USDA Natural Resources Conservation Service

Ecological site F115XB004MO
Loess Upland Woodland

Accessed: 04/27/2024

General information

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

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 115X–Central Mississippi Valley Wooded Slopes

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

Classification relationships

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

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Quercus alba - Quercus stellata - Quercus velutina / Schizachyrium scoparium Woodland (CEGL002150).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs in several Land Type Associations of the following Subsections:
Outer Ozark Border
Mississippi River Hills

Ecological site concept

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

Loess Upland Woodlands (green areas on the map) are on upland summit crests north of the Missouri River, not adjacent to the Missouri River floodplain. Soils are very deep, with no rooting restrictions. The reference plant community is woodland with an overstory dominated by white oak, with minor amounts of black oak, and a ground flora of native grasses and forbs.

Associated sites

F115XB005MO	**Loamy Upland Woodland** Loamy Upland Woodland include different soils formed in both sandstone and limestone.
F115XB011MO	**Chert Protected Backslope Forest** Chert Protected Backslope Forest occur downslope and steep north facing backslopes.
F115XB013MO	**Chert Upland Woodland** Chert Upland Woodland occur downslope on limestone derived soils.
F115XB048MO	**Chert Exposed Backslope Woodland** Chert Exposed Backslope Woodlands occur downslope and steep south facing backslopes.

Similar sites

F109XY003MO	**Loess Upland Woodland** Loess Upland Woodlands are similar but associated with MLRA 109 assigned soils.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus velutina*
Shrub	(1) *Rhus aromatica*
Herbaceous	(1) *Elymus virginicus* (2) *Carex pensylvanica*

Physiographic features

This site is on upland summit crests and shoulders, with slopes of 2 to 9 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.
The adjacent figure (adapted from Held, 1978) 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 “1”. Sites north of the Missouri River are commonly underlain by a thin layer of till, as shown in the figure. A variety of ecological sites may occur downslope, depending on local stratigraphy and degree of landscape dissection. For example, Loamy Upland Woodlands (labeled “4”) include different soils formed in both sandstone and limestone.

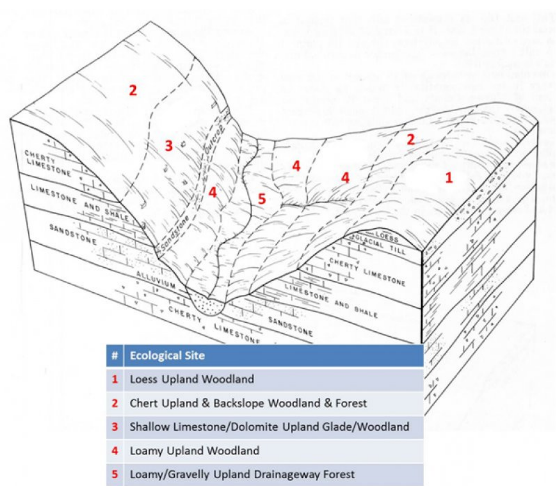


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Interfluve (2) Ridge (3) Hill
Flooding frequency	None
Ponding frequency	None
Slope	2–9%
Water table depth	19–30 in
Aspect	Aspect is not a significant factor

Climatic features

The Central Mississippi Valley Wooded Slopes, Western Part has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce abundant amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over the region, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

The Central Mississippi Valley Wooded Slopes, Western Part experiences regional differences in climates, but these differences do not have obvious geographic boundaries. Regional climates grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line diagonally crossing the MLRA from northwest to southeast. Both mean annual temperature and precipitation exhibit gradients along this line.

The average annual precipitation in most of this area is 38 to 48 inches. The average annual temperature is 53 to 57 degrees F. Mean January minimum temperature follows the northwest-to-southeast gradient. However, mean July maximum temperature shows hardly any geographic variation in the MLRA. Mean July maximum temperatures have a range of only two or three degrees across the area.
Mean annual precipitation varies along the same gradient as temperature. Seasonal climatic variations are more complex. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages three to four times greater than January precipitation. Most of the rainfall occurs as high-intensity, convective thunderstorms in summer. Snowfall is common in winter.

