Natural Resources
Conservation Service

Ecological site F116AY008MO
Loamy Upland Woodland

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General information

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

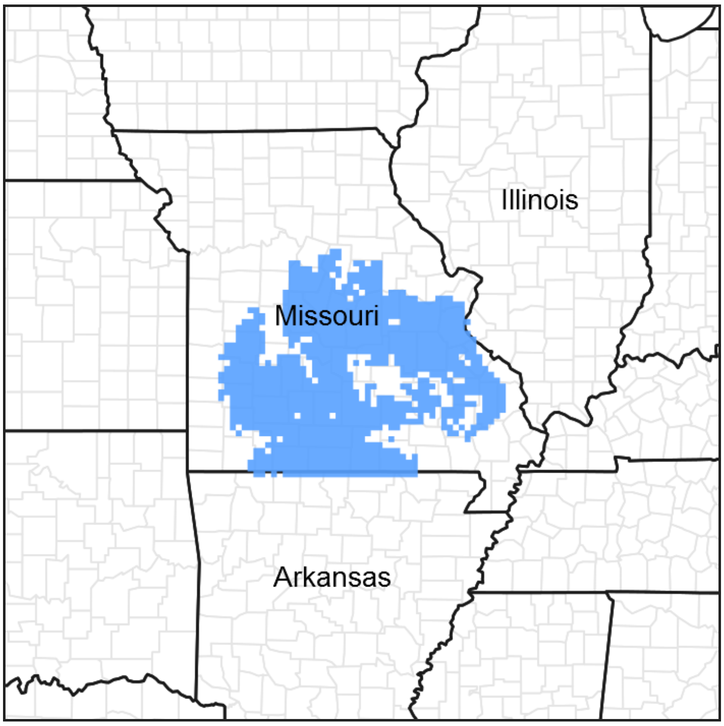


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 116A–Ozark Highland

The Ozark Highland constitutes the Salem Plateau of the Ozark Uplift. Elevation ranges from about 300 feet on the southeast edge of the Ozark escarpment, to about 1,600 feet in the west, adjacent to the Burlington Escarpment of the Springfield Plateau. The underlying bedrock is mainly horizontally bedded Ordovician-aged dolomites and sandstones that dip gently away from the uplift apex in southeast Missouri. Cambrian dolomites are exposed on deeply dissected hillslopes. In some places, Pennsylvanian and 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 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 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 throughout the Ozark Highlands Section, primarily within the following Subsections:
Inner Ozark Border
Meramec River Hills
Osage River Hills
Prairie 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”.

Loamy Upland Woodlands occur on rolling uplands, 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 woodland with an overstory dominated by white oak, black oak, and post oak, and a ground flora of native grasses and forbs.

Associated sites

F116AY004MO	**Fragipan Upland Woodland** Fragipan Upland Woodlands are on summits in weakly dissected landscapes.
F116AY016MO	**Chert Dolomite Protected Backslope Forest** Chert Dolomite Protected Backslope Forests are downslope in strongly dissected landscapes, on steep backslopes with northern to eastern aspects.
F116AY048MO	**Chert Dolomite Exposed Backslope Woodland** Chert Dolomite Exposed Backslope Woodlands are downslope in strongly dissected landscapes, on steep backslopes with southern to western aspects.
R116AY006MO	**Loamy Upland Prairie** Loamy Upland Prairies are on summits in weakly dissected prairie landscapes.

Similar sites

F116AY043MO	**Loamy Sinkhole Woodland** Loamy Sinkhole Woodlands have similar species compositions but are associated with sinkhole topography.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus velutina*
Shrub	(1) *Rhus aromatica*
Herbaceous	(1) *Elymus virginicus* (2) *Solidago ulmifolia*

Physiographic features

This site is on upland summit crests, shoulders and upper backslopes, with slopes of 1 to 15 percent. 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 “1” on the figure. A variety of ecological sites may occur downslope where the loess thins, such as the Chert Dolomite Backslope and the Loamy Upland Drainageway sites shown here.

