USDA Natural Resources Conservation Service

Ecological site R116AY026MO
Wet Upland Drainageway Prairie

Last updated: 9/24/2020
Accessed: 04/28/2024

General information

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

Figure 1. Mapped extent

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

MLRA notes

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

The Ozark Highland constitutes the Salem Plateau of the Ozark Uplift. Elevation ranges from about 300 feet on the southeast edge of the Ozark escarpment, to about 1,600 feet in the west, adjacent to the Burlington Escarpment of the Springfield Plateau. The underlying bedrock is mainly horizontally bedded Ordovician-aged dolomites and sandstones that dip gently away from the uplift apex in southeast Missouri. Cambrian dolomites are exposed on deeply dissected hillslopes. In some places, Pennsylvanian and Mississippian sediments overlie the plateau. Relief varies, from the gently rolling central plateau areas to deeply dissected hillslopes associated with drainageways such as the Buffalo, Current, Eleven Point and White Rivers.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to a Wet-Mesic Bottomland Prairie.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to Andropogon gerardii - Panicum virgatum - Helianthus grosseserratus Herbaceous Vegetation (CEGL002398).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily in the Tipton Upland Prairie Plain Land Type Association of the Prairie Ozark Border Subsection.

Ecological site concept

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

Wet Upland Drainageway Prairies occur in a few counties in the northernmost part of the Ozark Highland. Soils are very deep and loamy with seasonal high water tables, and are subject to flooding. The reference plant community is a prairie dominated by a dense cover of wetland species, including prairie cordgrass, sedge, and wet-tolerant forbs.

Associated sites

R116AY005MO	**Wet Footslope Savanna** Wet Footslope Savannas are upslope.
R116AY006MO	**Loamy Upland Prairie** Loamy Upland Prairies are upslope, on convex summits, shoulders and upper backslopes.

Similar sites

R116AY026MO	**Wet Upland Drainageway Prairie** Wet Upland Drainageway Prairie have no similar ecological sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix humilis*
Herbaceous	(1) *Spartina pectinata* (2) *Andropogon gerardii*

Physiographic features

This site is on upland drainageways with slopes of 1 to 3 percent. The site receives runoff from upland sites, and is subject to flooding.

The following figure shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “4” on the figure. Claypan Summit Prairie sites labeled “1” are typically upslope from Wet Footslope sites, labeled “2”. The dashed lines above this site area indicate the various prairie sites included with this ecological site.

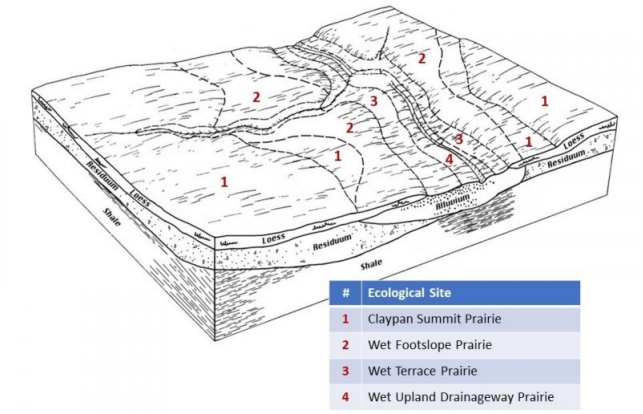


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None to rare
Slope	0–3%
Water table depth	30–61 cm
Aspect	Aspect is not a significant factor

Climatic features

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

The Ozark Highland experiences regional differences in climates, but these differences do not have obvious geographic boundaries. Regional climates grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line crossing the MLRA from northwest to southeast.
The average annual precipitation in almost all of this area is 38 to 45 inches. Snow falls nearly every winter, but the snow cover lasts for only a few days. The average annual temperature is about 53 to 60 degrees F. The lower temperatures occur at the higher elevations in the western part of the MLRA. Mean January minimum temperature follows a stronger north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the MLRA. Mean July maximum temperatures have a range of only two or three degrees across the area.