During years when precipitation is normal, moisture is stored in the soil profile during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Drought directly affects plant and animal life by limiting water supplies, especially at times of high temperatures and high evaporation rates.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. In regions of appreciable relief, for example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Higher daytime temperatures of bare rock surfaces and higher reflectivity of these unvegetated surfaces create characteristic glade and cliff ecological sites. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier than adjacent north- and-east-facing slopes. Finally, the climate within a canopied forest ecological site is measurably different from the climate of the more open grassland or savanna ecological sites.

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

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

Table 3. Representative climatic features

Frost-free period (average)	176 days
Freeze-free period (average)	203 days
Precipitation total (average)	46 in

Climate stations used

- (1) COLUMBIA U OF M [USC00231801], Columbia, MO
- (2) FULTON [USC00233079], Fulton, 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 have no major rooting restriction. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is loess over pedisediment and till. The soils have silt loam surface horizons. Subsoils are silt loam to silty clay loam. These soils are slightly affected by seasonal wetness. Soil series associated with this site include Gorin and Hatton.

Table 4. Representative soil features

Surface texture	(1) Silt loam
Family particle size	(1) Clayey
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Very slow
Soil depth	72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–7 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)	0–2%

Subsurface fragment volume >3" (Depth not specified)	0%

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 well-developed woodland dominated by an overstory of white oak, along with occasional black oak. The canopy is moderately tall (65 to 80 feet) but less dense (55 to 75 percent canopy closure) and less structurally diverse than the adjacent protected slopes. Increased light from a more 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.

Because of their proximity to prairies, fire played a significant role in the maintenance of these systems, more so than the sites to the south. It is likely that these ecological sites burned at least once every 3 to 10 years. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. During fire free intervals, woody understory species increased and the herbaceous understory diminished. The return of fire would open the woodlands up again and stimulate the abundant ground flora.

Loess 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 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 woodland ground flora species.

Today, these ecological sites have been cleared and converted to pasture and cropland 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 and sugar maple, encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration means.

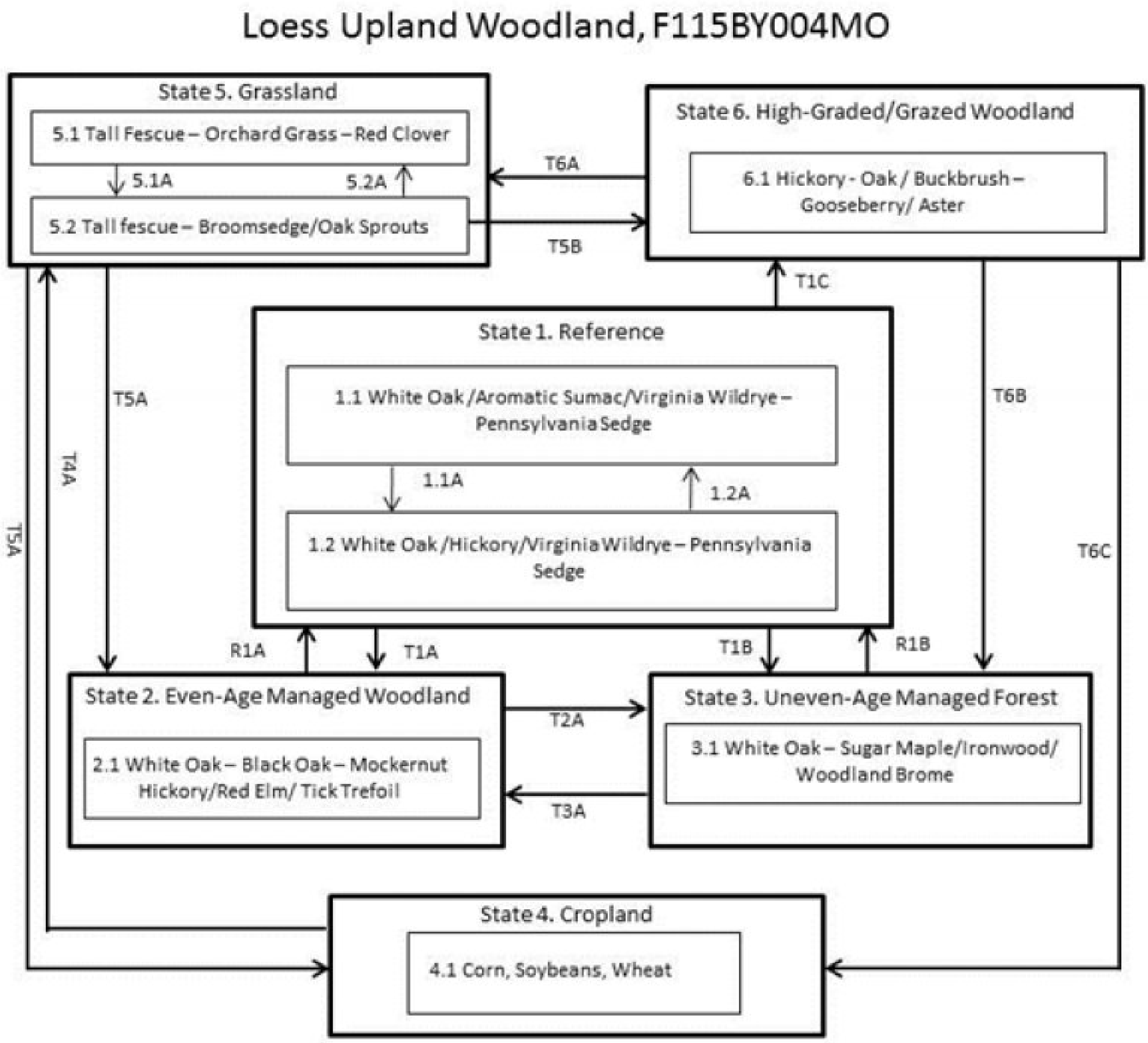
Uncontrolled domestic grazing has also impacted these communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as buckbrush, gooseberry, and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction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

