

## **Ecological site R112XY107KS Mined Land**

Last updated: 11/05/2024  
Accessed: 05/11/2025

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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): 112X—Cherokee Prairies

MLRA 112 (Cherokee Prairies) is in Kansas (48 percent), Oklahoma (29 percent), and Missouri (23 percent) makes up about 20,885 square miles (54,092 square kilometers).

This area is in the Osage Plains Section of the Central Lowland Province of the Interior Plains. It is a gently sloping to rolling dissected plains. Elevation ranges from 120 to 1,540 feet (30 to 470 meters). Even though the area is thoroughly dissected, local relief typically is only 3 to 10 feet (1 to 3 meters) and major valleys generally are less than 8 feet (25 meters) below the adjacent uplands.

The extent of the major hydrologic unit area is made up of major rivers such as the Neosho, Verdigris, Osage, and Marais des Cygnes. The Harry Truman reservoir lies in the western part of Lake of the Ozarks in Missouri and is on the Osage and Grand Rivers.

This area is dominantly underlain by Pennsylvanian and in some areas, Permian and Mississippian sandstone, shale, and limestone bedrock. The northern part of the area has a thin mantle of loess. The dominant soils within this region are Mollisols and Entisols. Alfisols occur in the eastern part of the MLRA. There are small areas of Vertisols throughout the MLRA. It also contains small areas of Vertisols. Soils in this region are developed in residuum, loess, colluvium, and alluvium. These soils were developed under big bluestem, little bluestem, Indiangrass, and switchgrass on the western part of this area. The eastern part of the area and the valleys in the western part support hardwoods, mainly northern red oak, white oak, and shagbark hickory with islands of tall prairie grasses being common. Major wildlife species of this area are deer, cottontail rabbit, fox squirrel, and bobwhite quail.

This MLRA is mostly rangeland, hayland, and pasture. More than two-fifths of the area supports pasture grasses and legumes. The western part of this area generally supports tall prairie grasses. Big bluestem, little bluestem, Indiangrass, and switchgrass are the main species. The cropland is used to produce winter wheat, soybeans, corn, grain sorghum, and other feed grains. The forested areas are mainly on steep valley sides and in low-lying areas on flood plains.

### **Classification relationships**

U.S. Department of Agriculture  
Major Land Resource Area (MLRA) 112 - Cherokee Prairies

US Forest Service Ecoregions (1994-1995):  
Domain name: Humid Temperate Domain  
Division name: Prairie Division  
Province name: Prairie Parkland (Temperate) Province  
Province code: 251

## Ecological site concept

The MLRA 112 Mined Land ecological site is located on previously mined lands predominately in northeastern Oklahoma, southeastern Kansas, and west-central Missouri. Soil characteristics and vegetative communities are variable and influenced by post-mining land management.

## Associated sites

R112XY102KS	<b>Clayey Upland</b> The Clayey Upland site is widely distributed in the uplands of MLRA 112. This site is made up of poorly to moderately well drained soils with silt loam to silty clay surface layers, and clayey subsoils. It has a parent material of loess over residuum and residuum from limestone and shale. It is generally on a slope range of 1 to 15 percent.
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## Similar sites

R112XY103KS	<b>Loamy Upland</b> The Loamy Upland ecological site is on similar landform positions but is not located on formerly mined sites.
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**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Schedonorus arundinaceus</i>

## Physiographic features

This site is characterized by mining spoils and/or earthen fill. Site conditions are variable and highly dependent upon the type of post-mining management. This site is located predominantly on hillslopes, ridges, and interfluves with slopes of 0-50 percent. There is no flooding or ponding frequency. Site elevation ranges from 492-1050 feet.

**Table 2. Representative physiographic features**

Landforms	(1) Hills > Hillslope (2) Plains > Hillslope (3) Plains > Interfluve (4) River valley > Ridge
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	492–1,050 ft
Slope	0–50%
Water table depth	72 in
Aspect	W, NW, N, NE, E, SE, S, SW

## Climatic features

MLRA 112 (Cherokee Prairies) has a continental climate marked by strong seasonality. In winter, dry-cold air masses 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 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. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages three to four times greater than January precipitation. 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 influences ecological communities by limiting water supplies, especially at times of high temperatures and high evaporation rates.

Representative climatic features shown in Table 3 were derived from the climate stations selected for use within the MLRA.

