

Ecological site R109XY005MO Loamy Floodplain Prairie

Accessed: 04/20/2024

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): 109X—Iowa and Missouri Heavy Till Plain

The Iowa and Missouri Heavy Till Plain (area outlined in red on the map) is an area of rolling hills interspersed with interfluvial divides and alluvial valleys. Elevation ranges from about 660 feet along the lower reaches of rivers, to about 980 feet on stable interfluvial summits in southern Iowa. Relief is about 80 to 160 feet between major streams and adjacent interfluvial summits. Most of the till plain drains south to the Missouri River via the Grand and Chariton River systems, but the northeastern portion drains southeast to the Mississippi River. Loess caps the pre-Illinoian aged till on interfluvial divides, whereas the till is exposed on side slopes. Mississippian aged limestone and Pennsylvanian aged sandstone and shale crop out on lower slopes in some areas.

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.

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):

This ecological site occurs in several Land Type Associations, primarily within the following Subsections:

Chariton River Hills
 Grand River Hills
 Wyaconda River Dissected Till Plains

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. As additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Loamy Floodplain Prairies are within the green areas on the map. These sites are common in smaller stream floodplains throughout the MLRA and adjacent areas. Soils are very deep and loamy, and subject to flooding. The reference plant community is prairie dominated by Indiangrass, big bluestem, little bluestem and sideoats grama, and a wide variety of prairie wildflowers.

Associated sites

R109XY018MO	Loamy Footslope Savanna Loamy Footslope Savannas are on adjacent upland footslopes in places.
R109XY031MO	Wet Floodplain Prairie Wet Floodplain Prairies are often in adjacent, backswamp positions farther from the stream channel.
R109XY046MO	Till Upland Savanna Till Upland Savanna is the dominant upland ecological site across most of the geographic range of this site.

Similar sites

R109XY028MO	Loamy Upland Drainageway Savanna Loamy Upland Drainageway Savannas are in narrower upland floodplains and generally have higher densities of large trees. Herbaceous species composition is very similar.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus macrocarpa</i>
Shrub	(1) <i>Salix humilis</i>
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Tripsacum dactyloides</i>

Physiographic features

This site is on floodplains and floodplain steps, with slopes of 0 to 3 percent. The site generates some runoff to adjacent lower floodplain sites, and receives some runoff from stream terraces and uplands. This site is subject to flooding.

The following figure (adapted from Ferguson, 1999) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites of the floodplain and stream terrace systems and adjacent uplands. This site is within the area labeled as “5” on the figure, and typically contains the active stream channel of the floodplain system. Wet Floodplain Prairie sites are often in adjacent, backswamp positions farther from the channel. Larger floodplain systems may contain stream terrace ecological sites, such as the Wet Terrace Prairie in the figure. Several sites occur in adjacent upland positions, particularly the Till and Footslope sites shown in the figure.

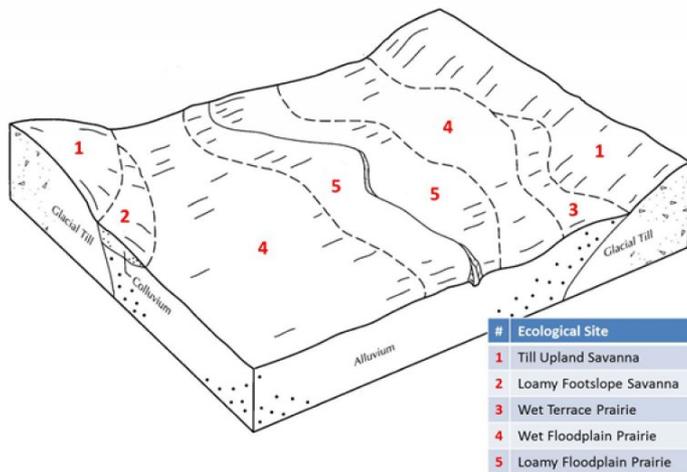


Figure 2. Landscape relationships for this ecological site

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Flood-plain step
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Rare to occasional
Slope	0–2%
Water table depth	24–48 in
Aspect	Aspect is not a significant factor

Climatic features

The Iowa and Missouri Heavy Till Plain MLRA 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.

This MLRA experiences small regional differences in climates that grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line from north to south. Both mean annual temperature and precipitation exhibit fairly minor gradients along this line.

Mean January minimum temperature follows the north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the region. Mean July maximum temperatures have a range of only two to three degrees across the region.

