USDA Natural Resources Conservation Service

Ecological site F115XB003MO
Deep Loess Protected Backslope Forest

Accessed: 05/14/2024

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 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 Mixed Hardwood Mesic Forest.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Quercus alba - Quercus rubra - Acer saccharum - Carya cordiformis / Lindera benzoin Forest (CEGL002058).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs in many Land Type Associations of the following Subsections:
Inner Ozark Border
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”.

Deep Loess Protected Backslope Forests are within the green areas on the map. They occupy the northerly and

easterly aspects of steep, dissected slopes, and are mapped in complex with the Deep Loess Exposed Backslope Woodland ecological site. These sites are adjacent to the Missouri and Mississippi River Floodplains. In some areas they occupy the entire hillslope. In other areas, Chert or Limestone/Dolomite ecological sites are on lower slopes. Upslope summit areas are typically Deep Loess Upland Woodland ecological sites. Soils are very deep, with no rooting restrictions. 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

F115XB001MO	**Deep Loess Upland Woodland** Deep Loess Upland Woodlands are upslope on summit positions from this ecological site
F115XB008MO	**Loamy Limestone/Dolomite Protected Backslope Forest** Loamy Limestone/Dolomite Protected Backslope Forests are on similar aspects but on the lower backslopes underlain with limestone and/or dolomite bedrock at 20 to 40 inches.
F115XB045MO	**Loamy Limestone/Dolomite Exposed Backslope Woodland** Loamy Limestone/Dolomite Exposed Backslope Woodlands are on the lower exposed backslopes underlain with limestone and/or dolomite bedrock at 20 to 40 inches.
R115XB018MO	**Limestone/Dolomite Protected Cliff** Limestone/Dolomite Protected Cliffs are sometimes present below this ecological site on major floodplains.

Similar sites

F115XB043MO	**Deep Loess Exposed Backslope Woodland** Deep Loess Exposed Backslope Woodlands are mapped in a complex with this ecological site on south and west facing slopes

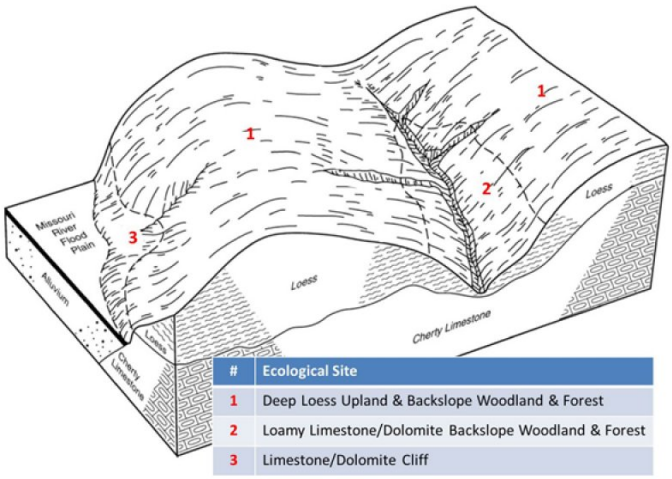
Table 1. Dominant plant species

Tree	(1) *Quercus rubra* (2) *Quercus alba*
Shrub	(1) *Asimina triloba*
Herbaceous	(1) *Laportea canadensis* (2) *Erigenia bulbosa*

Physiographic features

This site is on upland backslopes, with slopes of 15 to 60 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 accompanying figure (adapted from Young et al., 2003) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites in the uplands adjacent to the Missouri River. The site is within the area labeled “1”, on steep backslopes with northerly and easterly aspects. Deep Loess Upland sites are directly upslope, and are included within the area labeled “1”.



#	Ecological Site
1	Deep Loess Upland & Backslope Woodland & Forest
2	Loamy Limestone/Dolomite Backslope Woodland & Forest
3	Limestone/Dolomite Cliff

Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Slope	15–60%
Water table depth	91–152 cm
Aspect	N, NE, E

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)	171 days
Freeze-free period (average)	197 days
Precipitation total (average)	1,168 mm

Climate stations used

- (1) WELDON SPRING NWS [USC00238805], Saint Charles, MO
- (2) ALTON MELVIN PRICE L&D [USC00110137], West Alton, IL
- (3) NEW FRANKLIN 1W [USC00236012], Franklin, MO
- (4) JACKSON [USC00234226], Jackson, 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. The soils have silt loam surface horizons. Subsoils are silt loam to silty clay loam. Some soils are slightly affected by seasonal wetness. Soil series associated with this site include Bold, Drury, Menfro, Stookey, Sylvan, and Winfield.