Mean annual precipitation varies along a northwest to southeast gradient. Seasonal climatic variations are more complex. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages three to four times greater than January precipitation. Most of the rainfall occurs as high-intensity, convective thunderstorms in summer.

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

high evaporation rates.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. In regions of appreciable relief, for example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Deep sinkholes often have a microclimate significantly cooler, moister, and shadier than surrounding surfaces, a phenomenon that may result in a strikingly different ecology. Higher daytime temperatures of bare rock surfaces and higher reflectivity of these unvegetated surfaces may create distinctive environmental niches such as glades and cliffs.

Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier than adjacent north- and-east-facing slopes. Finally, the climate within a canopied forest is measurably different from the climate of a more open grassland or savanna areas.

Source: University of Missouri Climate Center - http://climate.missouri.edu/climate.php; Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - http://soils.usda.gov/survey/geography/mlra/

Table 3. Representative climatic features

Frost-free period (characteristic range)	159-171 days
Freeze-free period (characteristic range)	185-194 days
Precipitation total (characteristic range)	1,118 mm
Frost-free period (actual range)	155-173 days
Freeze-free period (actual range)	183-196 days
Precipitation total (actual range)	1,118-1,143 mm
Frost-free period (average)	165 days
Freeze-free period (average)	190 days
Precipitation total (average)	1,118 mm

Climate stations used

- (1) CALIFORNIA [USC00231189], California, MO
- (2) VERSAILLES 2W [USC00238603], Versailles, MO
- (3) ELDON [USC00232503], Eldon, MO

Influencing water features

This ecological site is influenced by a seasonal high water table, which is typically near the surface in late fall through spring, receding in the summer and contains first- and second-order streams, which originate from headslope positions at the upper reaches of the units, and are fed from smaller headslopes in the adjacent uplands. These streams are ephemeral in most years, with flow in the late fall, winter, and spring months, generally disappearing in the summer, or reduced to isolated pools in the lower reaches. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short-duration flooding is common in many areas.

This site is in the SLOPE wetlands class of the Hydrogeomorphic (HGM) classification system (Brinson, 1993), and are Emergent Palustrine wetlands (Cowardin et al., 1979). SLOPE wetlands are found in stream headwaters, slope toes, or at outcrops of low conductivity soil or rock layers. In a stream network, they are found on stream corridor reaches upstream of higher order RIVERINE reaches.

Soil features

These soils were formed under a mixture of prairie and woodland vegetation. Parent material is alluvium. They have

silt loam surface horizons and loamy subsoils. These soils have no rooting restriction. They are affected by a seasonal high-water table during the spring months. Soil series associated with this site include Speed.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained
Permeability class	Slow to moderately slow
Soil depth	183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–7.3
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.