Table 3. Representative climatic features

Frost-free period (characteristic range)	169-186 days
Freeze-free period (characteristic range)	193-203 days
Precipitation total (characteristic range)	41-45 in
Frost-free period (actual range)	130-195 days
Freeze-free period (actual range)	157-216 days
Precipitation total (actual range)	41-45 in
Frost-free period (average)	171 days
Freeze-free period (average)	194 days
Precipitation total (average)	43 in

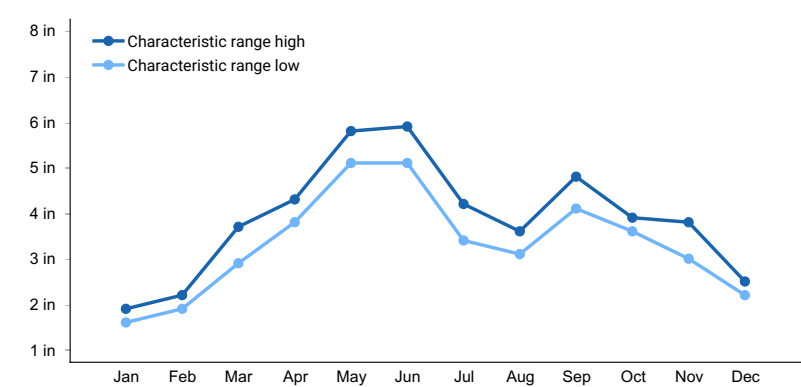


Figure 1. Monthly precipitation range

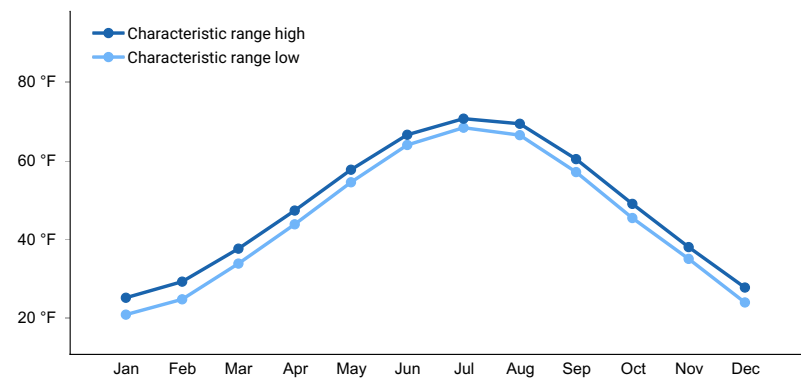
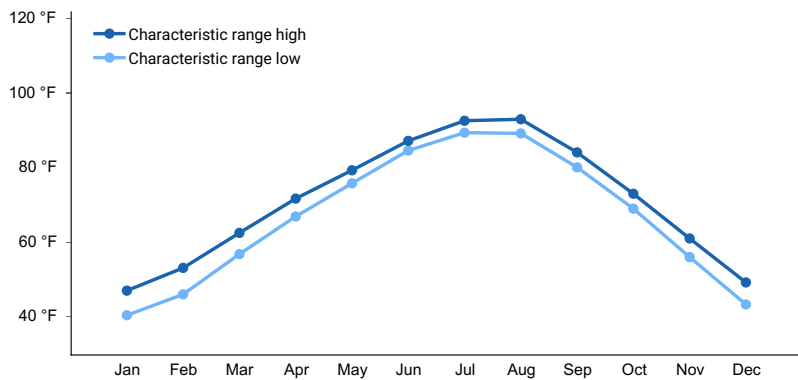
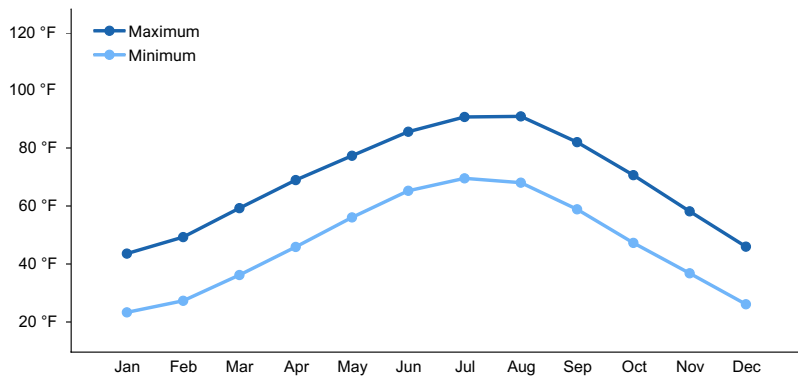