These ecological sites are moderately productive. Oak regeneration is typically problematic. Sugar maple, red elm, and hickories are often dominant competitors in the understory. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects. Single tree selection timber harvests are common in this region and often results in removal of the most productive trees (high grading) in the stand leading to poorer quality timber and a shift in species composition away from more valuable oak species. Better planned single tree selection or the creation of group openings can help regenerate and maintain more desirable oak species and increase vigor on the residual trees.

Clearcutting also occurs and results in dense, even-aged stands dominated by oak. This may be most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands and the application of prescribed fire, the ground flora diversity may 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



Code	Activity/Process
T1A	Fire suppression; even-aged management
T1B	Fire suppression; uneven-age management
T1C, T5B	Poorly planned harvest; uncontrolled grazing
T2A	Uneven-age management; extended rotations
T3A	Even-age management; thinning
T4A	Pasture planting; prescribed grazing
T5A	Tillage; crop rotation
T6A	Clearing; pasture planting; prescribed grazing
T6B	Uneven-age management; tree planting
T6C	Clearing; tillage; crop rotation
R1A, R1B	Prescribed fire; extended rotations

Code	Activity/Process
1.1A	No disturbance >10 years
1.2A	Disturbance (fire, wind, ice) < 10 years
5.1A	Over grazing; no fertilization
5.2A	Brush management; prescribed grazing

Figure 7. State and transition diagram for this ecological s

State 1

Reference

The historical reference state for this ecological site was old growth oak woodland. The woodland was dominated by white oak and black oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice as well as grazing by native large herbivores 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 very rare today. Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Most Reference States are currently altered because of timber harvesting, domestic grazing or clearing and conversion to grassland or cropland.

Community 1.1
White Oak /Aromatic Sumac/Virginia Wildrye – Pennsylvania Sedge

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.

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
White Oak /Hickory/Virginia Wildrye – Pennsylvania Sedge

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.

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).

State 2
Even-Age Managed Woodland

An even-age managed forest can resemble the reference state. The primary 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 harvests and disturbance activities. 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. This state can be restored to a reference state by modifying or eliminating timber harvests, extending rotations, incorporating selective thinning, and re-introducing prescribed fire.

Community 2.1
White Oak – Black Oak – Mockernut Hickory/Red Elm/ Tick Trefoil

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 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 Forest

Due to selective single tree harvesting canopy densities have increased. Composition is likely altered from the Reference State depending on tree selection during harvest. This state will slowly increase in more shade tolerant species and white oak will become less dominant and is also dense because of fire suppression. Without periodic canopy disturbance, stem density and fire intolerant species, like hickory and maple will increase in abundance. This state can be restored to a reference state by modifying or eliminating timber harvests, extending rotations, incorporating selective thinning, and re-introducing prescribed fire.

