USDA Natural Resources Conservation Service

Ecological site R058AY726MT
Woody Draw 15-19

Last updated: 8/29/2024
Accessed: 05/13/2025

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): 058A–Northern Rolling High Plains, Northern Part

MLRA 058A, Northern Rolling High Plains (Northern Part), is an expansive and agriculturally and ecologically significant area encompassing 26 counties in southeast Montana (99 percent) and northeast Wyoming (1 percent). It stretches approximately 290 miles from east to west and 220 miles from north to south and comprises approximately 42,350 square miles (26,875,928 acres). The area is within the Missouri Plateau, Unglaciated, Section of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been eroded. Slopes generally are gently rolling to steep, and wide belts of steeply sloping badlands border a few of the larger river valleys. In some areas flat-topped, steep-sided buttes rise sharply above the general level of the plains. Elevations generally range from 1,950 to 3,280 feet, increasing from east to west and from north to south.

Tertiary continental shale, siltstone, and sandstone of the Fort Union Formation underlie the eastern one-third to one-half of this area. Marine and continental sediments of the Cretaceous Montana Group underlie the rest of the MLRA, generally at the higher elevations. There are also younger Cretaceous sediments of the Livingston Group occurring between the higher elevation Montana Group sediments and the lower elevation Tertiary sediments. The dominant soil orders in MLRA 058A are Entisols and Inceptisols. The soils in the area dominantly have a frigid soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. They range from shallow to very deep and are generally well drained and clayey or loamy.

The area primarily supports native prairie vegetation characterized by a variety of cool-season and warm-season graminoids, forbs, and shrubs. In the western portion of the area, cool-season grasses such as western wheatgrass and bluebunch wheatgrass are dominant but, in the eastern portion of the area, warm-season grasses such as little bluestem and sideoats grama become dominant. Wyoming big sagebrush, silver sagebrush, and fringed sagewort are common shrub species throughout the area. Forested areas occur in rough hilly areas and river breaks, particularly in areas with higher precipitation. Common tree species are ponderosa pine and Rocky Mountain juniper with scattered pockets of Douglas fir.

More than 75 percent of this MLRA is native rangeland utilized for livestock production and more than 50 percent of the MLRA consists of privately-owned ranches. Approximately 15 percent of the MLRA is used as cropland. Other land uses including forestland, urban development, water, and other uses combine for less than 10 percent of the total land use.

Classification relationships

NRCS Soil Geography Hierarchy
• Land Resource Region: Western Great Plains
• Major Land Resource Area (MLRA): 058A Northern Rolling High Plains, Northern Part

National Hierarchical Framework of Ecological Units (Cleland et al., 1997; McNab et al., 2007)
• Domain: Dry

• Division: Temperate Steppe
• Province: Great Plains-Palouse Dry Steppe Province (331)
• Section: North Central Highlands (331K) and Powder River Basin (331G)

National Vegetation Classification Standard (Federal Geographic Data Committee, 2008)
• Class: Forest and Woodland Class (1)
• Subclass: Temperate and Boreal Forest and Woodland Subclass (1.B)
• Formation: Cool Temperate Forest and Woodland Formation (1.B.2)
• Division: North American Great Plains Forest and Woodland Division (1.B.2.Ne)
• Macrogroup: Great Plains Forest and Woodland Macrogroup (1.B.2.Ne.1)
• Group: Great Plains Mesic Forest and Woodland Group (1.B.2.Ne.1.b)
• Alliance: Great Plains Ash - Elm Ravine Forest

EPA Ecoregions
• Level 1: Great Plains (9)
• Level 2: West-Central Semi-Arid Prairies (9.3)
• Level 3: Northwestern Great Plains (9.3.3)
• Level 4: Montana Central Grasslands (43n), River Breaks (43c), and Pine Scoria Hills (43p)

Ecological site concept

This ecological site is an extensive site which occurs on moderately steep to very steep landscapes, typically where the landscape has been dissected by streams, rivers, or drainageways. This site generally occurs at elevations ranging from 1,900 to 3,500 feet and can occur on a wide range of slopes, although slopes ranging from 15 to 45 percent are most common. The site typically occurs in the narrowest, most sheltered swales and is most common on northerly aspects. The soils for this ecological site are typically very deep (greater than 60 inches), well drained, and derived from alluvium. The soil textures are typically loam, sandy loam, or silt loam.

