USDA Natural Resources Conservation Service

Ecological site F116AY030MO
Loamy Protected Backslope Forest

Last updated: 9/24/2020
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): 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 Mississipian 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 Loess/Glacial Till Forest.

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

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

The reference state for this ecological site is most similar to a Quercus alba / Cornus florida Unglaciated Forest (CEGL002066).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily in the Inner Ozark Border Subsection.

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 Loamy Protected Backslope Forests occupy the northerly and easterly aspects of steep, dissected slopes, and are mapped in complex with the Loamy Exposed Backslope Woodland ecological site. Loamy Backslope ecological sites occur primarily in the Ozark border counties near the boundary with MLRA 115B, where loess from the Missouri and Mississippi river valleys has been deposited. Soils are very deep, and are silt loam loess overlying gravelly residuum. The reference plant community is forest dominated by northern red oak, white oak, white ash and sugar maple with a well-developed understory and a rich herbaceous ground flora.

Associated sites

F116AY004MO	**Fragipan Upland Woodland** Fragipan Upland Woodlands are upslope on summits where a fragipan is present in the subsoil.
F116AY008MO	**Loamy Upland Woodland** Loamy Upland Woodlands are upslope on summits and shoulders.
F116AY016MO	**Chert Dolomite Protected Backslope Forest** Chert Dolomite Protected Backslope Forests are upslope or adjacent, where loess is thinner and dolomite bedrock is within 40 inches.
F116AY037MO	**Gravelly/Loamy Upland Drainageway Forest** Gravelly/Loamy Upland Drainageway Forests are often downslope.
F116AY046MO	**Loamy Exposed Backslope Woodland** Loamy Exposed Backslope Woodlands are mapped in complex with this ecological site, on steep lower backslopes with southern to western exposures.

Similar sites

F116AY019MO	**Loamy Dolomite Protected Backslope Forest** Loamy Dolomite Protected Backslope Forests are similar in landscape position and species composition but generally less productive.
F116AY046MO	**Loamy Exposed Backslope Woodland** Loamy Exposed Backslope Woodlands are mapped in complex with this ecological site, on steep lower backslopes with southern to western exposures.

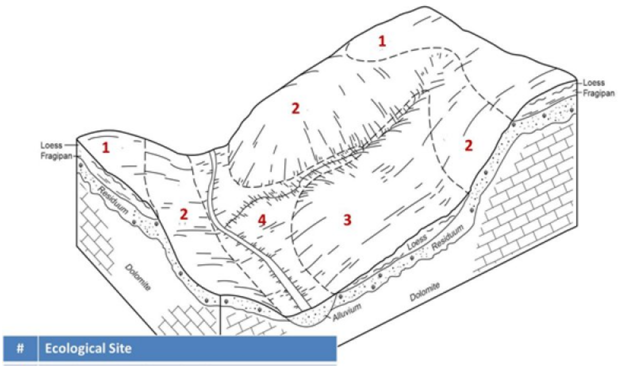
Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus rubra*
Shrub	(1) *Asimina triloba*
Herbaceous	(1) *Asarum canadense* (2) *Uvularia grandiflora*

Physiographic features

This site is on upland backslopes with slopes of 15 to 50 percent. It is on protected aspects (north, northeast, and east), which receive significantly less solar radiation than the exposed aspects. The site 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 with other ecological sites. It is within the area labeled “3”, on backslopes with northerly to easterly exposures. Loamy Exposed Backslope Woodland sites are on the corresponding southerly to westerly exposures. Footslopes and shoulders within the area are in the Loamy Upland Woodland ecological site. A variety of ecological sites occur in areas where the loess is thinner, such as the Chert Dolomite Backslope sites shown here. Upslope crests are commonly Fragipan Upland Woodland sites.