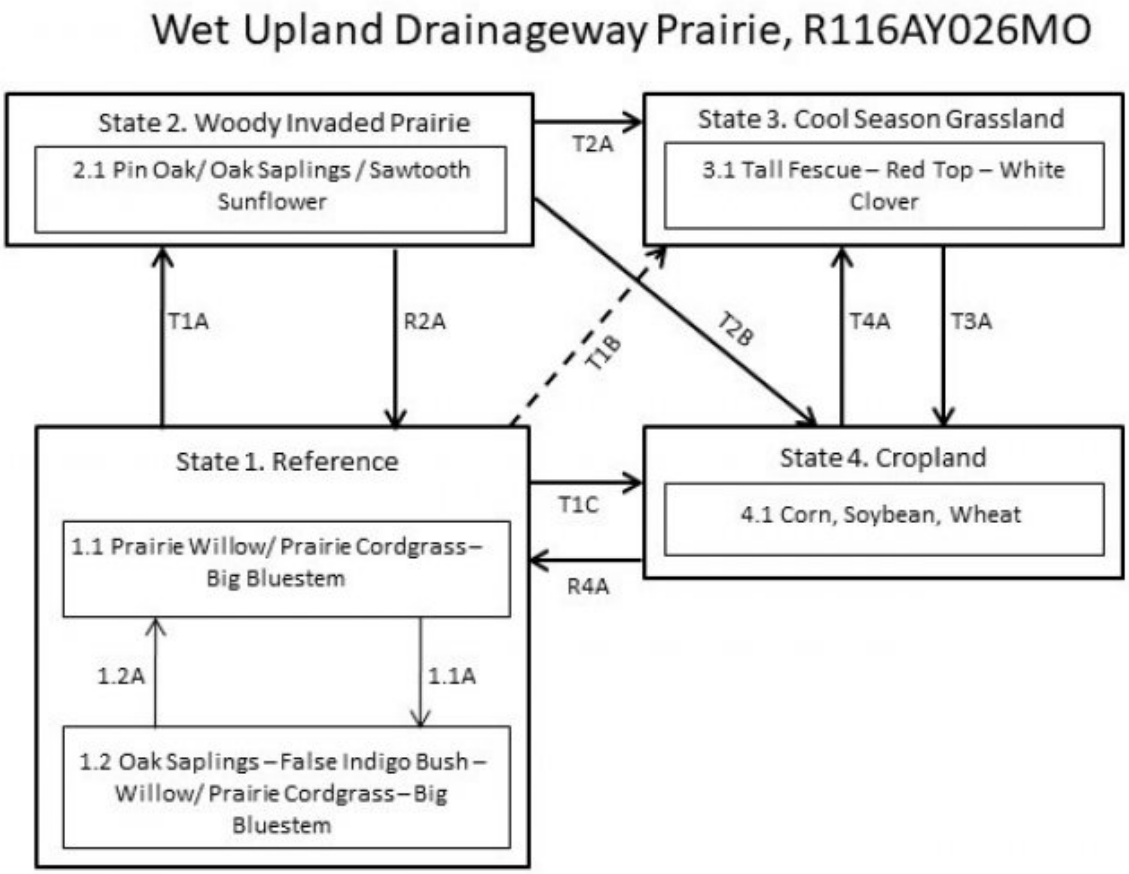
Wet Upland Drainageway Prairie ecological sites exist because of their seasonal high water table during the spring months and fire. They are found in narrow, low order, upland drainages that were subject to frequent short duration flooding. These conditions along with periodic fire had a strong influence on excluding trees. Wet Upland Drainageway Prairies are dominated by a dense cover of wet tolerant grasses and forbs. On slightly higher and drier areas within or at the edge of the prairie matrix scattered bur oak, pin oak, shellbark hickory and willow occurred amid the grass-dominated landscape. In addition to site wetness, periodic fire, likely occurring at least once every three years, also played a role in keeping woody species from exploiting the site. Fire during dry periods removed the dense mat of leaf litter creating opportunities for forbs less aggressive than the grasses and sedges and killed or damaged woody species that were developing on the site.

Wet Upland Drainageway Prairies were also subjected to grazing by native large herbivores. Grazing by large native herbivores, such as bison, elk, and white-tailed deer, would have effectively kept understory conditions open, creating conditions more favorable to ground flora species and minimizing woody trees and shrubs.

Today most of these ecological sites have been drained and farmed. Few quality remnants exist. However, during wet years, they do act as ephemeral farmed wetlands in the agricultural landscape. While their flood regime usually has been altered, their position and soil properties still make them good candidates for wet prairie and savanna development management.

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.

State and transition model



Code	Event/Activity/Process
T1A	Fire suppression > 20 years; woody invasion; reduced flooding duration
T1B	Tillage; vegetative seeding; grassland management; drainage water management
T1C	Tillage; conservation cropping system; drainage water management
T3A	Tillage; conservation cropping system
T2A	Woody removal; tillage; vegetative seeding; grassland management
T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding ; grassland management
1.1A	Fire-free interval 10+ years; reduced flooding duration
1.2A	Flooding; prescribed fire
R2A	Woody removal; prescribed fire
R3A, R4A	Vegetative seeding; prescribed fire; restore natural hydrology

Figure 9. State and transition diagram for this ecological site

State 1

Reference

This state is typical of wet prairies that are not connected to groundwater (not seepage communities or fens) and that experience full horizon saturation (endosaturation), at least briefly during part of the growing season. Two phases can occur that will transition back and forth depending on fire and flooding frequencies. Longer fire and flooding free intervals will allow woody species to increase such prairie willow, dogwoods and false indigo. When fire and flooding intervals shorten these woody species will decrease or be eliminated.