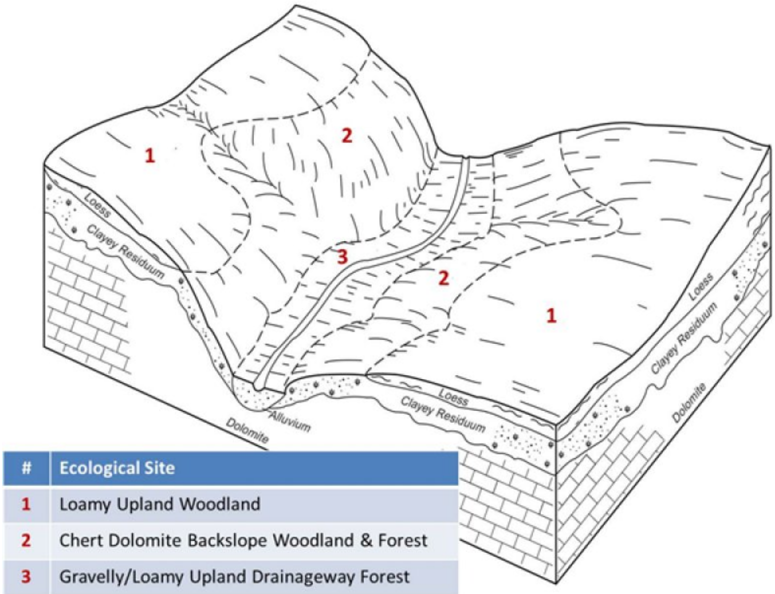


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Interfluve (3) Hill
Flooding frequency	None
Ponding frequency	None
Slope	2–15%
Water table depth	27–60 in
Aspect	Aspect is not a significant factor

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 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 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. Deep sinkholes often have a microclimate significantly cooler, moister, and shadier than surrounding surfaces that may result in a strikingly different vegetational composition and community structure. 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 (characteristic range)	152-167 days
Freeze-free period (characteristic range)	183-193 days
Precipitation total (characteristic range)	44-47 in
Frost-free period (actual range)	148-177 days
Freeze-free period (actual range)	182-198 days
Precipitation total (actual range)	43-49 in
Frost-free period (average)	160 days
Freeze-free period (average)	189 days
Precipitation total (average)	45 in

Climate stations used

- (1) FESTUS [USC00232850], Crystal City, MO
- (2) HARRISON BOONE CO AP [USW00013971], Harrison, AR
- (3) VERSAILLES 2W [USC00238603], Versailles, MO
- (4) EVENING SHADE 1 NNE [USC00032366], Evening Shade, AR
- (5) MTN GROVE 2 N [USC00235834], Mountain Grove, 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.

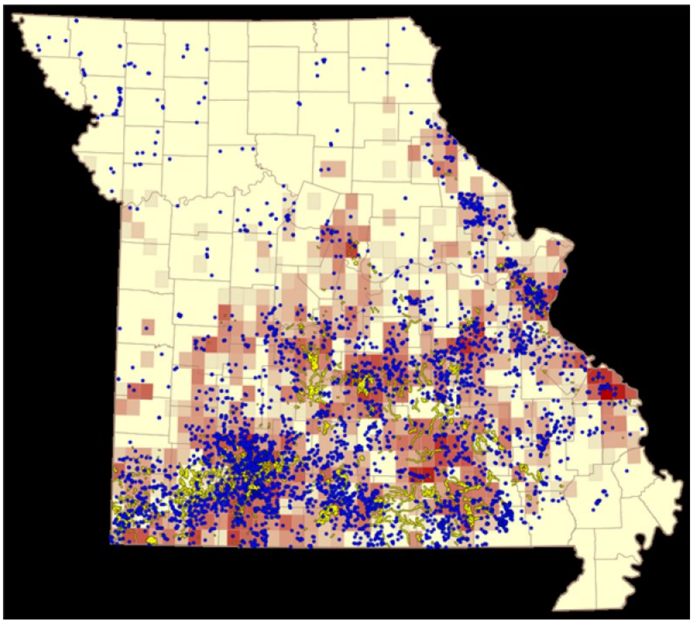


Figure 9. Distribution of karst-related features in Missouri. Image from Wikimedia Commons developed from the Missouri Department of Natural Resources, Division of Geology and Land Survey.