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

Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hillslope
Flooding frequency	None
Ponding frequency	None
Slope	15–50%
Water table depth	51–152 cm
Aspect	NW, N, NE, E

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)	145-150 days
Freeze-free period (characteristic range)	165-173 days
Precipitation total (characteristic range)	1,143-1,219 mm
Frost-free period (actual range)	143-150 days
Freeze-free period (actual range)	165-176 days
Precipitation total (actual range)	1,143-1,270 mm
Frost-free period (average)	147 days
Freeze-free period (average)	169 days
Precipitation total (average)	1,194 mm

Climate stations used

- (1) VIENNA 2 WNW [USC00238620], Vienna, MO
- (2) FREEDOM [USC00233043], Linn, MO
- (3) MARBLE HILL [USC00235253], Marble Hill, MO

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.

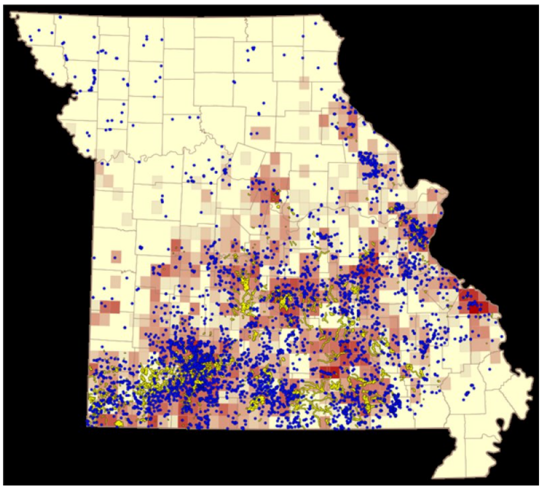


Figure 9. Distribution of karst-related features in Missouri. Image from Wikimedia Commons developed from the Missouri Department of Natural Resources, Division of Geology and Land Survey.

Soil features

These soils have no major rooting restriction. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is loess over slope alluvium over residuum weathered from limestone and dolomite. The soils have silt loam surface horizons. Subsoils are silty clay loam in the upper part, and are very gravelly and cobbly silty clay loam, clay loam to clay in the underlying slope alluvium and residuum. These soils are not affected by seasonal wetness. Some soils have bedrock between 40 and 60 inches, but this does not significantly affect native vegetation. Soil series associated with this site include Bucklick, Gravois, Peridge, and Wrengart.

The accompanying picture of the Peridge series shows a thin, light-colored silt loam surface horizon over a reddish brown silty clay loam subsoil. Red very gravelly clay is typically below one meter in these soils, and appears at the very bottom of this picture. Scale is in centimeters. Picture courtesy of John Preston, NRCS.

Figure 10. Peridge series

Table 4. Representative soil features

Parent material	(1) Loess (2) Slope alluvium–limestone and dolomite (3) Residuum–limestone and dolomite
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately slow
Soil depth	102–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–20.32 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)	20–35%
Subsurface fragment volume >3" (Depth not specified)	0–40%

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 a forest dominated by an overstory of northern red oak, white oak, white ash and sugar maple. The canopy is tall (75 to 90 feet) and well developed (80 to 100 percent closure) and the understory well developed and with great structural diversity. In the most mesic landscape positions, shade tolerant and moisture loving species, such as basswood, coffeetree, and bitternut hickory would have been in greater abundance.

While fire-prone prairies, savannas and open woodlands surround this region, Loamy Protected Backslope Forests historically occurred in the most protected landscape positions on lower, steep slopes in the deeper valleys furthest from the prairie uplands.
While the upland prairies and savannas may have had a fire frequency of 1 to 3 years, Loamy Protected Backslope Forests would have burned less frequently (estimated 10 to 25 years) and with lower intensity. Periodic fires would have removed some of the shade tolerant understory, but it would have quickly recovered.

Loamy Protected Backslope Forests would have also been 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. Such canopy disturbances allowed more light to reach the ground and favored reproduction of the dominant oak species. Grazing by native herbivores would have kept understory conditions more open, creating conditions more favorable to oak reproduction.

