

Ecological site F115XB046MO

Chert Limestone/Dolomite Exposed Backslope Woodland

Accessed: 04/26/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 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-Illinoian-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 Chert Woodland.

Missouri Department of Conservation Forest and Woodland Communities (MDC, 2006):

The reference state for this ecological site is most similar to a Post Oak Woodland.

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

The reference state for this ecological site is most similar to a *Quercus stellata* - *Quercus marilandica* - *Quercus velutina* - *Carya texana* / *Schizachyrium scoparium* Woodland (CEGL002149).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):

This ecological site occurs primarily in Land Type Associations of the following Subsections:

Inner Ozark Border
Outer Ozark Border

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/Dolomite 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

Limestone/Dolomite Protected Backslope Forest ecological site. These sites are in scattered upland locations in the Missouri River watershed. Soils are typically moderately deep over limestone/dolomite bedrock, with gravelly surfaces. The reference plant community is woodland with an overstory dominated by post oak, with minor amounts of blackjack oak and black oak, and a ground flora of native grasses and forbs with scattered shrubs.

Associated sites

| | |
|-------------|---|
| F115XB005MO | Loamy Upland Woodland Loamy Upland Woodlands are typically upslope on hillslope summits, crests and shoulders. |
| F115XB014MO | Chert Limestone/Dolomite Protected Backslope Forest Chert Limestone/Dolomite Protected Backslope Woodlands are mapped in complex with this ecological site on north and east aspects. |
| R115XB009MO | Shallow Limestone/Dolomite Upland Glade/Woodland Shallow Limestone/Dolomite Upland Glade sites are commonly associated with this site. |

Similar sites

| | |
|-------------|---|
| F115XB014MO | Chert Limestone/Dolomite Protected Backslope Forest Chert Limestone/Dolomite Protected Backslope Woodlands are mapped in complex with this ecological site on north and east aspects. |
|-------------|---|

Table 1. Dominant plant species

| | |
|------------|---|
| Tree | (1) <i>Quercus stellata</i> (2) <i>Quercus marilandica</i> |
| Shrub | (1) <i>Rhus aromatica</i> |
| Herbaceous | (1) <i>Schizachyrium scoparium</i> |

Physiographic features

This site is on 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 Davis, 2002) 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 northerly and easterly aspects. Loamy Upland Woodlands (labeled “1”) are typically upslope on hillslope summits, crests and shoulders. Shallow Limestone/Dolomite glade sites are commonly associated with this site, but are not shown on the figure.

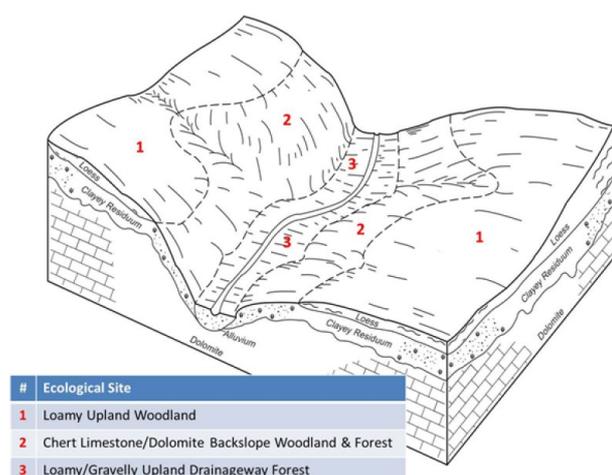


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

| | |
|--------------------|----------|
| Landforms | (1) Hill |
| Flooding frequency | None |
| Ponding frequency | None |
| Slope | 15–70% |
| Water table depth | 24–60 in |
| 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 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. 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>; 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/>

Table 3. Representative climatic features

| | |
|-------------------------------|----------|
| Frost-free period (average) | 168 days |
| Freeze-free period (average) | 194 days |
| Precipitation total (average) | 46 in |

Climate stations used

- (1) COLUMBIA U OF M [USC00231801], Columbia, MO
- (2) ROSEBUD [USC00237300], Gerald, MO
- (3) ST LOUIS SPRT OF S L AP [USW00003966], Chesterfield, MO

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 are underlain with limestone and/or dolomite bedrock at 20 to 40 inches deep. 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, overlying limestone bedrock. They have gravelly to very gravelly 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 Bardley and Gatewood.

The accompanying picture of the Gatewood series shows abundant chert fragments in the upper part of the soil, over a reddish clay subsoil. Cherty limestone/dolomite bedrock limits rooting depth. Picture courtesy of John Preston, NRCS.