Mean annual precipitation varies along the same gradient as temperature – lower annual precipitation in the north, higher in the south. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages four to five 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. Drought indirectly affects ecological communities by increasing plant and animal susceptibility to the probability and severity of fire. Frequent fires encourage the development of grass/forb dominated communities and understories.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or

microclimatic variations. 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. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier, supporting more grass dominated communities than adjacent north- and-east-facing slopes that are cooler and moister that support more woody dominated communities. Finally, the cooler microclimate within a canopied forest is measurably different from the climate of a more open and warmer grassland or savanna area.

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)	162 days
Freeze-free period (average)	187 days
Precipitation total (average)	41 in

Climate stations used

- (1) AMITY 4 NE [USC00230143], Maysville, MO
- (2) BROOKFIELD [USC00230980], Brookfield, MO
- (3) GRANT CITY [USC00233369], Grant City, MO
- (4) MEMPHIS [USC00235492], Memphis, MO
- (5) KEARNEY 3E [USC00234382], Kearney, MO

Influencing water features

This ecological site is in floodplains of perennial streams where prairie is extensive in the uplands. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short- to medium- duration flooding is common in many areas, particularly during spring and early summer storm events. Constructed levees, often accompanied by stream channelization, and surface drainage systems have altered the hydrology and flooding dynamics in many places. Streambeds are typically incised into the surrounding floodplain by as much as 10 feet.

Soils in this ecological site typically have seasonal water tables below about two feet in the winter and spring, generally receding with the falling river levels in the early summer. The water table has a minimal effect on the vegetative community.

Soil features

These soils have no rooting restriction. They were formed under a mixture of woodland and prairie vegetation, with periodic depositional flood events. Organic matter content is high. Parent material is alluvium. They have silt loam surface horizons, and loamy substrata. They are well drained. Soil series associated with this site include Kennebec.

Table 4. Representative soil features

Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained
Permeability class	Moderate
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-40in)	8–9 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–7.3
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 characterized as a tallgrass prairie unit dominated by big bluestem, Indian grass, switch grass, eastern gama grass and a wide variety of prairie wildflowers while other species such as Culver's root, Michigan lily, and bunchflower added to the mix of floodplain prairie species. Slightly higher areas within or at the edge of the floodplains supported widely scattered bur oak, pin oak, elm, shellbark hickory and willow.

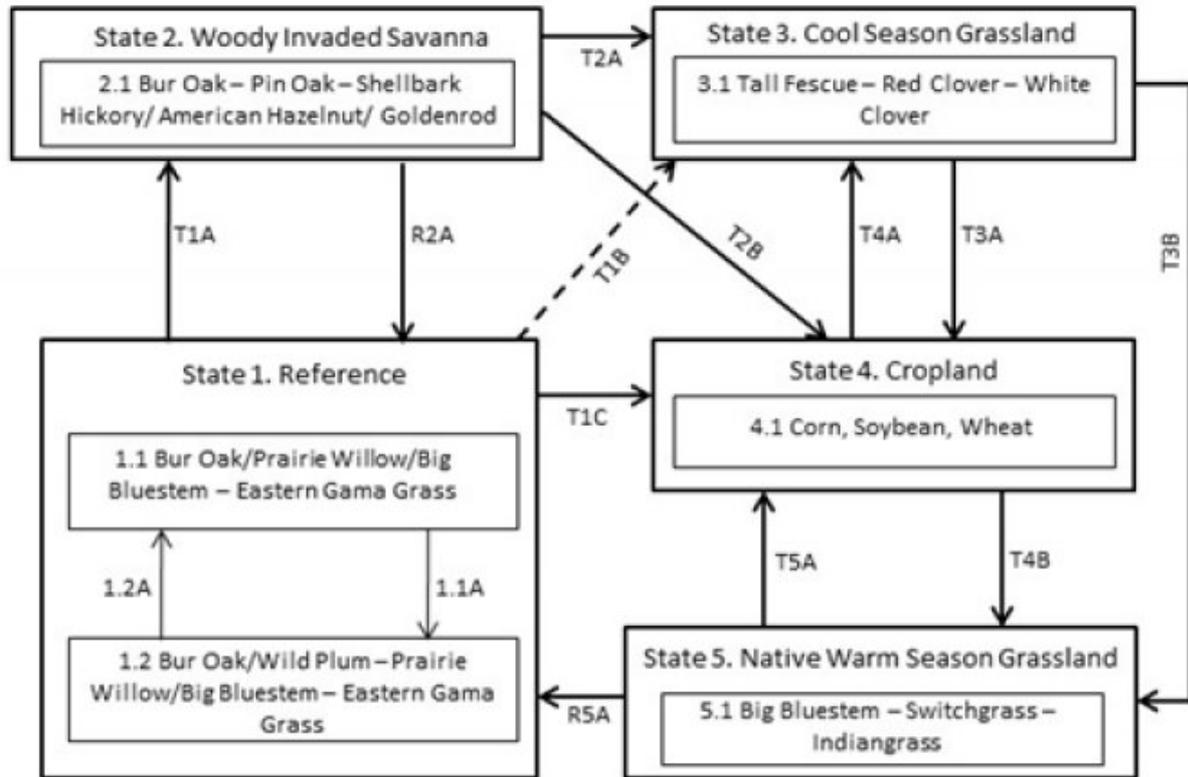
These areas flooded periodically. In addition to the flooding, fire played a key role, likely occurring at least once every 3 years. Fire removed dead plant litter and provided room for a lush growth of prairie vegetation. Fire also controlled woody species. During fire free intervals woody species would have increased in abundance and spread out onto the prairie. Grazing by native large herbivores, such as bison, elk, and deer, furthermore impacted these sites. Their activities altered the composition, fuel loads and structure of the vegetation, adding to the diversity of structure and composition.