Associated sites

R058AY727MT	**Loamy 15-19** This site occurs on nearly level to gently sloping positions upslope from and commonly surrounding the Woody Draw ecological site. It is typically found in summit positions where slopes are less than 15 percent and depth to bedrock is greater than 20 inches.
R058AY728MT	**Loamy Steep 15-19** This site is generally found is on moderately steep to steep positions adjacent to the Woody Draw ecological site, but in areas that are less sheltered and receive less effective moisture such as south facing slopes or broader, more gently sloped drainageways.

Similar sites

R058AY720MT	**Swale 10-14** This site differs from the Woody Draw ecological site in that it receives less moisture and is dominated by herbaceous species. Bunchgrasses dominate the site in terms of cover and production.
R058AY736MT	**Riparian Woodland 10-19** This site differs from the Woody Draw ecological site in that it is on flood plains rather than upland swales. It generally is on stream terraces adjacent to a perennial stream reach and typically contains riparian species such as sandbar willow and plains cottonwood.
R058AY727MT	**Loamy 15-19** This site differs from the Woody Draw ecological site in that it is in higher topographical positions that do not receive additional moisture and it does not support woody vegetation whereas the Woody Draw ecological site is in sheltered coulees or swales and supports woody vegetation.

Table 1. Dominant plant species

Tree	(1) *Fraxinus pennsylvanica*
Shrub	(1) *Prunus virginiana*

Herbaceous	Not specified

Physiographic features

This ecological site occurs on moderately steep to very steep landscapes, typically where the landscape has been dissected by streams, rivers, or drainageways. Slopes typically range from 15 to 45 percent. This site occurs most commonly on northern aspects. Aspect can be significant factor.

Table 2. Representative physiographic features

Landforms	(1) Draw (2) Drainageway (3) Swale
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	579–1,067 m
Slope	15–45%
Aspect	NW, N, NE

Climatic features

MLRA 058A is a semi-arid region and is considered to have a continental climate characterized by cold winters, hot summers, low humidity, light rainfall, and much sunshine. The climate is the result of the MLRA's location in the geographic center of North America. Temperatures can be extreme. The average annual temperature is 41 to 49 degrees Fahrenheit. Summer daytime temperatures are typically quite warm, generally averaging in the lower to mid 80 degree range for July and August. Summertime temperatures will typically reach 100 degrees or more at some point during the summer and can reach 90 degrees during any month between May and September. Conversely, winter temperatures can be cold, averaging in the lower teens or less for December and January. There will typically be several days of below zero temperatures each winter. It is not uncommon for temperatures to reach 30 to 40 degrees below zero, or even colder, most any winter.

During an average year, 70 to 75 percent of the annual precipitation falls between April and September, which are the primary growing season months. Most of the rainfall occurs as frontal storms early in the growing season during the months of May and June. Some high-intensity, convective thunderstorms occur in July and August, and some rainfall occurs in autumn. Later summer precipitation is greater in the eastern portion of the MLRA, which effects plant community composition. Winter precipitation occurs as snow although snowfall is not heavy, averaging about 39 inches annually, and snow cover is typically 1 to 3 inches. Heavy snowfall occurs infrequently, usually late in the winter or early spring. The average annual precipitation ranges from 8 to 22 inches but is typically 11 to 17 inches throughout most of the area. This site occurs in the higher range of 15 to 19 inches of precipitation. Precipitation fluctuates widely from year to year and severe drought occurs 2 out of 10 years on average.

There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature. Spring can be windy throughout the MLRA, with winds averaging over 10 mph about 15 percent of the time. Speeds of 50 mph or stronger can occasionally occur. During the winter months, the western half of the MLRA commonly experiences Chinook winds, which are strong west to southwest surface winds accompanied by abrupt increases in temperature. The Chinook winds are strongest on the western boundary of the MLRA near the Rocky Mountain foothills and decrease eastward. In addition to producing damaging winds, prolonged Chinook episodes can result in drought or vegetation kills due to a reaction of plants to a "false spring" (Oard, 1993).

For local climate station information, refer to https://wrcc.dri.edu/summary/Climsmemt.html.