Figure 7. Gatewood series

Table 4. Representative soil features

| | |
|--|---|
| Parent material | (1) Slope alluvium–dolomite (2) Residuuum–dolomite |
| Surface texture | (1) Very gravelly silt loam (2) Gravelly silt loam (3) Very gravelly loam |
| Family particle size | (1) Clayey |
| Drainage class | Moderately well drained to well drained |
| Permeability class | Very slow |
| Soil depth | 20–40 in |
| Surface fragment cover <=3" | 20–60% |
| Surface fragment cover >3" | 0–15% |
| Available water capacity (0-40in) | 1–3 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) | 0–50% |

Ecological dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

The somewhat shallow, droughty soils of Cherty Limestone/Dolomite Exposed Backslope Woodlands limit the growth of trees and support an abundance of native grasses and forbs in the understory. Wild fires played an important role in the maintenance of these ecological sites with these sites, along with adjacent glades and woodlands burned at least once every 5 years. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. Rather short (40 to 50 feet) post oak dominated an open overstory, with occasional blackjack and black oak. Shrubs were scattered within a dense matrix of native grasses and forbs.

During longer fire free intervals, woody species, such as especially eastern red cedar and black hickory, would have increased and the herbaceous understory diminished. But the return of wild fires would have opened the woodlands up again and stimulated the abundant ground flora. 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.

Cherty Limestone/Dolomite 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.

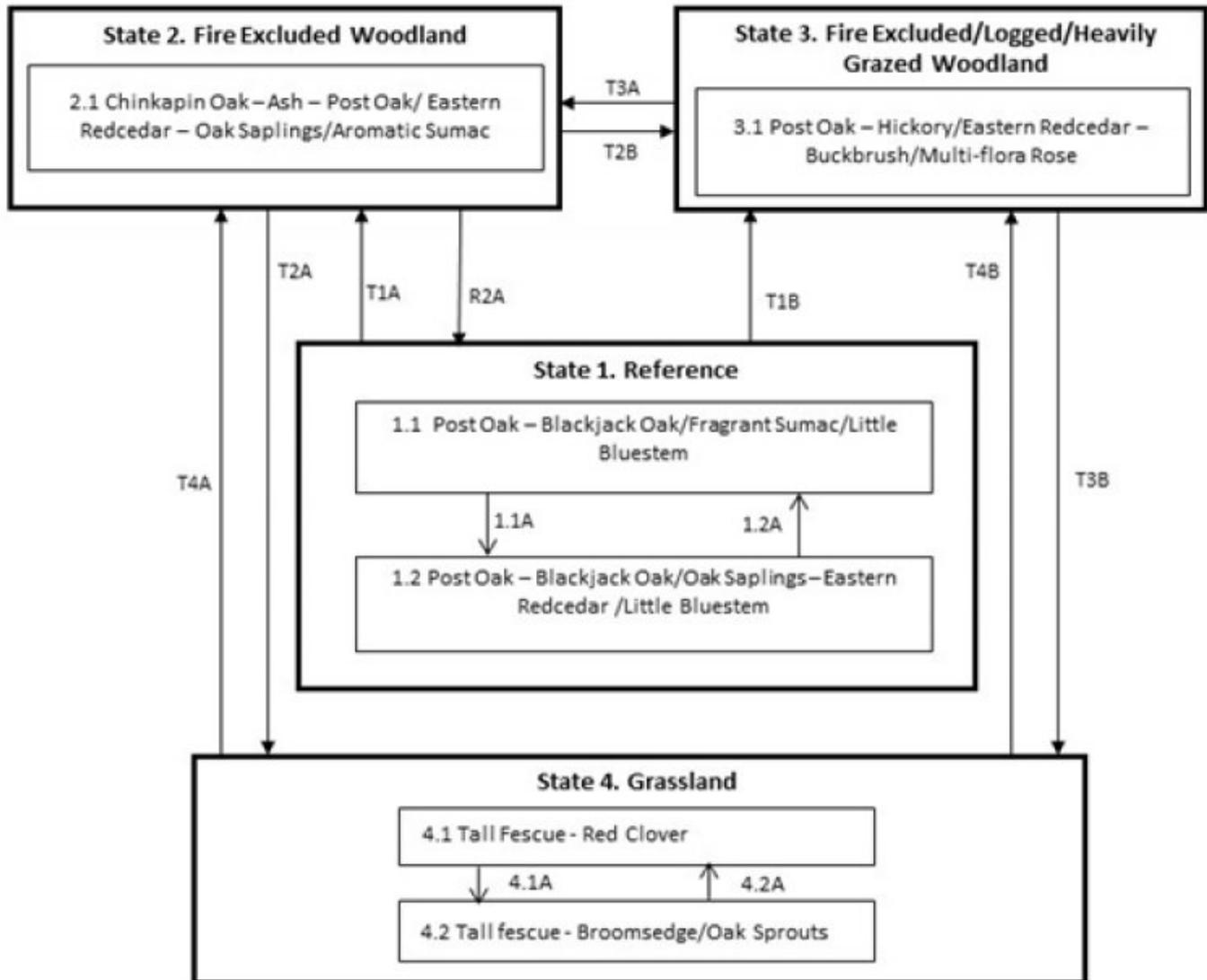
Uncontrolled domestic grazing has also impacted these communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as redcedar, buckbrush, gooseberry, and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and soil erosion due related to grazing can be a problem and lower site productivity.