Today, Loamy Floodplain Prairies are nearly extirpated from the region as the former floodplain prairies have been converted to intensive agriculture or non-native pasture. No reference quality remnants exist. While re-establishing prairie on agriculture sites is beneficial to wildlife, restoration to the reference state from agricultural land is a long term proposition, potentially expensive and with uncertain outcomes.

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

Loamy Floodplain Prairie, R109XY005MO



Code	Event/Activity/Process
T1A	Fire suppression > 20 years; woody invasion
T1B	Tillage; vegetative seeding; grassland management
T1C, T3A, T5A	Tillage; conservation cropping system
T2A	Woody removal; tillage; vegetative seeding; grassland management
T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding; grassland management
T3B, T4B	Vegetative seeding; prescribed fire; grassland management
1.1A	Fire-free interval 10+ years
1.2A	Fire interval 1-3 years
R2A	Woody removal; prescribed fire 1-3 years
R5A	Vegetative seeding; prescribed fire 1-3 years

Figure 7. State and transition diagram for this ecological s

State 1

Reference

This State is native tall grass prairie dominated by big bluestem, eastern gama grass, and a wide variety of prairie wildflowers. In some cases, bur oak, pin oak, elm, American hazelnut, prairie willow and wild plum occurred in small groves or as scattered individuals across the prairie landscape. Two phases can occur that will transition back and forth depending on fire frequencies. Longer fire free intervals will allow woody species to increase such as bur oak, prairie willow, dogwoods and wild plum. When fire intervals shorten these woody species will decrease or be eliminated. This state is believed to be expatriated. All sites have been converted to cool season grassland and intensive agriculture cropland.

Community 1.1

Bur Oak/Prairie Willow/Big Bluestem – Eastern Gama Grass

This phase is dominated by big bluestem, Indian grass, switch grass, eastern gama grass and a wide variety of prairie wildflowers while other species such as Culver's root, Michigan lily, and bunchflower added to the mix of floodplain prairie species. These areas flooded periodically. In addition to the flooding, fire played a key role, likely occurring at least once every 3 years.

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

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

Community 1.2

Bur Oak/Wild Plum – Prairie Willow/Big Bluestem – Eastern Gama Grass

This phase is characterized by fire free intervals. Woody species would have increased in abundance and spread out onto the prairie. Slightly higher areas within or at the edge of the floodplains supported widely scattered bur oak, pin oak, elm, shellbark hickory and willow.

State 2

Woody Invaded Savanna

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

Community 2.1

Bur Oak – Pin Oak – Shellbark Hickory/ American Hazelnut/ Goldenrod

State 3

Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue, white clover, and red clover has been common in this area. Occasionally, these pastures will have scattered bur oaks. Long term uncontrolled grazing and a lack of grassland management can cause significant soil erosion and compaction and increases in less productive species such as Kentucky bluegrass and weedy forbs such as ironweed. A return to the Reference State may be impossible and costly, requiring a very long term series of management options.