Table 3. Representative climatic features

Frost-free period (characteristic range)	70-150 days
Freeze-free period (characteristic range)	90-180 days
Precipitation total (characteristic range)	381-483 mm
Frost-free period (average)	116 days
Freeze-free period (average)	140 days
Precipitation total (average)	406 mm

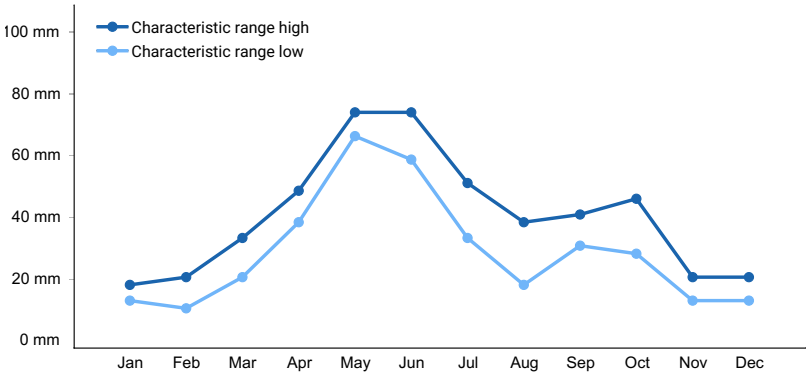


Figure 1. Monthly precipitation range

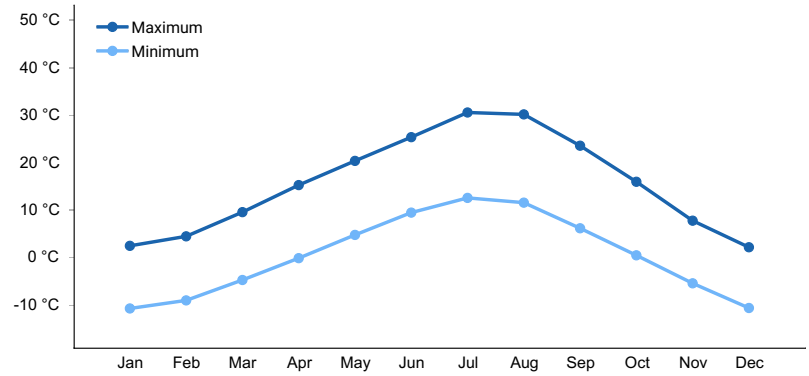


Figure 2. Monthly average minimum and maximum temperature

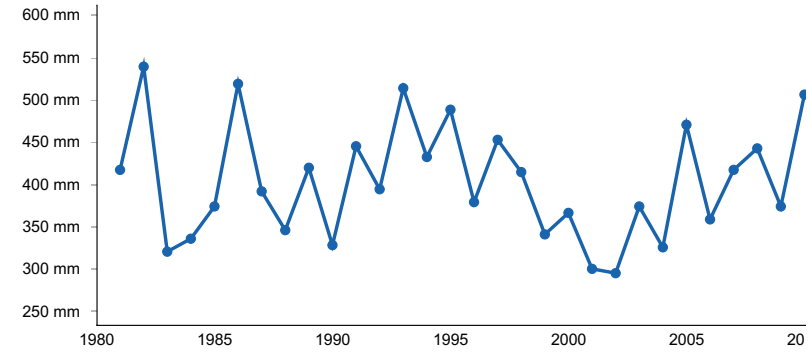


Figure 3. Annual precipitation pattern

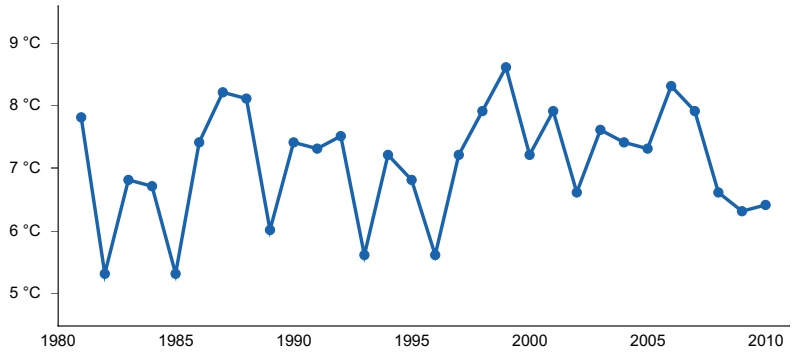


Figure 4. Annual average temperature pattern

Climate stations used

- (1) WINIFRED [USC00249033], Hilger, MT
- (2) COLUMBUS [USC00241938], Columbus, MT
- (3) WYOLA 1 SW [USC00249175], Wyola, MT
- (4) EKALAKA [USC00242689], Ekalaka, MT
- (5) MELSTONE [USC00245596], Musselshell, MT
- (6) YELLOWTAIL DAM [USC00249240], Lodge Grass, MT

