Ecological site F115XB043MO
Deep Loess Exposed Backslope Woodland

Last updated: 12/30/2024
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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.

MLRA notes

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

This MLRA is characterized by deeply dissected, loess-covered hills bordering well defined valleys of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers and their tributaries. It is used to produce cash crops and livestock. About one-third of the area is forested, mostly on the steeper slopes. This area is in Illinois (50 percent), Missouri (36 percent), Indiana (13 percent), and Iowa (1 percent) in two separate areas. It makes up about 25,084 square miles (64,967 square kilometers). Most of this area is in the Till Plains section and the Dissected Till Plains section of the Central Lowland province of the Interior Plains. The Springfield-Salem plateaus section of the Ozarks Plateaus province of the Interior Highlands occurs along the Missouri River and the Mississippi River south of the confluence with the Missouri River. The nearly level to very steep uplands are dissected by both large and small tributaries of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers. The Ohio River flows along the southernmost boundary of this area in Indiana. Well defined valleys with broad flood plains and numerous stream terraces are along the major streams and rivers. The flood plains along the smaller streams are narrow. Broad summits are nearly level to undulating. Karst topography is common in some parts along the Missouri and Mississippi Rivers and their tributaries. Well-developed karst areas have hundreds of sinkholes, caves, springs, and losing streams. In the St. Louis area, many of the karst features have been obliterated by urban development. Elevation ranges from 90 feet (20 meters) on the southernmost flood plains to 1,030 feet (320 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters) but can be 50 to 150 feet (15 to 45 meters) in the steep, deeply dissected hills bordering rivers and streams. The bluffs along the major rivers are generally 200 to 350 feet (60 to 105 meters) above the valley floor. The uplands in this MLRA are covered almost entirely with Peoria Loess. The loess can be more than 7 feet (2 meters) thick on stable summits. On the steeper slopes, it is thin or does not occur. In Illinois, the loess is underlain mostly by Illinoian-age till that commonly contains a paleosol. Pre-Illinoian-age till is in parts of this MLRA in Iowa and Missouri and to a minor extent in the western part of Illinois. Wisconsin-age outwash, alluvial deposits, and sandy eolian material are on some of the stream terraces and on dunes along the major tributaries. The loess and glacial deposits are underlain by several bedrock systems. Pennsylvanian and Mississippian bedrock are the most extensive. To a lesser extent are Silurian, Devonian, Cretaceous, and Ordovician bedrock. Karst areas have formed where limestone is near the surface, mostly in the southern part of the MLRA along the Mississippi River and some of its major tributaries. Bedrock outcrops are common on the bluffs along the Mississippi, Ohio, and Wabash Rivers and their major tributaries and at the base of some steep slopes along minor streams and drainageways. The annual precipitation ranges from 35 to 49 inches (880 to 1,250 millimeters) with a mean of 41 inches (1,050 millimeters). The annual temperature ranges from 48 to 58 degrees F (8.6 to 14.3 degrees C) with a mean of 54 degrees F (12.3 degrees C). The freeze-free period ranges from 150 to 220 days with a mean of 195 days. Soils The dominant soil orders are Alfisols and, to a lesser extent, Entisols and Mollisols. The soils in the area have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or smectitic mineralogy. They are shallow to very deep, excessively drained to poorly drained, and loamy, silty, or clayey. The soils on uplands in this area support natural hardwoods. Oak, hickory, and sugar maple are the dominant species. Big bluestem, little bluestem, and scattered oak and eastern redcedar grow on some sites. The soils on flood plains support mixed forest vegetation, mainly American elm, eastern cottonwood, river birch, green ash, silver maple, sweetgum, American sycamore, pin oak, pecan, and willow. Sedge and grass meadows and scattered trees are on some low-lying sites. (United States Department of Agriculture, Natural Resources Conservation Service, 2022)