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 Aaron, Bucklick, Courtois, Gravois, Gressy, Jerktail, Peridge, Portia, Useful, 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 (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	40–72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6–7 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)	10–46%

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 well developed woodland dominated by an overstory of white oak, along with black oak and post oak. The canopy is moderately tall (65 to 80 feet) but less dense (65 to 85 percent closure) and less structurally diverse than nearby protected slopes. Increased light from the open canopy causes a diversity of woodland ground flora species to flourish. 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.

Despite being somewhat distant from prairies, fire played a significant role in the maintenance of these systems. It is likely that these ecological sites burned at least once every 10 to 15 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.

Loamy Upland Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison, elk, and white-tailed deer. Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees. Grazing by large native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and woodland ground flora species.

Today, these ecological sites have been cleared and converted to pasture or have undergone repeated timber harvest and domestic grazing. Most existing forested ecological sites have a younger (50 to 80 years) canopy layer whose species composition and quality has been altered by timber harvesting practices.

In the long term absence of fire, woody species, especially hickory, encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration means.

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

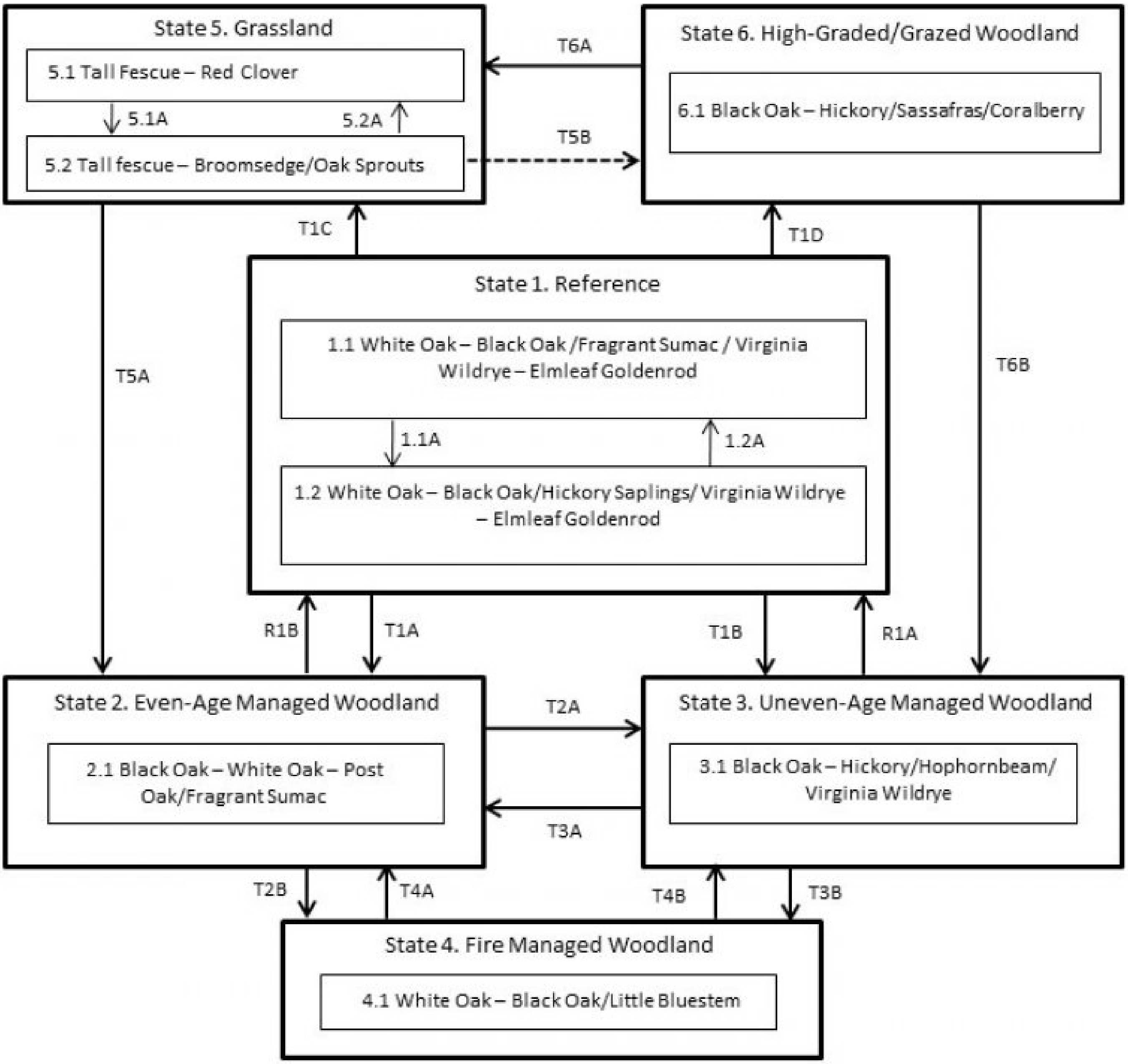
These ecological sites are moderately productive. Oak regeneration is typically problematic. Maple, elm, and hickory are often dominant competitors in the understory. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects.