Community 3.1
White Oak – Sugar Maple/Ironwood/ Woodland Brome

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 northern red oak and sugar maple. Densities numbers, especially more shade tolerant species, are increasing at the lower size-class levels.

State 4
Cropland

This is a State that exists currently with intensive cropping of corn, soybeans, and wheat occurring especially when commodity prices are high. Some conversion to cool season grassland occurs for a limited period of time before transitioning back to cropland. Limited acres are sometimes converted to native warm season grassland.

Community 4.1
Corn, Soybeans, Wheat

This phase exists currently with intensive cropping of corn, soybeans, and wheat occurring. Some conversion to cool season grassland occurs for a limited period of time before transitioning back to cropland.

State 5
Grassland

Conversion of other states to non-native cool season species such as tall fescue, orchard grass, 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 an even-age managed woodland (livestock controlled and woodland management initiated) or to a high-graded/grazed woodland (continued grazing, high graded harvesting, and no woodland management).

Community 5.1
Tall Fescue – Orchard Grass – 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 5.2
Tall fescue – Broomsedge/Oak Sprouts

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

State 6
High Graded/Grazed Woodland

States that were subjected to repeated, high-grading timber harvests and uncontrolled domestic grazing will transition 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 4, Grassland or removing livestock, limited harvesting, and allowing long term succession to occur to some other woodland or forest state.

Community 6.1
Hickory - Oak / Buckbrush – Gooseberry/ Aster

Due to high-grade logging and uncontrolled grazing, this community phase exhibits an over-abundance of hickory and other less economically desirable tree species and weedy understory species such as buckbrush, gooseberry, poison ivy and multi-flora rose. The understory vegetation offers little nutritional value for cattle, and excessive livestock stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff.

Additional community tables

Table 5. Community 1.2 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	–	2–95	–	–
post oak	QUST	*Quercus stellata*	Native	–	5–75	–	–
black oak	QUVE	*Quercus velutina*	Native	–	5–20	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	5–10	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	2–5	–	–
mockernut hickory	CATO6	*Carya tomentosa*	Native	–	–	–	–

Table 6. Community 1.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	1–10
James' sedge	CAJA2	*Carex jamesii*	Native	–	1–5
poverty oatgrass	DASP2	*Danthonia spicata*	Native	–	1–2
eastern woodland sedge	CABL	*Carex blanda*	Native	–	0.1–2
blue sedge	CAGL6	*Carex glaucodea*	Native	–	1–2
nodding fescue	FESU3	*Festuca subverticillata*	Native	–	1–2
slimleaf panicgrass	DILI2	*Dichanthelium linearifolium*	Native	–	1–2
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	0.1–2
big bluestem	ANGE	*Andropogon gerardii*	Native	–	–
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	–
parasol sedge	CAUM4	*Carex umbellata*	Native	–	–
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	–
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	–
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	–
Forb/Herb					
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	1–25
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	1–10
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	2–10
trailing lespedeza	LEPR	*Lespedeza procumbens*	Native	–	5–10
largebract ticktrefoil	DECU	*Desmodium cuspidatum*	Native	–	1–10
Dillenius' ticktrefoil	DEGL4	*Desmodium glabellum*	Native	–	2–5
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	2–5
mayapple	POPE	*Podophyllum peltatum*	Native	–	1–5
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	Native	–	1–5
clustered blacksnakeroot	SAOD	*Sanicula odorata*	Native	–	1–2
manyray aster	SYAN2	*Symphyotrichum anomalum*	Native	–	1–2
smooth violet prairie aster	SYTU2	*Symphyotrichum turbinellum*	Native	–	1–2
violet lespedeza	LEVI6	*Lespedeza violacea*	Native	–	1–2
slender lespedeza	LEVI7	*Lespedeza virginica*	Native	–	1–2
nakedflower ticktrefoil	DENU4	*Desmodium nudiflorum*	Native	–	–
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	–
Shrub/Subshrub					
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	1–10
blackhaw	VIPR	*Viburnum prunifolium*	Native	–	2–5
leadplant	AMCA6	*Amorpha canescens*	Native	–	1–2

Table 7. Community 1.4 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	–	2–95	–	–
post oak	QUST	*Quercus stellata*	Native	–	5–75	–	–
black oak	QUVE	*Quercus velutina*	Native	–	5–20	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	5–10	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	2–5	–	–
mockernut hickory	CATO6	*Carya tomentosa*	Native	–	–	–	–