Influencing water features

This is an upland ecological site and is not influenced by a water table but does receive run in from adjacent sites. Due to the semi-arid climate in which it occurs, the water budget is normally contained within the soil pedon. Soil moisture is recharged by spring rains, but it but rarely exceeds field capacity in the upper 40 inches before being depleted by evapotranspiration. During intense precipitation events, precipitation rates frequently exceed infiltration rates and this site receives additional moisture from upslope sites via surface runoff. Moisture loss through evapotranspiration exceeds precipitation for the majority of the growing season, but this site receives enough moisture from runoff to remain moist much longer than adjacent sites.

Wetland description

Not Applicable

Soil features

Soils for this ecological site are typically very deep (greater than 60 inches to bedrock), well drained, and derived from mudstone colluvium. A thin (0 to 1 inches) organic horizon comprised of forest litter and partially decomposed plant litter is typically present on the soil surface. Surface mineral horizon textures are typically loam or clay loam. The underlying horizons typically have loam, clay loam, silt loam, silty clay loam or fine sandy loam textures, but may also stratified with thin layers that range from fine sandy loam to silty clay. Some soil profiles may contain bleached sand grains or pieces of charcoal from past fires. Content of coarse fragments is less than 35 percent in the upper 20 inches of soil. The soil temperature regime is primarily frigid, with smaller areas of mesic temperature regime present. The soil moisture regime is typic ustic. Figure 5 shows a typical soil profile for this ecological site.

Soil Series:	Horizon	Depth	Texture
Arikara	Oi	0-1	Forest litter and partially decomposed plant litter
	A	1-2	Loam
	Bw	2-14	Loam
	Bk	14-39	Loam
	C1	39-54	Loam
	C2	54-60	Fine sandy loam

Figure 5. Typical Soil Profile

Table 4. Representative soil features

Parent material	(1) Colluvium–mudstone
Surface texture	(1) Loam (2) Clay loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	152–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–1%
Available water capacity (0-91.4cm)	5.08–6.35 cm
Calcium carbonate equivalent (0-91.4cm)	0–3%
Electrical conductivity (0-91.4cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-91.4cm)	0
Soil reaction (1:1 water) (0-91.4cm)	6.7–7
Subsurface fragment volume <=3" (0-91.4cm)	0–3%
Subsurface fragment volume >3" (0-91.4cm)	0–4%

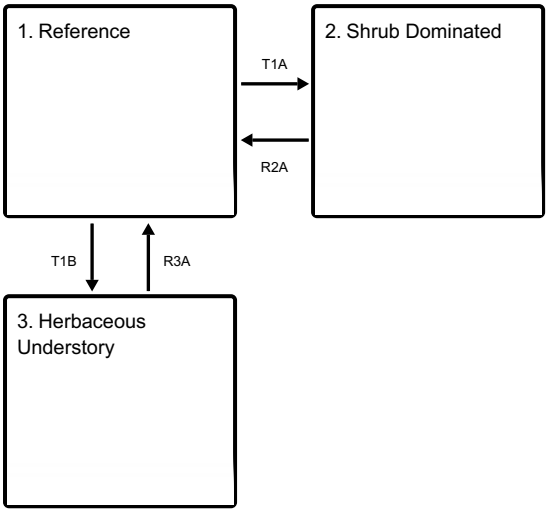
Ecological dynamics

Interpretations are primarily based on the Reference state, which is used as a reference in order to understand the original potential of the site. This ecological site developed under the combined influences of climatic conditions, periodic fire activity, grazing by large herbivores, and impacts from small mammals and insects. Changes may occur to the Reference state due to management actions such as improper grazing management, climatic conditions such as drought, and natural events such as wildfire. The Reference state for this ecological site is dominated by a diversity of tall to medium height trees and shrubs, which are tightly intermixed and well distributed over the site. Various grasses and forbs are common in the understory on this site. The Reference state is not necessarily the management goal, as other vegetative states may be considered desired plant communities as long as critical resource concerns are met.