Timber harvest is limited on these sites because of rather poor to fair quality trees. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration management practices.

A State and Transition Diagram follows. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

State and transition model

Chert Limestone/Dolomite Exposed Backslope Woodland, F115BY046MO



| Code | Event/Activity |
|----------|---|
| T1A | Fire-free interval (20+ years) |
| T1B | Fire suppression; heavy grazing by livestock; logging |
| T3A | Livestock removal |
| T2B | Heavy grazing by livestock; logging |
| T2A, T3B | Clearing; grassland seeding; grassland management |
| T4A | Tree planting; long term succession (50+ years); no grazing |
| T4B | Long term succession (50+ years); light periodic grazing |
| R2A | Understory removal; prescribed fire |
| 1.1A | Fire-free interval 10-15 years |
| 1.2A | Fire 3-5 year cycle |
| 4.1A | Over grazing; no fertilization |
| 4.2A | Brush management; grassland seeding; grassland management |

Figure 8. State and transition diagram for this ecological s

State 1

Reference

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

Community 1.1

Post Oak - Blackjack Oak/Aromatic Sumac/Little Bluestem

This phase has an old growth overstory that is dominated by post oak and blackjack oak with hickory and post oak also present. This woodland community has a two-tiered structure with an open understory and a dense, diverse herbaceous ground flora. Periodic disturbances including fire, ice and wind create canopy gaps, allowing white oak and black oak to successfully reproduce and remain in the canopy. It is likely that this phase burned at least once every 5 years.

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

Post Oak – Blackjack Oak/Oak Saplings - Fragrant Sumac/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.

State 2

Fire Excluded Woodland

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

Community 2.1

Chinkapin Oak – Ash – Post Oak/ Eastern Redcedar – Oak Saplings/Aromatic Sumac

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

State 3

Fire Excluded/ Logged/Heavily Grazed Woodland

In addition to fire exclusion, many of these sites have been subjected to heavy grazing by domestic livestock and periodic logging. Like State 2, these areas are dense and shady with a diminished ground flora. In addition, grazed areas exhibit a lower diversity of native ground flora species and an increased abundance of eastern redcedar and other invasive natives such as buck brush and multi-flora rose. Like State 2, restoration using thinning and fire is possible, but will take longer and require more effort. Restricting livestock access and eliminating logging will be necessary for successful restoration.

Community 3.1

Post Oak – Hickory/Eastern Redcedar – Buckbrush/Multi-flora Rose

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

State 4

Grassland

Conversion of other states to non-native cool season species such as tall fescue 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

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.

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 | | | | | | | |
| post oak | QUST | <i>Quercus stellata</i> | Native | – | – | – | – |
| blackjack oak | QUMA3 | <i>Quercus marilandica</i> | Native | – | – | – | – |
| black oak | QUVE | <i>Quercus velutina</i> | Native | – | – | – | – |
| black hickory | CATE9 | <i>Carya texana</i> | Native | – | – | – | – |
| eastern redcedar | JUVI | <i>Juniperus virginiana</i> | Native | – | – | – | – |
| common serviceberry | AMAR3 | <i>Amelanchier arborea</i> | Native | – | – | – | – |
| blue ash | FRQU | <i>Fraxinus quadrangulata</i> | Native | – | – | – | – |
| chinquapin oak | QUMU | <i>Quercus muehlenbergii</i> | Native | – | – | – | – |