The accompanying picture of the Menfro series shows a thin, light-colored surface horizon to about 7 inches overlying the brown silt loam to silty clay loam subsoil. The excellent rooting characteristics of Menfro and other soils allow for productive, diverse reference vegetation communities on this ecological site. Scale is in feet.

Figure 7. Menfro series

Table 4. Representative soil features

Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow
Soil depth	183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	17.78–20.32 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)	0%
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 forest dominated by an overstory of northern red oak, white oak, white ash, black walnut and sugar maple. The canopy is tall (80 to 100 feet) and well developed (80 to 100 percent closure) with great structural diversity. In the most mesic landscape positions, more shade tolerant and moisture loving

species, such as basswood, coffee tree, and bitternut hickory would have been in greater abundance.

While fire-prone prairies, savannas and open woodlands surround this region, Deep Loess Protected Backslope Forests historically occurred in the most protected landscape positions on lower, steep slopes in the deeper valleys furthest from the prairie uplands and would have burned less frequently (estimated 15 to 25 years) and with lower intensity. Periodic fires would have removed some of the shade tolerant understory, but it would have quickly recovered.

Deep Loess Protected Backslope Forests would have also been subjected to occasional disturbances from wind and ice, as well as grazing by native 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. Such canopy disturbances allowed more light to reach the ground and favored reproduction of the dominant oak species. Grazing by native large herbivores would have kept understory conditions more open, also creating conditions more favorable to oak reproduction.

Today, most of 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. A few reference states still can be found, primary on public lands. An increase in hickories 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 hickories to increase in abundance.

Current domestic grazing has diminished the diversity and amount of cover of forest ground flora species, and has introduced weedy species such as gooseberry, buckbrush, poison ivy and Virginia creeper created a more open understory and increased soil compaction.
Deep Loess Protected Backslope Forests are the most productive upland 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, ironwood, hickories, grapes, pawpaw and 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 very 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, but targeting them solely for woodland restoration is not advisable.

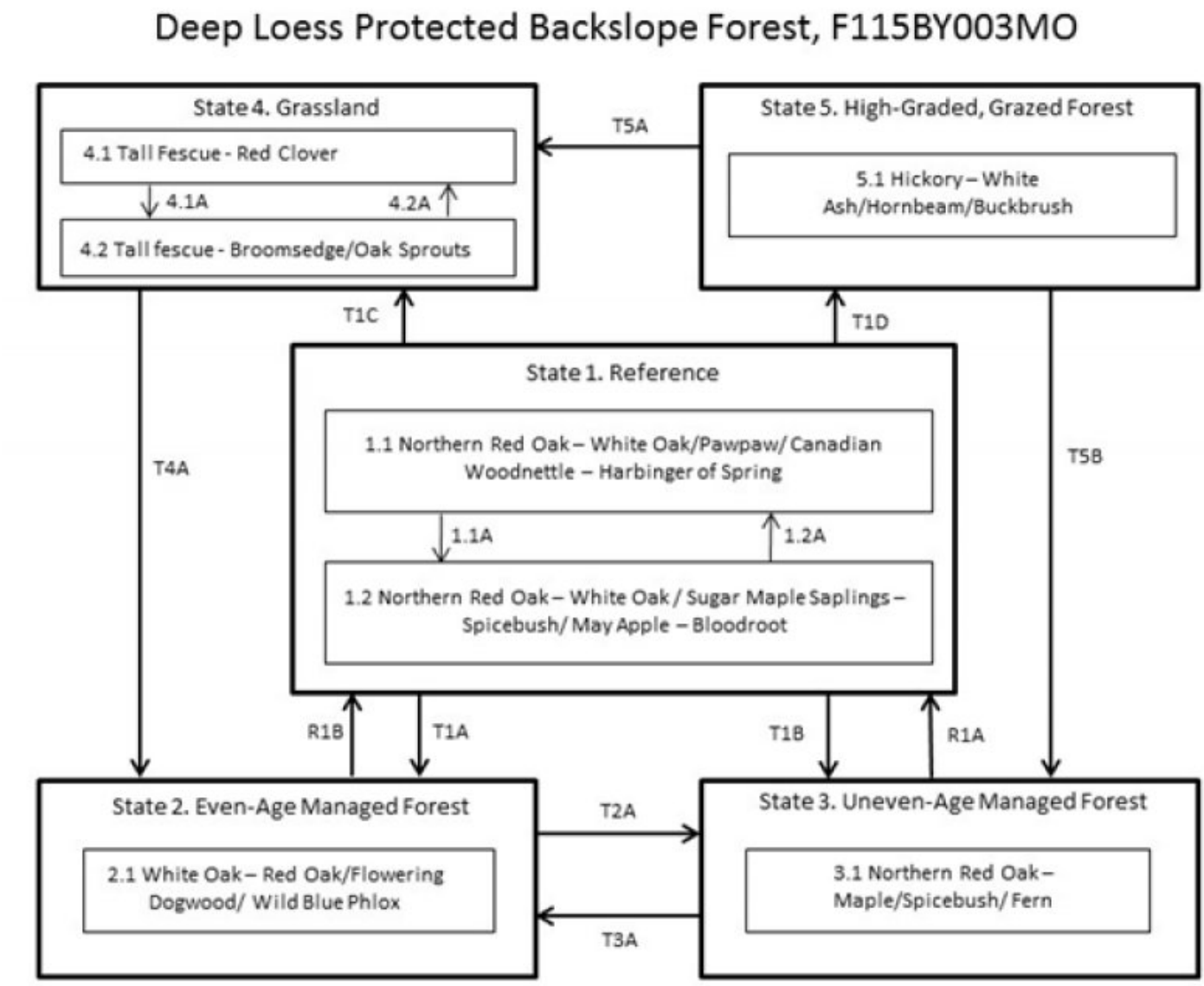
A State and Transition Diagram follows. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases

Ecological Site Correlation Issues and Questions:

The Illinois NRCS state office staff has requested the Illinois map units that are unique to Illinois (e.g. Sylvan, Bold) have further field investigation. This would include the following ecological sites: F115BY003MO and F115BY043MO

The Deep Loess Backslope ecological sites (F115BY003MO, F115BY043MO) may have some overstory tree species differences related to map units on the Illinois side verses the map units on the Missouri side. Further field review is needed.

State and transition model



Code	Activity/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	Activity/Event/Process
1.1A	No disturbance (20+ yrs)
1.2A	Disturbance (fire, wind, ice) < 10 yrs
4.1A	Over grazing; no fertilization
4.2A	Brush management; grassland seeding; grassland management

Code	Activity/Event/Process
R1A	Extended rotations
R1B	Uneven-age mgt, extended rotations

Figure 8. State and transition diagram for this ecological s

State 1
Reference

The Reference State was dominated by white oak and northern red oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the dominance of white oak and no red oak by opening up the canopy and allowing more light oak reproduction. Long disturbance-free periods allowed an increase in more shade tolerant species such as basswood and sugar maple. Two community phases are recognized in this state, with shifts between phases based on disturbance frequency. This Reference State is rare 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). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Many Reference sites have been managed for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) forests.

Community 1.1
Northern Red Oak – White Oak/Pawpaw/ Canadian Woodnettle – Harbinger of Spring

Figure 9. MDC Hart Creek Conservation Area, Boone County, MO

This community is the most productive upland forest in the MLRA. This forest community has a multi-tiered structure, and a canopy that is 75 to 100 feet tall with 80 to 100 percent closure. The sub-canopy and understory are well developed. An abundance of shade tolerant forest generalists, such as May apple, Christmas fern, tick trefoil and white snakeroot, cover the ground. In the absence of disturbance, more shade tolerant species increase such as sugar maple, basswood, white ash and others increase in importance and add structural diversity to the system. In addition, more shade-loving forest shrub (e.g., spicebush) and herbaceous (e.g., bloodroot) species also increase.

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
Northern Red Oak – White Oak / Sugar Maple Saplings – Spicebush/ May Apple – Bloodroot

The overstory is a mixture of more shade tolerant species such as northern red oak, sugar maple, basswood, white ash and others. This forest community has a multi-tiered structure, and a canopy that is 75 to 100 feet tall with 90 to 100 percent closure. An abundance of shade tolerant forest generalists, such as May apple, Christmas fern, tick trefoil and white snakeroot, cover the ground. In addition, more shade-loving forest shrub (e.g., spicebush) and herbaceous (e.g., bloodroot) species are common.

State 2
Even-Age Managed Forest

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

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

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

Uneven-Age Managed forests 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
Northern Red Oak – Maple/Spicebush/ Fern

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
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 to State 2 (Even-Age).

Community 4.1
Tall fescue - Broomsedge/Oak Sprouts

This phase is well managed grassland, composed of non-native cool season grasses and legumes. Grazing and haying is occurring.

Community 4.2
Tall Fescue - Red Clover

This phase is well managed grassland, composed of non-native cool season grasses and legumes. Grazing and haying is occurring.

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 buckbrush, gooseberry, poison ivy and Virginia creeper. The vegetation offers little nutritional value for cattle, and excessive stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Exclusion of livestock from sites in this state coupled with uneven-age management techniques will cause a transition to State 3 (Uneven-Age).