In addition to the Reference state, other plant communities can occur on this site and are usually the result of historic management practices. Long term overgrazing on this ecological site results in a decrease in shrub diversity and in an increase of less palatable forbs and shrubs. Tree and shrub densities increase in the absence of prescribed fire and wildfire. More frequent fire intervals decrease the tree and shrub density resulting in an increase in herbaceous species. There are various transitional stages which may occur on this ecological site.

State and transition model

Ecosystem states



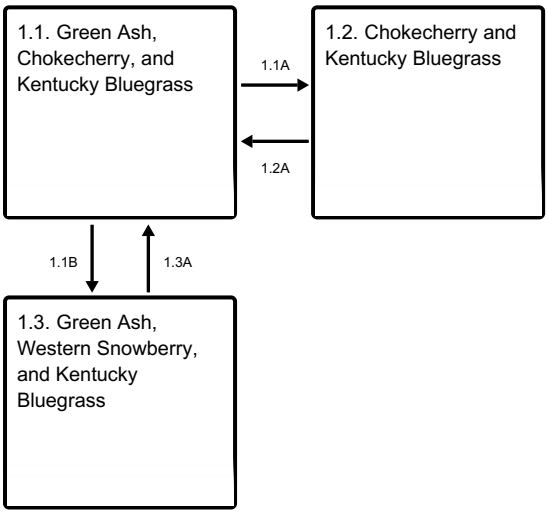
T1A - Stand-replacing event in combination with prolonged improper grazing management

T1B - Prolonged improper grazing management

R2A - Proper grazing management, tree/shrub planting, intensive weed management (management intensive and costly)

R3A - Proper grazing management, tree/shrub planting, intensive weed management (management intensive and costly)

State 1 submodel, plant communities



1.1A - Stand-replacing event (wildfire, prescribed fire, or biological processes)

1.1B - Improper grazing management

1.2A - Lack of disturbance, tree regeneration, and woody plant regrowth

1.3A - Proper grazing management

State 2 submodel, plant communities

2.1. Western Snowberry, Silver Buffaloberry, and Kentucky Bluegrass

State 3 submodel, plant communities

3.1. Green Ash, Box Elder, and Kentucky Bluegrass

3.2. Green Ash, Box Elder, and Leafy Spurge

State 1
Reference

The Reference state for this ecological site consists of three communities and evolved under the combined influences of climatic conditions, periodic fire activity, grazing by large herbivores, and impacts from small mammals and insects. The Reference state is the plant communities in which interpretations are primarily based and is used as a reference in order to understand the original potential of the site.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- chokecherry (*Prunus virginiana*), tree
- Kentucky bluegrass (*Poa pratensis*), grass

Community 1.1
Green Ash, Chokecherry, and Kentucky Bluegrass

This plant community is characterized by a green ash and box elder overstory with tree canopy ranging from 20 to 80 percent and tree diameters ranging from 4 to 16 inches DBH. There is a diverse shrub understory consisting of species such as chokecherry and serviceberry. Common introduced grass species include smooth brome and Kentucky bluegrass.

Community 1.2
Chokecherry and Kentucky Bluegrass

This plant community is characterized by an overstory dominance of chokecherry. Tree species such as green ash and box elder are reduced and canopy cover ranges from 10 to 25 percent. Tree diameters are 4 inches or less DBH. Green ash re-sprouting is common. Common introduced grass species include smooth brome and Kentucky bluegrass. This community occurs following tree mortality due to wildfire, prescribed fire, or biological processes.

Community 1.3
Green Ash, Western Snowberry, and Kentucky Bluegrass

This plant community is characterized by a green ash and box elder overstory with tree canopy ranging from 20 to 60 percent and tree diameters ranging from 4 to 16 inches DBH. Unpalatable shrubs such as western snowberry and Wood’s rose are common. Common introduced grass species include smooth brome and Kentucky bluegrass. This plant community occurs when site conditions decline due to improper grazing management practices such as continuous season-long or year-long grazing.

Pathway 1.1A
Community 1.1 to 1.2

Community 1.1 will transition to community 1.2 through prescribed fire and wildfire, and biological processes.