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

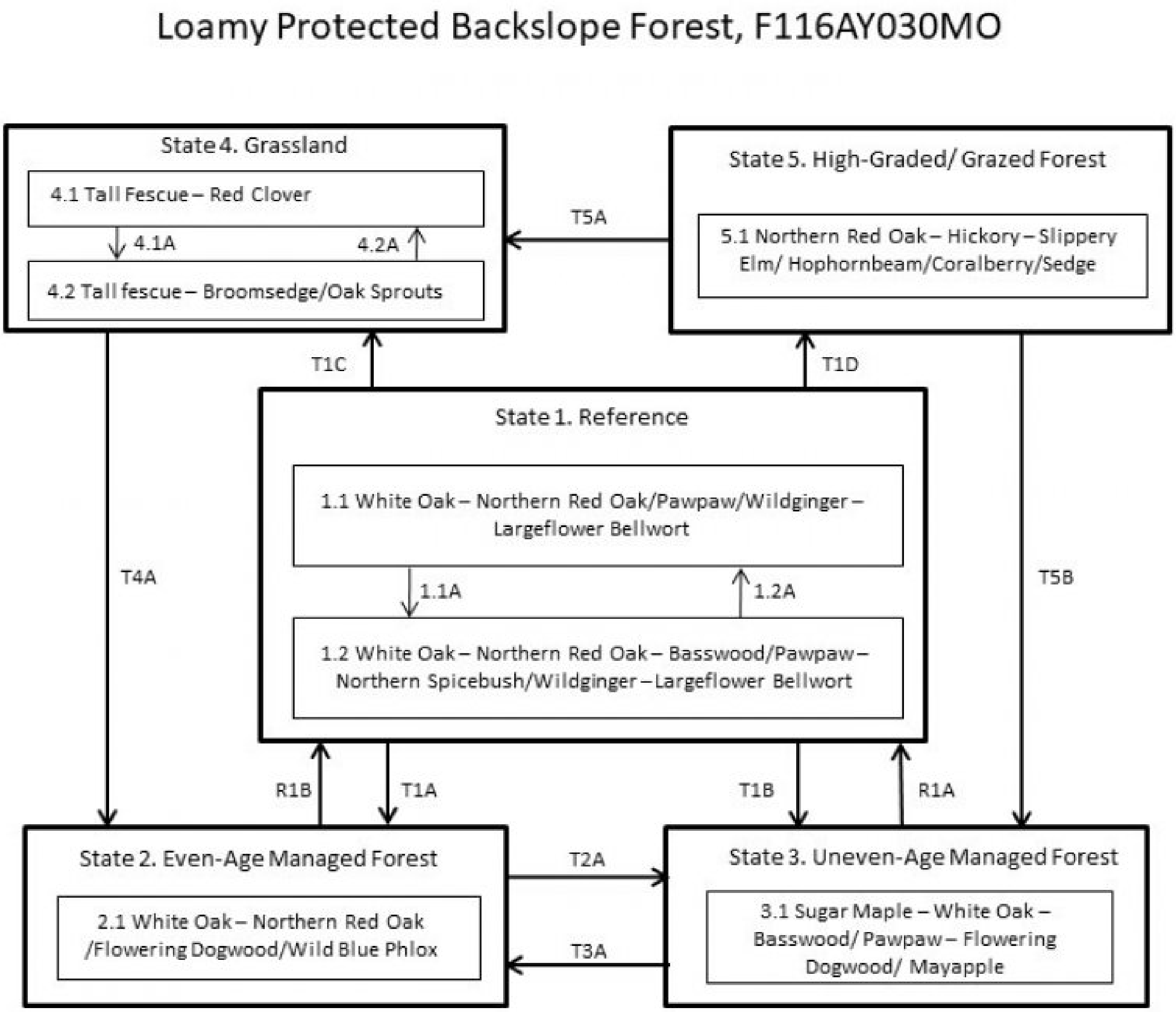
Uncontrolled domestic grazing has diminished the diversity and cover of woodland ground flora species, and has introduced weedy species such as gooseberry, coralberry, poison ivy and Virginia creeper created a more open understory and increased soil compaction and soil erosion.