Community 5.1
Hickory – White Ash/Hornbeam/Buckbrush

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 1.1 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	–	30–50	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	30–50	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	5–20	–	–
slippery elm	ULRU	*Ulmus rubra*	Native	–	10–20	–	–
white ash	FRAM2	*Fraxinus americana*	Native	–	10–20	–	–
black walnut	JUNI	*Juglans nigra*	Native	–	5–10	–	–
bitternut hickory	CACO15	*Carya cordiformis*	Native	–	5–10	–	–
American basswood	TIAM	*Tilia americana*	Native	–	5–10	–	–
tuliptree	LITU	*Liriodendron tulipifera*	Native	–	1–5	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
eastern woodland sedge	CABL	*Carex blanda*	Native	–	0–5
Forb/Herb					
wild blue phlox	PHDI5	*Phlox divaricata*	Native	–	10–30
mayapple	POPE	*Podophyllum peltatum*	Native	–	10–30
harbinger of spring	ERBU	*Erigenia bulbosa*	Native	–	10–30
Virginia springbeauty	CLVI3	*Claytonia virginica*	Native	–	10–30
dutchman's breeches	DICU	*Dicentra cucullaria*	Native	–	10–20
white fawnlily	ERAL9	*Erythronium albidum*	Native	–	10–20
Virginia snakeroot	ARSE3	*Aristolochia serpentaria*	Native	–	10–20
white baneberry	ACPA	*Actaea pachypoda*	Native	–	5–20
largeflower bellwort	UVGR	*Uvularia grandiflora*	Native	–	10–20
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	–	10–20
toadshade	TRSE2	*Trillium sessile*	Native	–	10–20
smooth Solomon's seal	POBI2	*Polygonatum biflorum*	Native	–	10–20
goldenseal	HYCA	*Hydrastis canadensis*	Native	–	10–20
Jack in the pulpit	ARTR	*Arisaema triphyllum*	Native	–	10–20
green dragon	ARDR3	*Arisaema dracontium*	Native	–	5–10
Fern/fern ally					
Christmas fern	POAC4	*Polystichum acrostichoides*	Native	–	5–20
broad beechfern	PHHE11	*Phegopteris hexagonoptera*	Native	–	5–20
Shrub/Subshrub					
northern spicebush	LIBE3	*Lindera benzoin*	Native	–	5–10
Tree					
pawpaw	ASTR	*Asimina triloba*	Native	–	5–20
American bladdernut	STTR	*Staphylea trifolia*	Native	–	5–10
flowering dogwood	COFL2	*Cornus florida*	Native	–	5–10
hophornbeam	OSVI	*Ostrya virginiana*	Native	–	5–10
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	10–20

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.

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 collected site index values average 77 for all species and 87 for northern red 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. Where possible, favor white oak, black walnut, black cherry, and northern red oak.

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

Deep Loess Protected Backslope Forest – Potential Reference – F115BY003MO

Plot HACRCA_JK02 – Menfro soil
Located in Hart Creek CA, Boone County, MO
Latitude: 38.718586
Longitude: -92.32617966

Plot HACRCA_JK03 – Menfro soil
Located in Hart Creek CA, Boone County, MO
Latitude: 38.718249
Longitude: -92.32712605

Plot HACRCA_JK04 – Menfro soil
Located in Hart Creek CA, Boone County, MO
Latitude: 38.712871
Longitude: -92.3291663

Plot HACRCA_JK06 – Menfro soil
Located in Hart Creek CA, Boone County, MO
Latitude: 38.713392
Longitude: -92.32873587

Plot HACRCA_JK07 – Menfro soil
Located in Hart Creek CA, Boone County, MO
Latitude: 38.713025
Longitude: -92.32772712

Plot HACRCA_KS06 – Menfro soil
Located in Hart Creek CA, Boone County, MO
Latitude: 38.711684
Longitude: -92.327958

Plot ROCACA_JK02 – Menfro soil
Located in Rocheport Cave CA, Boone County, MO
Latitude: 38.94349
Longitude: -92.51829435

Plot SCWOUM_JK03 – Menfro soil
Located in Schnabel Woods, UMC, Boone County, MO

Latitude: 38.870443
Longitude: -92.42655746

Plot SCWOUM_JK04 – Menfro soil
Located in Schnabel Woods, UMC, Boone County, MO
Latitude: 38.8743
Longitude: -92.42840552

Plot SCWOUM03 – Menfro soil – no veg
Located in Schnabel Woods, UMC, Boone County, MO
Latitude: 38.870461
Longitude: -92.426545

Plot TRTESP_KS03 – Menfro soil – no veg cover
Located in Trail of Tears SP, Cape Girardeau County, MO
Latitude: 37.468375
Longitude: -89.487986

Other references

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

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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:

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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):**

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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:**