Community 1.1
Prairie Willow/ Prairie Cordgrass – Big Bluestem

Two phases can occur that will transition back and forth depending on fire and flooding frequencies. Longer fire and flooding free intervals will allow woody species to increase such prairie willow, dogwoods and false indigo. When fire and flooding intervals shorten these woody species will decrease or be eliminated.

Forest overstory. The Forest Overstory Species list is based commonly occurring species listed in Nelson (2010).

Forest understory. The Forest Understory Species list is based commonly occurring species listed in Nelson (2010).

Community 1.2
Oak Saplings – False Indigo Bush – Willow/ Prairie Cordgrass – Big Bluestem

Two phases can occur that will transition back and forth depending on fire and flooding frequencies. Longer fire and flooding free intervals will allow woody species to increase such prairie willow, dogwoods and false indigo. When fire and flooding intervals shorten these woody species will decrease or be eliminated.

Pathway P1.1A
Community 1.1 to 1.2

Fire-free interval 10+ years; reduced flooding duration

Pathway P1.2A
Community 1.2 to 1.1

Flooding; prescribed fire

State 2
Woody Invaded Prairie

Degraded reference states that have experienced fire suppression and flooding reduction for 20 or more years will transition to this state. With fire suppression and reduced flooding, woody species such as pin oak and bur oak will begin to increase transitioning this state from a prairie to a Woody Invaded Prairie. Native ground cover will also decrease. Transition from this state to cool season grasslands (State 3) or intensive cropland (State 4) was very common.

Community 2.1
Pin Oak/ Oak Saplings / Sawtooth Sunflower

State 3
Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue, white clover, and red top has been common in this area. Occasionally, these pastures will have scattered bur oaks or pecan. Transitioning to a Cropland State to help eliminate non-native grassland species and then restoring to a reference state is usually the easiest and most useful method of restoration from this state.

Community 3.1
Tall Fescue – Red Top – White Clover

State 4
Cropland

This is the dominant state that exists currently with intensive cropping of corn, soybeans, and wheat occurring. A return to the reference state may be difficult and costly, requiring a very long term series of management options.