Loamy Protected Backslope Forests are some of the more productive timber sites in the region. Carefully planned single tree selection or the creation of small group openings can help regenerate more desirable oak species and increase vigor on the residual trees. Clear-cutting does occur and results in dense, even-aged stands of primarily oak. This may be most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands, the ground flora diversity can be shaded out and productivity of the stand may suffer. Oak regeneration is typically problematic. Sugar maple, red elm, hophornbeam, hickory, grape, pawpaw and northern spicebush are often dominant competitors in the understory.

Maintenance of the oak component will require disturbances that will impair the cool, moist, shaded conditions, so trade-offs will have to be made carefully. Prescribed fire can play a beneficial but limited role in the management of this ecological site. The higher productivity of these sites makes it more challenging than on other forest sites in the region. Protected aspect forests did evolve with some fire, but their composition often reflects more closed, forested conditions, with fewer woodland ground flora species that can respond to fire. Consequently, while having protected aspects in a burn unit is acceptable, targeting them solely for woodland restoration is not advisable.

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

State and transition model



Code	Event/Process
T1A	Harvesting; even-aged management
T1B	Harvesting; uneven-age management
T1C, T5A	Clearing; pasture planting
T1D	High-grade harvesting; uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T4A, T5A	Tree planting; long-term succession; no grazing
T5B	Uneven-age management; tree planting; no grazing

Code	Event/Process
1.1A	No disturbance (10+ yrs)
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	Extended rotations
R1B	Uneven-age mgt, extended rotations

Figure 11. State and transition diagram for this ecological site.

State 1

Reference

The reference state was dominated by white oak and northern red oak. Periodic disturbances from wind or ice maintained the dominance of oaks by opening up the canopy and allowing more light for oak reproduction. In the absence of disturbance, more shade tolerant species such as sugar maple and bitternut hickory, white ash and others increase in importance and add structural diversity to the system. Two community phases are recognized in this state, with shifts between phases based on disturbance frequency. The reference state is uncommon today. Some sites have been converted to grassland (State 4). Others have been subject to repeated, high-graded timber harvest coupled with domestic livestock grazing (State 5). Lack of disturbances 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) forests.

Community 1.1
White Oak – Northern Red Oak/Pawpaw/Wildginger – Largeflower Bellwort

Two community phases are recognized in this state, with shifts between phases based on disturbance frequency.

Forest overstory. Forest 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. Forest 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
White Oak – Northern Red Oak – Basswood/Pawpaw – Northern Spicebush/Wildginger – Largeflower Bellwort

Two community phases are recognized in this state, with shifts between phases based on disturbance frequency.

Pathway P1.1A
Community 1.1 to 1.2

This pathway is the result of a disturbance-free interval >10 years.

Pathway P1.2A
Community 1.2 to 1.1

This pathway is the result of a fire disturbance (<10-year) cycle being re-established.

State 2
Even-Age Managed Forest

These forests tend to have 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) forests.

Community 2.1
White Oak – Northern Red Oak /Flowering Dogwood/Wild Blue Phlox

State 3
Uneven-Age Managed Forest

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

Community 3.1
Sugar Maple – White Oak – Basswood/ Pawpaw – Flowering Dogwood/ Mayapple

State 4
Grassland

Conversion of forests to planted, non-native pasture species such as tall fescue has been common in this MLRA. 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, over time, to State 2 (Even-Age).

Community 4.1
Tall Fescue - Red Clover

Community 4.2
Tall fescue - Broomsedge/Oak Sprouts

Pathway P1.1A
Community 4.1 to 4.2

This pathway is the result of over grazing and lack of proper grassland management.

Pathway P1.2A
Community 4.2 to 4.1

This pathway is the result of brush management, grassland re-seeding and proper grassland management.