Table 6. Community 1.1 forest understory composition

| Common Name | Symbol | Scientific Name | Nativity | Height (Ft) | Canopy Cover (%) |
|--------------------------------------|--------|---|----------|-------------|------------------|
| Grass/grass-like (Graminoids) | | | | | |
| little bluestem | SCSC | <i>Schizachyrium scoparium</i> | Native | – | – |
| big bluestem | ANGE | <i>Andropogon gerardii</i> | Native | – | – |
| whiteninge sedge | CAALA | <i>Carex albicans var. albicans</i> | Native | – | – |
| fuzzy wuzzy sedge | CAHI6 | <i>Carex hirsutella</i> | Native | – | – |
| reflexed sedge | CARE9 | <i>Carex retroflexa</i> | Native | – | – |
| poverty oatgrass | DASP2 | <i>Danthonia spicata</i> | Native | – | – |
| sideoats grama | BOCU | <i>Bouteloua curtipendula</i> | Native | – | – |
| rock muhly | MUSO | <i>Muhlenbergia sobolifera</i> | Native | – | – |
| Forb/Herb | | | | | |
| hoary puccoon | LICA12 | <i>Lithospermum canescens</i> | Native | – | – |
| Ozark milkvetch | ASDI4 | <i>Astragalus distortus</i> | Native | – | – |
| manyray aster | SYAN2 | <i>Symphotrichum anomalum</i> | Native | – | – |
| late purple aster | SYAP2 | <i>Symphotrichum patens var. patens</i> | Native | – | – |
| widowsfrill | SIST | <i>Silene stellata</i> | Native | – | – |
| golden zizia | ZIAU | <i>Zizia aurea</i> | Native | – | – |
| prairie rosinweed | SITE | <i>Silphium terebinthinaceum</i> | Native | – | – |
| smooth violet prairie aster | SYTU2 | <i>Symphotrichum turbinellum</i> | Native | – | – |
| common goldstar | HYHI2 | <i>Hypoxis hirsuta</i> | Native | – | – |
| stiff tickseed | COPA10 | <i>Coreopsis palmata</i> | Native | – | – |
| Virginia tephrosia | TEVI | <i>Tephrosia virginiana</i> | Native | – | – |
| tall blazing star | LIAS | <i>Liatris aspera</i> | Native | – | – |
| scaly blazing star | LISQ | <i>Liatris squarrosa</i> | Native | – | – |
| wild quinine | PAIN3 | <i>Parthenium integrifolium</i> | Native | – | – |
| gray goldenrod | SONE | <i>Solidago nemoralis</i> | Native | – | – |
| downy ragged goldenrod | SOPE | <i>Solidago petiolaris</i> | Native | – | – |
| elmleaf goldenrod | SOUL2 | <i>Solidago ulmifolia</i> | Native | – | – |
| longbract wild indigo | BABR2 | <i>Baptisia bracteata</i> | Native | – | – |
| white prairie clover | DACA7 | <i>Dalea candida</i> | Native | – | – |
| purple prairie clover | DAPU5 | <i>Dalea purpurea</i> | Native | – | – |
| smooth small-leaf ticktrefoil | DEMA2 | <i>Desmodium marilandicum</i> | Native | – | – |
| hairy sunflower | HEHI2 | <i>Helianthus hirsutus</i> | Native | – | – |
| violet lespedeza | LEVI6 | <i>Lespedeza violacea</i> | Native | – | – |
| Shrub/Subshrub | | | | | |
| Carolina buckthorn | FRCA13 | <i>Frangula caroliniana</i> | Native | – | – |
| dwarf hackberry | CEPU10 | <i>Celtis pumila</i> | Native | – | – |
| fragrant sumac | RHAR4 | <i>Rhus aromatica</i> | Native | – | – |
| Tree | | | | | |
| rusty blackhaw | VIRU | <i>Viburnum rufidulum</i> | Native | – | – |

Animal community

Wildlife (MDC 2006):

Oaks provide hard mast; scattered shrubs provide soft mast.

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

Birds associated with Chert Limestone Exposed Backslope Woodlands are Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Summer Tanager, Eastern Wood-Pewee, Whip-poor-will, Chuck-will's widow, and Red-eyed Vireo.

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

Other information

Forestry (NRCS 2002, 2014):

Management: Statewide field collected site index values average 41 for white oak and 45 for black oak. Timber management opportunities are fair. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. Using prescribed fire as a management tool could have a negative impact on timber quality and should be used with caution on a particular site if timber management is the primary objective. These sites respond well to prescribed fire for restoration purposes. Favor post oak, black oak, chinkapin oak, and hickory.

Limitations: Large amounts of coarse fragments throughout profile; bedrock within 40 inches. Surface stones and rocks are problems for efficient and safe equipment operation and will make equipment use somewhat difficult. Disturbing the surface excessively in harvesting operations and building roads increases soil losses, which leaves a greater amount of coarse fragments on the surface. Hand planting or direct seeding may be necessary. Seedling mortality due to low available water capacity may be high. Mulching or providing shade can improve seedling survival. Mechanical tree planting will be limited. Erosion is a hazard when slopes exceed 15 percent. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

Inventory data references

Chert Limestone/Dolomite Exposed Backslope Woodland – Potential Reference state for – F115BY046MO:

Plot CLRAPR_KS04 - Bardley soil

Plot WESPCA01 - Sonsac soil

Other references

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Contributors

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Doug Wallace

Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support in the development of this ecological site.

Rangeland health reference sheet

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

| | |
|---|-------------------|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | |
| 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:**
