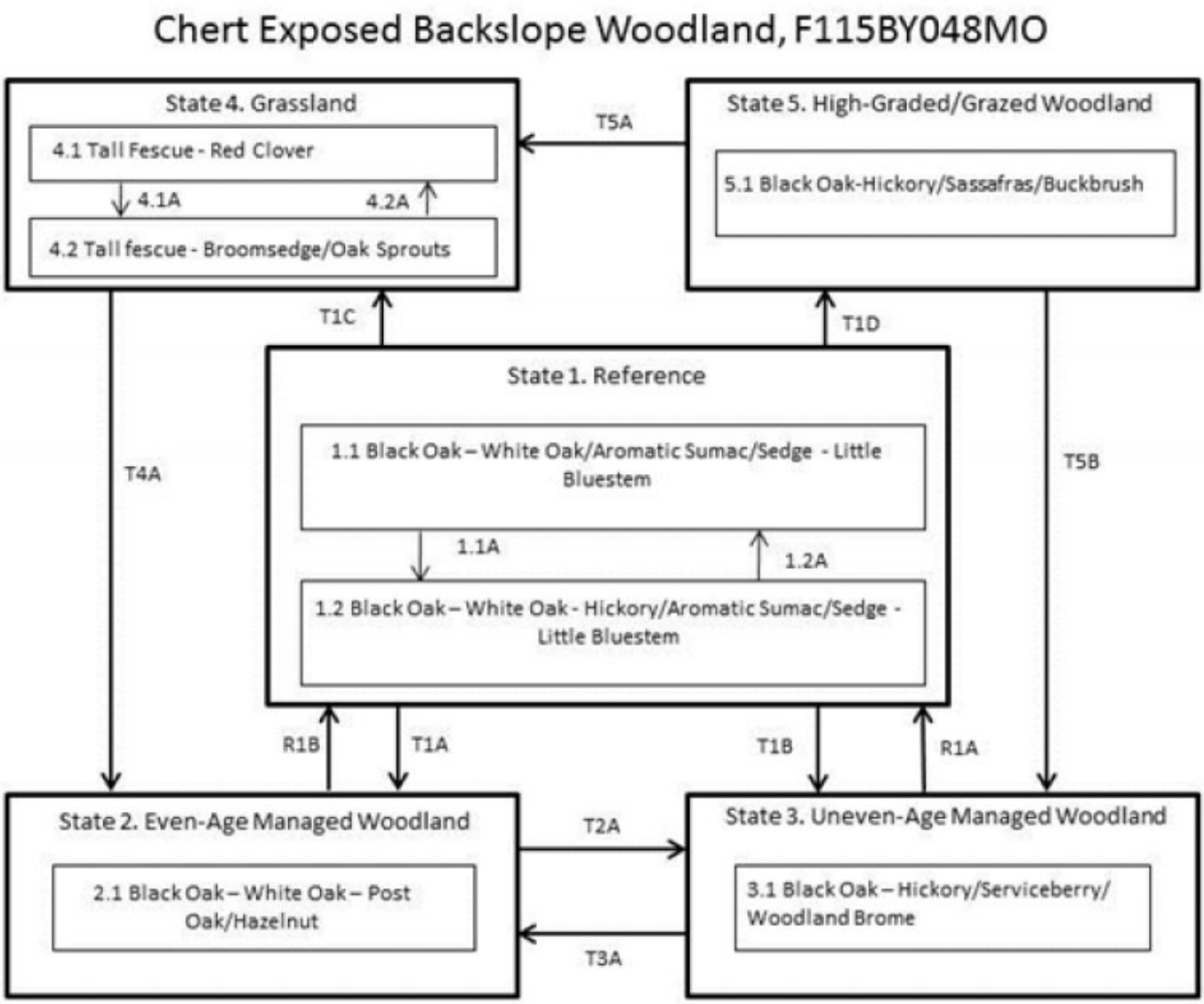
These ecological sites are only moderately productive, especially when compared to adjacent protected slopes and deeper loess covered units. Oak regeneration is typically problematic. Red maple, red elm, and hickories are often dominant competitors in the understory. Maintenance of the oak component 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 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/Process
T1A	Even-aged management
T1B	Fire suppression; uneven-age management
T1C, T5A	Clearing & pasture planting
T1D	Poorly planned harvest & uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T4A, T5A	Tree planting; long-term succession; no grazing
T4B	Uneven-age management; no grazing; forest stand improvement

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

Code	Event/Process
R1A	Prescribed fire & extended rotations
R1B	Uneven-age mgt, extended rotations

Figure 8. State and transition diagram for this ecological s

State 1

Reference

The reference state for this ecological site was old growth oak woodland dominated by black oak, post oak, and white oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species. Two community phases are recognized in the reference state, with shifts between phases based on disturbance frequency. This reference state is uncommon today. Some sites have been converted to grassland (State 4). Others have been subject to repeated, high-graded timber harvests coupled with domestic livestock grazing (State 5). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Many reference sites have been managed for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) woodlands.

Community 1.1
Black Oak – White Oak/Aromatic Sumac/Sedge - Little Bluestem

In this phase, the tree canopy is dominated by a mixture of old growth black, post and white oaks, and the understory is relatively open with scattered oak and sassafras saplings. This woodland community has a two-tiered structure, with a canopy that is 60 to 80 feet tall with 60 to 80 percent closure. Historically, these exposed slopes likely burned every 5 to 20 years, so ground flora cover was greater than 75 percent.