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 the application of prescribed fire, the ground flora diversity can be shaded out and diversity of the stand may suffer.

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

Loamy Upland Woodland, F116AY008MO



Code	Event/Process/Activity
T1A	Even-aged management
T1B	Fire suppression; uneven-age management
T2B, T3B	Prescribed fire; thinning;
T1C, T6A	Clearing and pasture planting
T1D	Poorly planned harvest & uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T4A	Even-age management; fire suppression
T4B	Even-age management; no grazing
T5A	Tree planting; long-term succession; no grazing
T5B	Light intermittent grazing; woody re-growth
T6B	Uneven-age management; tree planting

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

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

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

State 1
Reference

The historical reference state for this ecological site was old growth, oak woodland. The reference state was dominated by white oak and black oak. Periodic disturbances from fire, wind or ice maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species. Two community phases are recognized in the reference state, with shifts between phases based on disturbance frequency. Reference states are rare today. Many sites have been converted to grassland (State 5). Others have been subject to repeated, high-graded timber harvest coupled with uncontrolled domestic livestock grazing (State 6). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Some former reference states have been managed effectively for timber harvests, resulting in either even-age (State 2) or uneven-age (State 3) woodlands.

Community 1.1
White Oak – Black Oak /Fragrant Sumac / Virginia Wildrye – Elmleaf Goldenrod

This phase has an overstory that is dominated by white oak and black oak with hickory and northern red oak 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.

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 – Black Oak/Hickory Saplings/ Virginia Wildrye – Elmleaf Goldenrod

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.

Pathway 1.1A
Community 1.1 to 1.2

This pathway is a gradual transition that results from extended, disturbance-free periods of roughly 50 years or longer.

Pathway 1.2A
Community 1.2 to 1.1

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

State 2
Even-Age Managed Woodland

This state can start with a sequence of early seral mixed oak woodlands, which mature over time. These woodlands tend to be rather dense, with a depauperate understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. However, in the absence of fire, the diversity and cover of the ground flora is still diminished. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) woodlands. Prescribed fire along with a more open canopy and prescribed grazing can transition this state to a Fire Managed Woodland state (State 4).

Dominant resource concerns

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

Community 2.1
Black Oak – White Oak – Post Oak/Fragrant Sumac

This is an even-aged forest management phase. Logging activities are removing higher volumes of white oak causing a decrease in white oak in the canopy and an increase in northern red oak. Large group, shelterwood or clearcut harvests create a more uniform age class structure throughout the canopy layer while also opening up the understory and allowing more sunlight to reach the forest floor.

State 3
Uneven-Age Managed Woodland

Composition and tree age are altered from the reference state depending on tree selection during harvest. In addition, without a regular 15 to 20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species and white oak will become less dominant. Uneven Age Managed Woodland is also denser because of fire suppression. Consequently, the woodland ground flora is suppressed, and structural diversity is increased. Without periodic disturbance, overall stem density and fire intolerant species, like sassafras and hickory, increase in abundance.

Dominant resource concerns

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

Community 3.1
Black Oak – Hickory/Hophornbeam/ Virginia Wildrye

This is an uneven-aged forest management phase. Selective logging activities are removing higher volumes of white oak causing a decrease in white oak in the canopy and an increase in black oak and hickory. Densities numbers, especially more shade tolerant species, are increasing in the lower size-class levels.