State 5
High-Graded/Grazed Forest

Forested sites subjected to repeated, high-graded timber harvests and uncontrolled domestic grazing transition to this state. This state exhibits an over-abundance of hickory and other less desirable tree species, and weedy understory species such as coralberry, 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
Northern Red Oak – Hickory – Slippery Elm/ Hophornbeam/Coralberry/Sedge

Transition T1A
State 1 to 2

This transition typically results from even-age forest management practices, such as clear-cut, seed tree or shelterwood harvests and fire suppression.

Transition T1B
State 1 to 3

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

Transition T1C
State 1 to 4

This transition is the result of clearing and conversion to non-native cool season grassland.

Transition T1D
State 1 to 5

This transition is the result of high-grade logging and uncontrolled domestic livestock grazing.

Restoration pathway R1B
State 2 to 1

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 120 years.

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 T4A
State 2 to 4

This transition is the result of clearing and conversion to non-native cool season grassland.

Restoration pathway R1A
State 3 to 1

This restoration transition is the result of extended rotations and minimal disturbance.

Transition T3A
State 3 to 2

Restoration pathway T5B
State 5 to 3

This transition typically results from uneven-age forest management practices, such as clear-cut, seed tree or shelterwood harvest; fire suppression, tree planting and cessation of grazing.

Restoration pathway T5A
State 5 to 4

This transition is the result of clearing and conversion to non-native cool season grassland.

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							
white oak	QUAL	*Quercus alba*	Native	–	–	–	–
post oak	QUST	*Quercus stellata*	Native	–	–	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	–	–	–
black oak	QUVE	*Quercus velutina*	Native	–	–	–	–
pignut hickory	CAGL8	*Carya glabra*	Native	–	–	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	–	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	–	–	–
black walnut	JUNI	*Juglans nigra*	Native	–	–	–	–
white ash	FRAM2	*Fraxinus americana*	Native	–	–	–	–
chinquapin oak	QUMU	*Quercus muehlenbergii*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
white bear sedge	CAAL11	*Carex albursina*	Native	–	–
James' sedge	CAJA2	*Carex jamesii*	Native	–	–
eastern woodland sedge	CABL	*Carex blanda*	Native	–	–
Hitchcock's sedge	CAHI8	*Carex hitchcockiana*	Native	–	–
richwoods sedge	CAOL2	*Carex oligocarpa*	Native	–	–
white bear sedge	CAAL11	*Carex albursina*	Native	–	–
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	–
Bosc's panicgrass	DIBO2	*Dichanthelium boscii*	Native	–	–
slimleaf panicgrass	DILI2	*Dichanthelium linearifolium*	Native	–	–
cypress panicgrass	DIDI6	*Dichanthelium dichotomum*	Native	–	–
Forb/Herb					
bulblet bladderfern	CYBU3	*Cystopteris bulbifera*	Native	–	–
eastern greenviolet	HYCO6	*Hybanthus concolor*	Native	–	–
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	–	–
harbinger of spring	ERBU	*Erigenia bulbosa*	Native	–	–
whiteflower leafcup	POCA11	*Polymnia canadensis*	Native	–	–
roundleaf ragwort	PAOB6	*Packera obovata*	Native	–	–
cutleaf toothwort	CACO26	*Cardamine concatenata*	Native	–	–
bloodroot	SACA13	*Sanguinaria canadensis*	Native	–	–
white fawnlily	ERAL9	*Erythronium albidum*	Native	–	–
eastern false rue anemone	ENBI	*Enemion biternatum*	Native	–	–
blue cohosh	CATH2	*Caulophyllum thalictroides*	Native	–	–
largeflower bellwort	UVGR	*Uvularia grandiflora*	Native	–	–
American ginseng	PAQU	*Panax quinquefolius*	Native	–	–
toadshade	TRSE2	*Trillium sessile*	Native	–	–