LRU notes

The Central Mississippi Valley Wooded Slopes, Western Part consists of deeply dissected, loess-covered hills bordering the Missouri and Mississippi Rivers as well as floodplains and terraces of these rivers. The Northern boundary runs along the South Fabius River valley separating it from the broad rounded interfluves of the northern till plain. A major physiographic feature within the LRU (Land Resource Unit) includes the Lincoln Hills region. The Lincoln Hills extend along the Mississippi River in Missouri, starting about 40 miles (64 kilometers) northwest of St. Louis and extending north to Hannibal. The Lincoln Hills partially escaped the most recent glaciation in the region during the Pleistocene. In geology and biology, they resemble the rugged and forested hills of the Ozark Highlands (MLRA 116A) more than the rolling plains of northern Missouri. The underlying limestone bedrock has formed bluffs, glades, caves, springs, and

sinkholes. Elevation ranges from about 420 feet (128 meters) along the Mississippi River near Cape Girardeau, Missouri to about 830 feet (253 meters) near Clarksville along the Mississippi River upstream from St. Louis. High ridges near Hillsboro, Missouri can reach over 1,000 feet (305 meters). Underlying bedrock is mainly Ordovician-aged dolomite and sandstone, with Mississippian-aged limestone north of the Missouri River. Loess caps both stream and glacial outwash terraces along the major rivers along with Pre-Illinoisan till near the edges of the area.

Classification relationships

Major Land Resource Area (MLRA) (USDA-NRCS, 2022): 115X–Central Mississippi Valley Wooded Slopes 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 White 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 - (Carya ovata) / Carex pensylvanica Glaciated Woodland (CEGL002134). 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

Deep Loess Exposed Backslope Woodlands occupy the southerly and westerly aspects of steep, dissected slopes, and are mapped in complex with the Deep Loess Protected Backslope Forest 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 woodland with an overstory dominated by white oak and black oak, with minor amounts of northern red oak, and a ground flora of native grasses and forbs.

Associated sites

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.
R115XB019MO	**Limestone/Dolomite Exposed Cliff** Limestone/Dolomite Exposed Cliffs are sometimes present below this ecological site on major floodplains.
F115XB001MO	**Deep Loess Upland Woodland** Deep Loess Upland Woodlands are upslope on summit positions from this ecological site
F115XB003MO	**Deep Loess Protected Backslope Forest** Deep Loess Protected Backslope Forests are mapped in a complex with this ecological site on north and east facing slopes

Similar sites

F115XB003MO	**Deep Loess Protected Backslope Forest** Deep Loess Protected Backslope Forests are mapped in a complex with this ecological site on north and east facing slopes

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 backslopes, with slopes of 15 to 60 percent. It is on exposed aspects (south, southwest, and west), which receive significantly more solar radiation than the protected aspects. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following 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 southerly and westerly aspects. Deep Loess Upland sites are directly upslope, and are included within the area labeled “1”.

Figure 1. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hillslope
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	100 – 310 m
Slope	20 – 60 %
Water table depth	90 – 150 cm
Aspect	W, SE, S, SW

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 (characteristic range)	160-170 days
Freeze-free period (characteristic range)	190-200 days
Precipitation total (characteristic range)	1,090-1,250 mm
Frost-free period (actual range)	150-170 days
Freeze-free period (actual range)	180-200 days
Precipitation total (actual range)	1,090-1,270 mm
Frost-free period (average)	160 days
Freeze-free period (average)	190 days

Precipitation total (average)	1,170 mm

- (1) BOONVILLE [USC00230817], Boonville, MO
- (2) UNION [USC00238515], Union, MO
- (3) ANNA 2 NNE [USC00110187], Anna, IL
- (4) WATERLOO [USC00119002], Waterloo, IL
- (5) JACKSON [USC00234226], Jackson, MO
- (6) JEFFERSON CITY WTP [USC00234271], Jefferson City, MO
- (7) PERRYVILLE WTP [USC00236641], Perryville, 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. Photo courtesy of NRCS.