State 4
Fire Managed Woodland

The Fire Managed Woodland state results from managing woodland communities (States 2 or 3) with prescribed fire and canopy thinning,. This state can resemble the Reference State, but with younger maximum tree ages, more open canopies and lower ground flora diversity. Cessation of prescribed fire will allow transition to various managed woodland states. If controlled grazing is introduced to this state, a silvopasture system can be created. Opening of the canopy may need to occur to allow sufficient light levels to exist for suitable grazing needs.

Community 4.1
White Oak-Black Oak/Little Bluestem

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

State 5
Grassland

Conversion of woodlands to planted, non-native cool season grassland species such as tall fescue is common for this region. Steep slopes, surface fragments, low organic matter contents and soil acidity make grasslands harder to maintain in a healthy, productive state on this ecological site. Two community phases are recognized in the grassland state, with shifts between phases based on types of management. Poor management will result in a shift to Community 5.2 that shows an increase in oak sprouting and increases in broomsedge densities. If grazing and active pasture management is discontinued, the site will eventually transition to State 2 from this phase.

Community 5.1
Tall Fescue-Red Clover

This is an herbaceous community that is typically dominated by tall fescue. Various other grass and forb species are typically present, in various amounts. Shrub and pioneer tree species such as eastern redcedar and black locust typically invade sites that are not regularly managed.

Community 5.2
Tall Fescue-Broomsedge/Oak Sprouts

This phase is the result of poor grassland management. Over grazing and little fertility application has allowed broomsedge and oak sprouts to increase in cover and density reducing overall forage quality and site productivity. Soil pH and bases such as calcium and magnesium are lower, relative to well-managed pastures.

Pathway P5.1A
Community 5.1 to 5.2

This pathway is the result of over grazing, no fertilization, and poor grassland management.

Pathway P5.2A
Community 5.2 to 5.1

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

State 6
High-Graded / Grazed Woodland

States that were subjected to repeated, high-grading timber harvests and uncontrolled domestic grazing transitioned to a High-Graded, Grazed Woodland state. This state exhibits an over-abundance of hickory and other less desirable tree species, and weedy understory species such as buckbrush, gooseberry, poison ivy and Virginia creeper. The existing vegetation offers little nutritional value for cattle, and excessive cattle stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Two common transitions from this state are woody clearing and conversion to State 5, grassland or removing livestock, limited harvesting, and allowing long term succession to occur to some other woodland state.

Community 6.1
Black Oak-Hickory/Sassafras/Buckbrush

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

Transition T1A
State 1 to 2

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

Transition T1B
State 1 to 3

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

Transition T1C
State 1 to 5

This transition is the result of clearing the woodland community and planting pasture species. Soil erosion can be extensive in this process, along with loss of organic matter. Liming and fertilizing associated with pasture management typically raises the soil pH and increases the cation concentration (such as calcium and magnesium) of the upper soil horizons.

Transition T1D
State 1 to 6

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

Restoration pathway R1B
State 2 to 1

This restoration transition generally requires forest management practices with extended rotations that allow mature trees to exceed ages of about 120 years along with prescribed fire.

Transition T2A
State 2 to 3

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

Transition T2B
State 2 to 4

This transition is the result of the systematic application of prescribed fire. Mechanical thinning may also be used.

Restoration pathway R1A
State 3 to 1

This restoration transition generally requires selective forest management practices with extended rotations that allow mature trees to exceed ages of about 120 years along with prescribed fire.

Transition T3A
State 3 to 2

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

Transition T3B
State 3 to 4

This transition is the result of the systematic application of prescribed fire. Mechanical thinning may also be used.

Transition T4A
State 4 to 2

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

Transition T4B
State 4 to 3

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

Transition T5A
State 5 to 2

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

Transition T5B
State 5 to 6

This transition is the result of light intermittent grazing, woody re-growth and fire suppression.

Transition T6B
State 6 to 3

This transition typically results from uneven-age timber management practices, such as single tree or group selection harvest. Tree planting, mechanical thinning and other timber stand improvement techniques may be helpful to decrease the transition time.