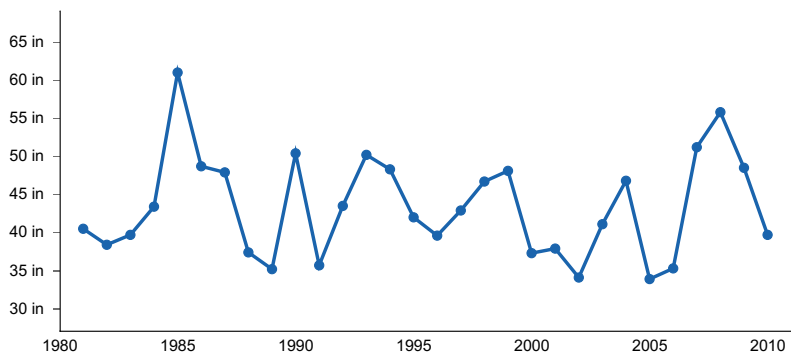
Figure 2. Monthly minimum temperature range



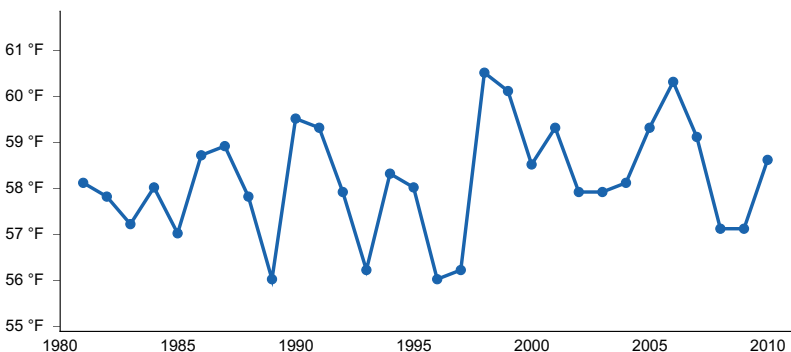
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) PRYOR [USC00347309], Pryor, OK
- (2) TULSA INTL AP [USW00013968], Tulsa, OK
- (3) FT SCOTT [USC00142835], Fort Scott, KS

- (4) CLAREMORE 2 ENE [USC00341828], Claremore, OK
- (5) CLINTON [USC00231711], Clinton, MO
- (6) ELM [USC00232568], Bates City, MO
- (7) GIRARD [USC00143074], Girard, KS
- (8) MIAMI [USC00345855], Miami, OK
- (9) NOWATA [USC00346485], Nowata, OK

## Influencing water features

This site is not influenced by riparian or wetland features.

## Soil features

Series included in this group are Barge, Brazilton, Coalvale, Foyil, Kanima, and Talala. These soils have been disturbed through mining and current site capability has been influenced by varying methods of post-mining management. The soils in this groups are Entisols, and the taxonomic groups include Udarents and Udorthents. Soils are moderately well drained to well drained with permeability ranging from very slow to moderate. Soil depth is 72 inches or greater; however, Talala and Foyil soils have a densic material layer between 11-23 inches.

**Table 4. Representative soil features**

Parent material	(1) Dredge spoils (2) Mine spoil or earthy fill (3) Coal extraction mine spoil
Surface texture	(1) Silt loam (2) Silty clay loam (3) Gravelly clay loam (4) Gravelly silty clay loam (5) Very fine sandy loam
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderate
Depth to restrictive layer	11–72 in
Soil depth	72 in
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–35%
Available water capacity (Depth not specified)	2–8 in
Calcium carbonate equivalent (Depth not specified)	0–5%
Soil reaction (1:1 water) (Depth not specified)	3.5–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–65%