Pathway 1.1B
Community 1.1 to 1.3

Improper grazing management such as continuous season-long or year-long grazing, or a combination of these factors can shift community 1.1 to community 1.3. These factors favor a decrease in shrub diversity and an increase in unpalatable shrubs such as western snowberry (Hansen et al., 1995)

Pathway 1.2A
Community 1.2 to 1.1

A lack of disturbance, tree regeneration, and natural woody plant regrowth will shift community 1.2 to community 1.1.

Pathway 1.3A
Community 1.3 to 1.1

Proper grazing management such as deferred or rotational grazing can shift community 1.3 to community 1.1.

State 2
Shrub Dominated

The dynamics of the Shrub Dominated state are driven by a combination of stand replacing events such as wildfire, prescribed fire, or biological processes and improper grazing management such as continuous season-long or year-long grazing. The Shrub Dominated state for this ecological site consists of one community.

Dominant plant species

- western snowberry (*Symphoricarpos occidentalis*), shrub
- silver buffaloberry (*Shepherdia argentea*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass

Community 2.1
Western Snowberry, Silver Buffaloberry, and Kentucky Bluegrass

This plant community is characterized by a community dominated by shrubs such as western snowberry and silver buffaloberry. Green ash saplings are rare or absent. Common introduced grass species include smooth brome and Kentucky bluegrass.

State 3
Herbaceous Understory

The Herbaceous Understory state occurs when the shrub understory has been removed due to long-term improper grazing management practices such as continuous season-long or year-long grazing. Once the stand has transitioned from a shrub dominated understory to an herbaceous dominated understory, returning the site to its former state is very difficult. The Herbaceous Understory state consists of two communities.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree
- Kentucky bluegrass (*Poa pratensis*), grass
- leafy spurge (*Euphorbia esula*), other herbaceous

Community 3.1
Green Ash, Box Elder, and Kentucky Bluegrass

This plant community is characterized by a community consisting of an open, decadent, green ash and box elder overstory. Shrubs species such as chokecherry, western snowberry, and silver buffaloberry are rare or absent. Common introduced grass species include smooth brome and Kentucky bluegrass.

Community 3.2
Green Ash, Box Elder, and Leafy Spurge

This plant community is characterized by a community consisting of an open, decadent, green ash and box elder overstory. Shrubs species such as chokecherry, snowberry, and buffaloberry are rare or absent. The understory is dominated by noxious weed species such as leafy spurge and Canada thistle.

Transition T1A
State 1 to 2

A stand replacing event such as wildfire, prescribed fire, or biological processes in combination with prolonged improper grazing management such as continuous season-long or year-long grazing weaken the resilience of the Reference state and drive its transition to the Shrub Dominated state. Existing tree cover is removed while tree reproduction is suppressed by livestock or wildlife browsing.

Transition T1B
State 1 to 3

Prolonged improper grazing practices such as continuous season-long or year-long grazing weaken the resilience of the Reference state and drive its transition to the Herbaceous Understory state. The Reference state transitions to the Herbaceous Understory state when tree and shrub reproduction becomes rare and the stand becomes open and decadent.

Restoration pathway R2A
State 2 to 1

A change in management alone may not be sufficient to restore the Shrub Dominated state to the Reference state. Proper grazing management in combination with tree/shrub planting, herbaceous weed control, and normal or above-normal moisture can transition the Shrub Dominated state back to the Reference state. These restoration methods are labor intensive, costly, and may not be a practical in all situations.

Conservation practices

Prescribed Grazing

Restoration pathway R3A
State 3 to 1

A change in management alone may not be sufficient to restore the Herbaceous Understory state to the Reference state. Proper grazing management in combination with tree/shrub planting, herbaceous weed control, and normal or above-normal moisture can transition the Herbaceous Understory state back to the Reference state. These restoration methods are labor intensive, costly, and may not be a practical in all situations.

Additional community tables

Inventory data references

Specific field data was not obtained for this provisional ecological site description. Existing field data were used in conjunction with a review of the scientific literature and professional experience to approximate the plant communities, states, and transitions. All community phases are considered provisional based on the sources identified in this ecological site description.

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Contributors

Jeff Fenton
Scott Brady
Maryjo Kimble
Brian Kloster

Approval

Kirt Walstad, 8/29/2024

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	05/13/2025
Approved by	Kirt Walstad

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:

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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:**