Transition T6A
State 6 to 5

This transition is the result of clearing the woodland communities and planting pasture species. Soil erosion can be extensive in this process, along with loss of organic matter. Liming and fertilizing associated with pasture management typically raises the soil pH and increases the cation concentration (such as calcium and magnesium) of the upper soil horizons.

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							
white oak	QUAL	*Quercus alba*	Native	–	20–40	–	–
black oak	QUVE	*Quercus velutina*	Native	–	20–40	–	–
post oak	QUST	*Quercus stellata*	Native	–	10–20	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	5–10	–	–
chinquapin oak	QUMU	*Quercus muehlenbergii*	Native	–	5–10	–	–
pignut hickory	CAGL8	*Carya glabra*	Native	–	5–10	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	5–10
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	5–10
big bluestem	ANGE	*Andropogon gerardii*	Native	–	5–10
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	5–10
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	5–10
parasol sedge	CAUM4	*Carex umbellata*	Native	–	5–10
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	5–10
fall panicgrass	PADI	*Panicum dichotomiflorum*	Native	–	5–10
Bosc's panicgrass	DIBO2	*Dichanthelium boscii*	Native	–	5–10
poverty oatgrass	DASP2	*Danthonia spicata*	Native	–	5–10
Forb/Herb					
spotted geranium	GEMA	*Geranium maculatum*	Native	–	1–5
Virginia springbeauty	CLVI3	*Claytonia virginica*	Native	–	1–5
woman's tobacco	ANPL	*Antennaria plantaginifolia*	Native	–	1–5
violet lespedeza	LEVI6	*Lespedeza violacea*	Native	–	1–5
prostrate ticktrefoil	DERO3	*Desmodium rotundifolium*	Native	–	1–5
smooth blue aster	SYLA3	*Symphyotrichum laeve*	Native	–	1–5
manyray aster	SYAN2	*Symphyotrichum*	Native	–	1–5

		anomalum			
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	1–5
nakedflower ticktrefoil	DENU4	*Desmodium nudiflorum*	Native	–	1–5
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	Native	–	1–5
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	1–5
Arkansas bedstraw	GAAR4	*Galium arkansanum*	Native	–	1–5
slender lespedeza	LEVI7	*Lespedeza virginica*	Native	–	1–5
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	1–5
American hogpeanut	AMBR2	*Amphicarpaea bracteata*	Native	–	1–5
rue anemone	THTH2	*Thalictrum thalictroides*	Native	–	1–5
spotted geranium	GEMA	*Geranium maculatum*	Native	–	1–5
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	1–5
Shrub/Subshrub					
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	5–10
American hazelnut	COAM3	*Corylus americana*	Native	–	5–10
New Jersey tea	CEAM	*Ceanothus americanus*	Native	–	5–10
leadplant	AMCA6	*Amorpha canescens*	Native	–	5–10

Animal community

Wildlife Species (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.

Oaks provide hard mast; scattered shrubs provide soft mast; native legumes provide high-quality wildlife food; sedges and native cool-season grasses provide green browse; patchy native warm-season grasses 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 mature communities include Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Eastern Wood-Pewee, Broad-winged Hawk, Great-Crested Flycatcher, Summer Tanager, and Red-eyed Vireo.

Reptile and amphibian species associated with the Upland Woodland include tiger salamander, small-mouthed salamander, ornate box turtle, northern fence lizard, five-lined skink, broad-headed skink, flat-headed snake, and rough earth snake.

Other information

Forestry (NRCS 2002, 2014):
Management: Field measured site index values average 58 for white oak, 68 for shortleaf pine and 64 for black oak. Timber management opportunities are good. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. Using prescribed fire as a management tool could have a negative impact on timber quality, may not be fitting, or should be used with caution on a particular site if timber management is the primary objective.

Limitations: No major equipment restrictions or limitations exist. Erosion is a hazard when slopes exceed 15 percent.

Inventory data references

Potential Reference Sites: Loamy Upland Woodland

Plot DANVCA01 – Courtois soil
Located in Danville CA, Montgomery County, Missouri
Latitude: 38.867651
Longitude: -91.501416

Plot VIGLCA01 – Useful soil
Located in Victoria Glade CA, Jefferson County, Missouri
Latitude: 38.202369
Longitude: -90.551657

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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	04/11/2026
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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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:**