bloody butcher	TRRE5	*Trillium recurvatum*	Native	–	–
wood wakerobin	TRVI4	*Trillium viride*	Native	–	–
showy orchid	GASP5	*Galearis spectabilis*	Native	–	–
white baneberry	ACPA	*Actaea pachypoda*	Native	–	–
Canadian wildginger	ASCA	*Asarum canadense*	Native	–	–
green dragon	ARDR3	*Arisaema dracontium*	Native	–	–
yellow fumewort	COFL3	*Corydalis flavula*	Native	–	–
hepatica	HENO2	*Hepatica nobilis*	Native	–	–
dwarf larkspur	DETR	*Delphinium tricorne*	Native	–	–
early meadow-rue	THDI	*Thalictrum dioicum*	Native	–	–
Wood's bunchflower	VEWO3	*Veratrum woodii*	Native	–	–
dutchman's breeches	DICU	*Dicentra cucullaria*	Native	–	–
eastern waterleaf	HYVI	*Hydrophyllum virginianum*	Native	–	–
great waterleaf	HYAP	*Hydrophyllum appendiculatum*	Native	–	–
Greek valerian	PORE2	*Polemonium reptans*	Native	–	–
zigzag goldenrod	SOFL2	*Solidago flexicaulis*	Native	–	–
Jack in the pulpit	ARTR	*Arisaema triphyllum*	Native	–	–
smooth Solomon's seal	POBI2	*Polygonatum biflorum*	Native	–	–
goldenseal	HYCA	*Hydrastis canadensis*	Native	–	–
Fern/fern ally					
Christmas fern	POAC4	*Polystichum acrostichoides*	Native	–	–
northern maidenhair	ADPE	*Adiantum pedatum*	Native	–	–
lowland bladderfern	CYPR4	*Cystopteris protrusa*	Native	–	–
glade fern	DIPY	*Diplazium pycnocarpon*	Native	–	–
broad beechfern	PHHE11	*Phegopteris hexagonoptera*	Native	–	–
Shrub/Subshrub					
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	–
American spikenard	ARRA	*Aralia racemosa*	Native	–	–
northern spicebush	LIBE3	*Lindera benzoin*	Native	–	–
Tree					
American bladdernut	STTR	*Staphylea trifolia*	Native	–	–
pawpaw	ASTR	*Asimina triloba*	Native	–	–
slippery elm	ULRU	*Ulmus rubra*	Native	–	–
American hornbeam	CACA18	*Carpinus caroliniana*	Native	–	–
flowering dogwood	COFL2	*Cornus florida*	Native	–	–

Animal community

Wildlife (MDC 2006):

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

Birds associated with this ecological site include Worm-eating warbler, Whip-poor-will, Great Crested Flycatcher, Ovenbird, Pileated Woodpecker, Wood Thrush, Red-eyed Vireo, Northern Parula, Louisiana Waterthrush (near streams), and Broad-winged Hawk.

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

Other information

Forestry (NRCS 2002, 2014):

Management: Field measured site index values range from 53 to 69 for oak. Timber management opportunities are excellent. 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. Uneven-aged management will slowly cause an increase in more shade tolerant species such as sugar maple. 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: No major equipment restrictions or limitations exist. Subsoils may contain low to moderate amounts of gravel. 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: Loamy Protected Backslope Forest

Plot MERASP04 – Bucklick soil
Located in Meramec State Park, Crawford County, MO
Latitude: 38.195734
Longitude: -91.11549323

Plot CURICA01 – Gravois soil
Located in Current River CA, Reynolds County, MO
Latitude: 37.176184
Longitude: -91.039651

Plot CLCRCA01 – Gravois soil
Located Clubb Creek CA, Bollinger County, MO
Latitude: 37.15077
Longitude: -90.037883

Plot WASHSP02 – Bucklick soil
Located Washington State Park, Washington County, MO
Latitude: 38.082464
Longitude: -90.706845

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Contributors

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Approval

Nels Barrett, 9/24/2020

Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support during this project.

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	05/08/2024
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:

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

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

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

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

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17. **Perennial plant reproductive capability:**