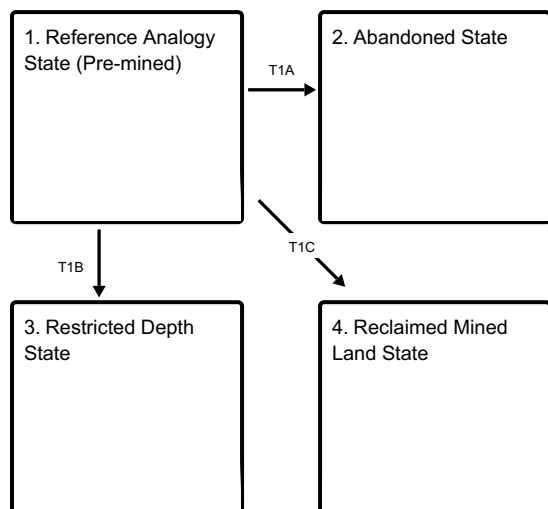
## Ecological dynamics

The ecological dynamics of mined lands requires further study as the physiographic and soil characteristics vary from site to site. There is no one universal and definitive reference condition given the variability of soil conditions within this group. Some mined land sites have been successfully transitioned to agricultural uses while others remain as wildlife habitat, recreation areas, or waste sites. Reclamation and restoration inputs post-mining are key criteria to evaluate the potential ecological dynamics of a given site. Conditions somewhat analogous to native soil conditions can occur on highly reclaimed sites.

The species listed within the state and transition model are representative and are not 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. Future field research will increase the detail and development of the Mined Lands state and transition model.

## State and transition model

### Ecosystem states

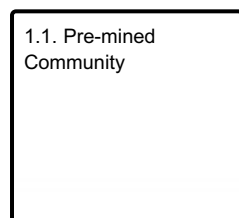


**T1A** - Coal extraction alters original soil conditions

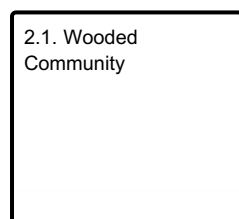
**T1B** - Coal extraction; materials replaced, but compaction/restrictive layer present

**T1C** - Coal extraction; restoration; soil is replaced by major horizons

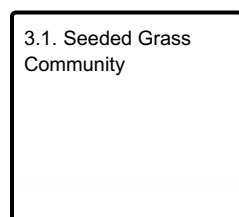
### State 1 submodel, plant communities



### State 2 submodel, plant communities



### State 3 submodel, plant communities



## State 4 submodel, plant communities

4.1. Seeded Plant  
Community

## State 1

### Reference Analogy State (Pre-mined)

The Reference Analogy State describes pre-mined conditions. Rangeland, tame pasture, woodlands, and miscellaneous uses may have been present as the pre-mined land use.

#### Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- switchgrass (*Panicum virgatum*), grass

## Community 1.1

### Pre-mined Community

Rangeland was a common pre-mined condition. This community is highly variable and could include rangeland, pastureland, forestland or miscellaneous uses.

#### Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- switchgrass (*Panicum virgatum*), grass

## State 2

### Abandoned State

This state is characterized by very deep, well drained, soils impacted by mining operations. Kanima is a moderately permeable soil formed in a regolith (a layer of unconsolidated rocky material covering bedrock) from surface coal mining operations. The Barge series consists of soils on spoil banks dredged from rivers and streams in long, narrow ridges. Vegetative communities will vary depending on age of spoil banks and post-mining management. Older spoil banks and disturbed areas are often wooded and include species such as winged elm, common hackberry, eastern cottonwood, and black locust. Dogwoods, green briar, poison ivy and blackberries are often present. Level areas may be utilized as managed pasture and seeded with cool-season grasses such as fescue, brome, and bermudagrass. A few areas are managed for public recreation or wildlife and include areas restored to native grasses.

#### Dominant plant species

- common hackberry (*Celtis occidentalis*), tree
- black locust (*Robinia pseudoacacia*), tree
- eastern cottonwood (*Populus deltoides*), tree
- winged elm (*Ulmus alata*), tree

## Community 2.1

### Wooded Community

This site is often dominated by native, deciduous, tree species that pioneered the disturbed areas. Species include hackberry, locust, elm, sycamore, and cottonwood. A few areas may be managed for tame pastures or wildlife and

recreations sites.

#### **Dominant plant species**

- common hackberry (*Celtis occidentalis*), tree
- black locust (*Robinia pseudoacacia*), tree
- eastern cottonwood (*Populus deltoides*), tree
- elm (*Ulmus*), tree

### **State 3**

#### **Restricted Depth State**

The Restricted Depth State includes sites that have a shallow to moderately deep restrictive layer in the soil profile. This state is often characterized by shallow, salvaged topsoil from pre-mined areas over dense fill. The substratum material is either replaced rock and/or rock fragments from shale, limestone, and sandstone. Other areas include surface mined spoils which have been smoothed and contain geologic materials that are less than strongly cemented, soil material, and rock fragments.