Table 8. Community 1.4 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	1–10
James' sedge	CAJA2	*Carex jamesii*	Native	–	1–5
poverty oatgrass	DASP2	*Danthonia spicata*	Native	–	1–2
eastern woodland sedge	CABL	*Carex blanda*	Native	–	0.1–2
blue sedge	CAGL6	*Carex glaucodea*	Native	–	1–2
nodding fescue	FESU3	*Festuca subverticillata*	Native	–	1–2
slimleaf panicgrass	DILI2	*Dichanthelium linearifolium*	Native	–	1–2
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	0.1–2
big bluestem	ANGE	*Andropogon gerardii*	Native	–	–
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	–
parasol sedge	CAUM4	*Carex umbellata*	Native	–	–
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	–
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	–
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	–
Forb/Herb					
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	1–25
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	1–10
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	2–10
trailing lespedeza	LEPR	*Lespedeza procumbens*	Native	–	5–10
largebract ticktrefoil	DECU	*Desmodium cuspidatum*	Native	–	1–10
Dillenius' ticktrefoil	DEGL4	*Desmodium glabellum*	Native	–	2–5
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	2–5
mayapple	POPE	*Podophyllum peltatum*	Native	–	1–5
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	Native	–	1–5
clustered blacksnakeroot	SAOD	*Sanicula odorata*	Native	–	1–2
manyray aster	SYAN2	*Symphyotrichum anomalum*	Native	–	1–2
smooth violet prairie aster	SYTU2	*Symphyotrichum turbinellum*	Native	–	1–2
violet lespedeza	LEVI6	*Lespedeza violacea*	Native	–	1–2
slender lespedeza	LEVI7	*Lespedeza virginica*	Native	–	1–2
nakedflower ticktrefoil	DENU4	*Desmodium nudiflorum*	Native	–	–
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	–
Shrub/Subshrub					
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	1–10
blackhaw	VIPR	*Viburnum prunifolium*	Native	–	2–5
leadplant	AMCA6	*Amorpha canescens*	Native	–	1–2

Animal community

Wildlife Species (MDC 2006):

Hard mast from the oaks, soft mast from shrubs, high nutrition seeds and forage is abundant in this ecological site. These food values and the two-tiered structure are attractive to abundant wildlife.

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.

Bird species associated with this ecological site include Red-headed Woodpecker, Eastern Wood-Pewee, Broad-winged Hawk, Great-Crested Flycatcher, Summer Tanager, Red-eyed Vireo, and Yellow-billed Cuckoo.

Amphibians and reptiles associated with ecological site 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 collected site index values average 54 for white oak and 61 for black oak. Timber management opportunities are moderately 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 and 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. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

Inventory data references

Loess Upland Woodland – Potential Reference – F115BY004MO

Plot RUBECA_JK02 - Hatton soil
Located in Rudolf Bennitt CA, Randolph County, MO
Latitude: 39.249047
Longitude: -92.43187

Plot DABOCA_JK07 - Hatton soil
Located in Daniel Boone CA, Warren County, MO
Latitude: 38.779304
Longitude: -91.393301

Plot WHCRCA02 - Hatton soil
Located in Whetstone Creek CA, Callaway County, MO
Latitude: 38.96724
Longitude: -91.721492

Plot REIFCA_JK01 - Hatton soil
Located in Reifsnider CA, Warren County, MO
Latitude: 38.77194
Longitude: -91.10139

Plot REIFCA_JK15 - Hatton soil
Located in Reifsnider CA, Warren County, MO
Latitude: 38.77367
Longitude: -91.10602

Other references

Held, Robert J. 1978. Soil Survey of Montgomery and Warren Counties, Missouri. U.S. Dept. of Agric. Soil Conservation Service.

MDC, 2006. Missouri Forest and Woodland Community Profiles. Missouri Department of Conservation, Jefferson City, Missouri.

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

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

NatureServe, 2010. Vegetation Associations of Missouri (revised). NatureServe, St. Paul, Minnesota.

Nelson, Paul W. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

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

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

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

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

Contributors

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Rangeland health reference sheet

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

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

Indicators

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

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

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

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

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

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

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

17. **Perennial plant reproductive capability:**