Community 3.1

Tall Fescue – Red Clover – White Clover

State 4

Cropland

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

Community 4.1 Corn, Soybean, Wheat

State 5 Native Warm Season Grassland

Conversion from the Cool Season Grassland (State 3) or the Cropland (State 4) to this state is increasing due to renewed interest in warm season grasses as a supplement to cool season grazing systems or as a native restoration activity. This State is the most easily transformable state back to a Reference State. Substantial restoration time, money and management inputs will still be needed.

Community 5.1 Big Bluestem – Switchgrass – Indiangrass

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
bur oak	QUMA2	<i>Quercus macrocarpa</i>	Native	–	0–5	–	–
pin oak	QUPA2	<i>Quercus palustris</i>	Native	–	0–5	–	–
shellbark hickory	CALA21	<i>Carya laciniosa</i>	Native	–	0–5	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
big bluestem	ANGE	<i>Andropogon gerardii</i>	Native	–	30–50
eastern gamagrass	TRDA3	<i>Tripsacum dactyloides</i>	Native	–	10–30
little bluestem	SCSC	<i>Schizachyrium scoparium</i>	Native	–	10–20
Indiangrass	SONU2	<i>Sorghastrum nutans</i>	Native	–	10–20
switchgrass	PAVI2	<i>Panicum virgatum</i>	Native	–	10–20
prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	Native	–	5–10
Forb/Herb					
Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	Native	–	5–20
ashy sunflower	HEMO2	<i>Helianthus mollis</i>	Native	–	5–20
button eryngo	ERYU	<i>Eryngium yuccifolium</i>	Native	–	5–20
white wild indigo	BAAL	<i>Baptisia alba</i>	Native	–	5–20
prairie milkweed	ASSU3	<i>Asclepias sullivantii</i>	Native	–	5–20
wild quinine	PAIN3	<i>Parthenium integrifolium</i>	Native	–	5–20
butterfly milkweed	ASTU	<i>Asclepias tuberosa</i>	Native	–	5–20
prairie blazing star	LIPY	<i>Liatris pycnostachya</i>	Native	–	5–20
purple prairie clover	DAPU5	<i>Dalea purpurea</i>	Native	–	10–20
eastern purple coneflower	ECPU	<i>Echinacea purpurea</i>	Native	–	10–20
compassplant	SILA3	<i>Silphium laciniatum</i>	Native	–	10–20
Virginia bunchflower	VEVI5	<i>Veratrum virginicum</i>	Native	–	10–20
wholeleaf rosinweed	SIIN2	<i>Silphium integrifolium</i>	Native	–	5–20
hoary puccoon	LICA12	<i>Lithospermum canescens</i>	Native	–	5–20
wild bergamot	MOFI	<i>Monarda fistulosa</i>	Native	–	5–20
Culver's root	VEVI4	<i>Veronicastrum virginicum</i>	Native	–	5–20
Michigan lily	LIMI9	<i>Lilium michiganense</i>	Native	–	5–10
purple milkwort	POSA3	<i>Polygala sanguinea</i>	Native	–	5–10
Shrub/Subshrub					
New Jersey tea	CEAM	<i>Ceanothus americanus</i>	Native	–	5–10
American hazelnut	COAM3	<i>Corylus americana</i>	Native	–	5–10
American plum	PRAM	<i>Prunus americana</i>	Native	–	5–10
leadplant	AMCA6	<i>Amorpha canescens</i>	Native	–	5–10
prairie willow	SAHU2	<i>Salix humilis</i>	Native	–	5–10

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 and Virginia Rail

Bird species associated with this ecological site's reference state condition:

Breeding birds: Sedge Wren, Red-Winged Blackbird, Least Bittern, Marsh Wren, and Common Yellowthroat.

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

Pashley. 2000b; Jacobs 2001)

Amphibian and reptile species associated with this ecological site's reference state condition: Western Chorus Frog (*Pseudacris triseriata triseriata*), Plains Leopard Frog (*Rana blairi*), Graham's Crayfish Snake (*Regina grahamii*), 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*).

Furbearers: Muskrat, Beaver, and Mink. (Schwartz and others 2001)

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*). (Johnson 2000; Heitzman and Heitzman. 1996)

Other invertebrates: Grassland Crayfish (*Procambarus gracilis*)

Other information

Forestry

Management: This ecological site is not recommended for traditional timber management 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. 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 bio-fuels

Inventory data references

EXTINCT in reference state – no available plots

Other references

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Contributors

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Rangeland health reference sheet

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

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

Indicators

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

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

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

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

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

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

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

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

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

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

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

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

Dominant:

Sub-dominant:

Other:

Additional:

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

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

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

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

17. **Perennial plant reproductive capability:**