#### **Dominant plant species**

- tall fescue (*Schedonorus arundinaceus*), grass
- Bermudagrass (*Cynodon dactylon*), grass
- smooth brome (*Bromus inermis*), grass
- lespedeza (*Lespedeza*), other herbaceous

### **Community 3.1**

#### **Seeded Grass Community**

This community is characterized by sufficient site restoration to allow seeded grass management and production. Managed pastures are common on these sites. Species often include fescue, Korean lespedeza, bermudagrass, and brome. Areas that are abandoned or unmanaged will transition to scrubby woodlands. Common opportunistic tree species include osage orange, winged elm, hackberry, and locust.

#### **Dominant plant species**

- tall fescue (*Schedonorus arundinaceus*), grass
- Bermudagrass (*Cynodon dactylon*), grass
- brome (*Bromus*), grass
- lespedeza (*Lespedeza*), other herbaceous

### **State 4**

#### **Reclaimed Mined Land State**

The Reclaimed Mined Land State consists of very deep, moderately well drained soils (such as Brazilton) on interfluvial and hillslopes with slopes usually below 5 percent. Depth to bedrock is greater than 60 inches with no restrictive layer in the soil profile. Due to the level of restoration, this state is utilized for pasture and cultivated cropland.

#### **Dominant plant species**

- tall fescue (*Schedonorus arundinaceus*), grass
- common wheat (*Triticum aestivum*), grass
- grain sorghum (*Sorghum bicolor ssp. bicolor*), grass

### **Community 4.1**

#### **Seeded Plant Community**

These mined sites have had a higher degree of soil placement post mining. Excavated material that has been replaced by major horizons and slopes are generally less than 5%. Agricultural uses are common on these sites including seeded pastures and small grain crop production.



## **Dominant plant species**

- tall fescue (*Schedonorus arundinaceus*), grass
- common wheat (*Triticum aestivum*), grass
- grain sorghum (*Sorghum bicolor ssp. bicolor*), grass

## **Transition T1A**

### **State 1 to 2**

After coal extraction, overburden material is left as a series of piles of overburden, called spoil banks, with a deep trench at the side where operations ceased often filled with water. Area is abandoned and naturally reseeded primarily by woody plants.

**Constraints to recovery.** The inherent soil properties have been mechanically altered and is unable to return to its original conditions.

## **Transition T1B**

### **State 1 to 3**

After coal extraction, spoil material is leveled and smoothed but may result in excessive compaction of the spoil material. Most areas are reseeded to grass and legume mixes.

**Constraints to recovery.** The inherent soil properties have been mechanically altered and is unable to return to its original conditions.

## **Transition T1C**

### **State 1 to 4**

After coal extraction, topsoil is removed from the land in a separate layer, replaced on the backfill area, or if not utilized immediately, segregated in a separate pile from other spoil. Land affected is restored to a condition capable of supporting the uses which it was capable of before mining.

**Constraints to recovery.** After coal extraction, excavated material has been replaced by major horizons. Site is utilized for pasture or crop production.

## **Additional community tables**

### **Inventory data references**

No field plots have been developed for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in this ecological site description.

## **Other references**

Caudle, D., H. Sanchez, J. DiBenedetto, C. Talbot, and M. Karl. 2013. Interagency Ecological Site Handbook for Rangelands.

Comer, P.J., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003 (Date accessed). Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems.

National Oceanic and Atmospheric Administration (NOAA). 2018 (Date accessed). Climate Data 1980-2010. <https://www.ncdc.noaa.gov/data-access/land-based-stationdata/find-station>.

Natural Resources Conservation Service. Web Soil Survey 2022 (Date accessed). (<https://websoilsurvey.sc.egov.usda.gov/>.)

Society for Rangeland Management. 1994. Rangeland cover types of the United States. Denver, CO.

Soil Survey Division, USDA- NRCS, Official Soil Series Descriptions (OSD). 2022 (Date accessed).  
<https://soilseries.sc.egov.usda.gov/osdname.aspx>.

U.S. Department of Agriculture, Natural Resources Conservation Service. National Ecological Site Handbook.  
<https://directives.sc.egov.usda.gov>

United States Department of Agriculture. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin.

USDA-NRCS. 1997. National range and pasture handbook, Chapter 7, rangeland and pastureland hydrology and erosion. Washington D.C.

USDA, NRCS. 2022 (Date accessed). The PLANTS Database. <http://plants.usda.gov>.

## **Contributors**

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## **Approval**

Suzanne Mayne-Kinney, 11/05/2024

## **Acknowledgments**

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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	05/11/2025
Approved by	Suzanne Mayne-Kinney
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:**
- 

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:

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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:**
-