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

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

Community 1.2
Black Oak – White Oak - Hickory/Aromatic Sumac/Sedge - Little Bluestem

This phase is similar to community phase 1.1 but oak and hickory understory densities are increasing due to longer periods of fire suppression. Displacement of some grasses and forbs may be occurring due to shading and competition from the increased densities of oak and hickory saplings in the understory. The persistence of oak as a dominant canopy species is not threatened on the exposed slopes.

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 and density. These woodlands tend to be rather dense, with an under developed understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) woodlands.

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

This is the only phase associated with this state at this time. See the corresponding state narrative for details.

State 3
Uneven-Age Managed Woodland

Composition in this state is 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, this state will slowly increase in more shade tolerant species such as sugar maple and white oak will become less dominant.

Community 3.1
Black Oak – Hickory/Serviceberry/ Woodland Brome

This is the only phase associated with this state at this time. See the corresponding state narrative for details.

State 4
Grassland

Conversion of forests to planted, non-native pasture species such as tall fescue has been common in this region. Steep slopes, abundant surface fragments, low organic matter contents and soil acidity make non-native pastures challenging to maintain in a healthy, productive state on this ecological site. If grazing and active pasture management is discontinued, the site will eventually transition to State 2 (Even-Age).

Community 4.1
Tall Fescue - Red Clover

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

Community 4.2
Tall fescue - Broomsedge/Oak Sprouts

This phase is the result of over use, poor grassland and grazing management and lack of adequate nutrient application. Oak sprouts, oak saplings, and invasive species are increasing as a result of poor management.

State 5
High-Graded/Grazed Woodland

Ecological 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 buckbrush, 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).

Community 5.1
Black Oak-Hickory/Sassafras/Buckbrush

This is the only phase associated with this state at this time. See the corresponding state narrative for details.

Restoration pathway R1B
State 1 to 3

This restoration pathway generally requires uneven-age timber management practices, such as single tree or group selection harvest, with extended rotations that allow mature trees to exceed ages of about 150 years. Prescribed fire is part of the restoration process. Mechanical thinning may be necessary in dense woodlands.

Restoration pathway R1A
State 1 to 4

This restoration pathway generally requires uneven-age timber management practices, such as single tree or group selection harvest, with extended rotations that allow mature trees to exceed ages of about 150 years. Prescribed fire is part of the restoration process.

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							
black oak	QUVE	*Quercus velutina*	Native	–	2–50	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	0.1–50	–	–
white oak	QUAL	*Quercus alba*	Native	–	5–50	–	–
post oak	QUST	*Quercus stellata*	Native	–	5–10	–	–
white ash	FRAM2	*Fraxinus americana*	Native	–	2–5	–	–
sassafras	SAAL5	*Sassafras albidum*	Native	–	2–5	–	–
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	–	30–50
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	10–30
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	10–30
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	10–20
Indiangrass	SONU2	*Sorghastrum nutans*	Native	–	2–5
eastern woodland sedge	CABL	*Carex blanda*	Native	–	1–2
poverty oatgrass	DASP2	*Danthonia spicata*	Native	–	0.1–1
Forb/Herb					
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	10–30
smooth small-leaf ticktrefoil	DEMA2	*Desmodium marilandicum*	Native	–	10–30
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	5–20
feathery false lily of the valley	MARA7	*Maianthemum racemosum*	Native	–	2–5
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	2–5
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	2–5
American hogpeanut	AMBR2	*Amphicarpaea bracteata*	Native	–	2–5
common dittany	CUOR	*Cunila origanoides*	Native	–	1–5
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	Native	–	1–2
manyray aster	SYAN2	*Symphyotrichum anomalum*	Native	–	1–2
violet lespedeza	LEVI6	*Lespedeza violacea*	Native	–	0.1–1
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	0.1–1
Virginia spiderwort	TRVI	*Tradescantia virginiana*	Native	–	–
Fern/fern ally					
rattlesnake fern	BOVI	*Botrychium virginianum*	Native	–	1–2
Shrub/Subshrub					
American hazelnut	COAM3	*Corylus americana*	Native	–	10–30
hophornbeam	OSVI	*Ostrya virginiana*	Native	–	0.1–25
leadplant	AMCA6	*Amorpha canescens*	Native	–	10–20
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	2–5
Tree					
flowering dogwood	COFL2	*Cornus florida*	Native	–	2–10
common serviceberry	AMAR3	*Amelanchier arborea*	Native	–	1–2

Animal community

Wildlife (MDC 2006):

Oaks provide hard mast for wildlife; scattered shrubs provide soft mast.

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 collected site index values average 55 for white oak and 54 for black oak. Timber management opportunities are generally 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, group selection cuttings of ½ to 1 acre, or crop tree release 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

Chert Exposed Backslope Woodland – Potential Reference – F115BY048MO

Plot DABOCA_JK05 – Rueter soil
Located in Daniel Boone CA, Warren County, MO
Latitude: 38.777497
Longitude: -91.39554

Plot WESPCA_JK06 – Rueter soil
Located in Weldon Springs CA, St. Charles County, MO
Latitude: 38.687863
Longitude: -90.70728

Plot REIFCA_JK09 – Rueter soil
Located in Reifsnider CA, Warren County, MO
Latitude: 38.77184
Longitude: -91.09662

Plot CAPLPV01 – Rueter soil

Plot WESPCA05 – Goss soil

Other references

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

MDC, 2006. 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.

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

Skaer, David M. 2004. Soil Survey of Jefferson County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

Vano, Julie A. 2005. Land Surface Hydrology in Northern Wisconsin: Influences of climatic variability and land cover. University of Wisconsin-Madison.

University of Missouri Climate Center - http://climate.missouri.edu/climate.php; accessed June 2012

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/

Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

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

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:**