Figure 8. Menfro series

Table 4. Representative soil features

Parent material	(1) Loess
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow
Soil depth	180 cm
Surface fragment cover <=3"	Not specified

Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	17.78 – 20.32 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	4.5 – 7.3
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

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 minor amounts of northern red oak. The canopy is relatively tall (70 to 90 feet) but less dense (65 to 85 percent closure) and less structurally diverse than nearby 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.

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.

Deep Loess Exposed Backslope Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by

native large herbivores. 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, such as bison, elk, and white-tailed deer, 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 to soil compaction and soil erosion problems and lower site productivity.

This ecological site is 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 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

Figure 9. State and transition diagram for this ecological site

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 6. 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	–	5-75	–	–
chinquapin oak	QUMU	*Quercus muehlenbergii*	Native	–	10-50	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	2-10	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	0.1-10	–	–
black oak	QUVE	*Quercus velutina*	Native	–	2-10	–	–
post oak	QUST	*Quercus stellata*	Native	–	2-5	–	–
mockernut hickory	CATO6	*Carya tomentosa*	Native	–	2-5	–	–

Table 7. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (m)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	10-30

hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	5-20
big bluestem	ANGE	*Andropogon gerardii*	Native	–	5-20
parasol sedge	CAUM4	*Carex umbellata*	Native	–	10-20
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	5-20
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	10-20
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	5-20
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	1-10
eastern woodland sedge	CABL	*Carex blanda*	Native	–	2-5
whitegrass	LEVI2	*Leersia virginica*	Native	–	0.1-5
Forb/Herb					
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	10-30
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	5-20
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	10-20
nakedflower ticktrefoil	DENU4	*Desmodium nudiflorum*	Native	–	10-20
slender lespedeza	LEVI7	*Lespedeza virginica*	Native	–	10-20
Canadian blacksnakeroot	SACA15	*Sanicula canadensis*	Native	–	10-20
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	10-20
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	Native	–	10-20
Culver's root	VEVI4	*Veronicastrum virginicum*	Native	–	5-10
American lopseed	PHLE5	*Phryma leptostachya*	Native	–	5-10
bluejacket	TROH	*Tradescantia ohiensis*	Native	–	5-10
common blue wood aster	SYCO4	*Symphyotrichum cordifolium*	Native	–	2-5
Nuttall's ticktrefoil	DENU5	*Desmodium nuttallii*	Native	–	2-5
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	2-5
Shrub/Subshrub					
northern spicebush	LIBE3	*Lindera benzoin*	Native	–	2-50
New Jersey tea	CEAM	*Ceanothus americanus*	Native	–	5-20
American hazelnut	COAM3	*Corylus americana*	Native	–	10-20
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	5-10

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 11. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 12. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 13. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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 Loess 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 62 for white oak and 73 for black 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 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

Potential Reference Sites: Deep Loess Exposed Backslope Forest Plot HACRCA_JK09 – Menfro soil Located in Hart Creek CA, Boone County, MO Latitude: 38.71113 Longitude: -92.33187 Plot HACRCA_JK10 – Menfro soil Located in Hart Creek CA, Boone County, MO Latitude: 38.710194 Longitude: -92.33222 Plot HACRCA_JK11 – Menfro soil Located in Hart Creek CA, Boone County, MO Latitude: 38.710053 Longitude: -92.33276 Plot HACRCA_KS05 – Menfro soil Located in Hart Creek CA, Boone County, MO Latitude: 38.707605 Longitude: -92.328525 Plot SCWOUM_JK01 – Menfro soil Located in Schnabel Woods, UMC, Boone County, MO Latitude: 38.867915 Longitude: -92.42733 Plot SCWOUM01 – Menfro soil Located in Schnabel Woods, UMC, Boone County, MO Latitude: 38.869069 Longitude: -92.423535 Plot TRTESP_KS04 – Winfield soil Located in Trail of Tears SP, Cape Girardeau County, MO Latitude: 37.467443 Longitude: -89.490562

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Approval

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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	09/23/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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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):**

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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:**