Community 4.1
Corn, Soybean, Wheat

Transition T1A
State 1 to 2

Fire suppression > 20 years; woody invasion; reduced flooding duration

Transition T1B
State 1 to 3

Tillage; vegetative seeding; grassland management; drainage water management

Transition T1C
State 1 to 4

Tillage; conservation cropping system; drainage water management

Restoration pathway R2A
State 2 to 1

Woody removal; prescribed fire

Transition T2A
State 2 to 3

Woody removal; tillage; vegetative seeding; grassland management

Transition T2B
State 2 to 4

Woody removal; tillage; conservation cropping system

Transition T3A
State 3 to 4

Tillage; conservation cropping system; drainage water management

Restoration pathway R4A
State 4 to 1

Vegetative seeding; prescribed fire; restore natural hydrology

Transition T4A
State 4 to 3

Vegetative seeding ; grassland management

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							
pin oak	QUPA2	*Quercus palustris*	Native	–	–	–	–
bur oak	QUMA2	*Quercus macrocarpa*	Native	–	–	–	–
shellbark hickory	CALA21	*Carya laciniosa*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Canada wildrye	ELCA4	*Elymus canadensis*	Native	–	–
switchgrass	PAVI2	*Panicum virgatum*	Native	–	–
prairie cordgrass	SPPE	*Spartina pectinata*	Native	–	–
hop sedge	CALU4	*Carex lupulina*	Native	–	–
fox sedge	CAVU2	*Carex vulpinoidea*	Native	–	–
fescue sedge	CAFE3	*Carex festucacea*	Native	–	–
big bluestem	ANGE	*Andropogon gerardii*	Native	–	–
Forb/Herb					
swamp milkweed	ASIN	*Asclepias incarnata*	Native	–	–
bearded beggarticks	BIAR	*Bidens aristosa*	Native	–	–
field clover	TRCA5	*Trifolium campestre*	Native	–	–
white wild indigo	BAAL	*Baptisia alba*	Native	–	–
paleleaf woodland sunflower	HEST	*Helianthus strumosus*	Native	–	–
wild bergamot	MOFI	*Monarda fistulosa*	Native	–	–
New England aster	SYNO2	*Symphyotrichum novae-angliae*	Native	–	–
willowleaf aster	SYPR5	*Symphyotrichum praealtum*	Native	–	–
white doll's daisy	BOAS	*Boltonia asteroides*	Native	–	–
sawtooth sunflower	HEGR4	*Helianthus grosseserratus*	Native	–	–
sweet coneflower	RUSU	*Rudbeckia subtomentosa*	Native	–	–
Culver's root	VEVI4	*Veronicastrum virginicum*	Native	–	–
Virginia bunchflower	VEVI5	*Veratrum virginicum*	Native	–	–
Shrub/Subshrub					
prairie willow	SAHU2	*Salix humilis*	Native	–	–
false indigo bush	AMFR	*Amorpha fruticosa*	Native	–	–
silky dogwood	COOB9	*Cornus obliqua*	Native	–	–

Animal community

Wildlife*

Game species that utilize this ecological site include:
White-tailed Deer will utilize this ecological site for browse (plant leaves in the growing season, seeds and soft mast

in the fall/winter). This site type also can provide escape cover.

Migratory Waterbirds: Sora, Common Snipe

Furbearers: Muskrat, Beaver, and Mink.

Bird species associated with this ecological site's reference state condition:
Breeding birds: Red-Winged Blackbird, Least Bittern, and Common Yellowthroat.

Migratory birds: Sora, Sedge Wren, Least Bittern, Yellow Rail and Common Snipe.

Amphibian and reptile species associated with this ecological site's reference state condition: Western Chorus Frog (Pseudacris triseriata triseriata), Southern Leopard Frog (Rana sphenocephala), Midland Brown Snake (Storeria dekayi wrightourm), and prairies with crawfish burrows may have Northern Crawfish Frog (Rana areolata circulosa).

Small mammals associated with this ecological site's reference state condition: Muskrat (Ondatra zibethicus), Southern Bog Lemming (Synaptomys cooperi), and Mink (Mustela vison).

Many native insect species are likely associated with this ecological site, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydids. However information on these groups is often lacking enough resolution to assign them to individual ecological sites.

Insect species known to be associated with this ecological site's reference state condition: Swamp Milkweed Leaf Beetle (Labidomera clivicollis), Cordgrass Planthopper (Prokelisia crocea), Dion Skipper butterfly (Euphyes dion), Duke's Skipper butterfly (Euphyes dukesi), native bees (Lasioglossum hartii, Hesperapis carinata, Svastra atripes and Cemolobus ipomoeae), Bullate Meadow katydid (Orchelimum bullatum) and Sedge Grasshopper (Stethophyma celatum).

Other invertebrates: Grassland Crayfish (Procambarus gracilis)

*This section prepared by Mike Leahy, Natural Areas Coordinator, Missouri Department of Conservation, 2013. References for this section: Fitzgerald and Pashley 2000a; Heitzman and Heitzman 1996; Jacobs 2001; Johnson 2000; Pitts and McGuire 2000; Schwartz and others 2001.

Other information

Forestry
Management: This ecological site is not recommended for traditional timber production activity. Historically this site was dominated by a ground cover of native prairie grasses and forbs. Some scattered open grown trees may have also been present. Altered sites may be suitable for non-traditional forestry uses such as windbreaks, environmental plantings, alley cropping (a method of planting, in which rows of trees or shrubs are interspersed with rows of crops) or woody biofuels.

Inventory data references

Potential Reference Sites: Wet Upland Drainageway Prairie

This site is probably extinct. No quality reference sites are known to exist.

Other references

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Contributors

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Approval

Nels Barrett, 9/24/2020

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Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support in the development of this ecological site.

Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	04/28/2024
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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:**