

Ecological site R058AE016MT Gravel (Gr) RRU 58A-E 10-14" p.z.

Accessed: 04/19/2024

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.

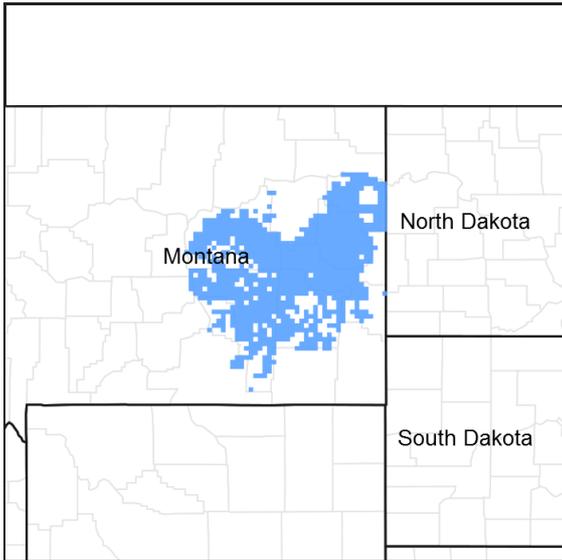


Figure 1. Mapped extent

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.

Associated sites

R058AY001MT	Loamy (Lo) 10-14 P.Z.
R058AE004MT	Silty-Steep (SiStp) RRU 58A-E 10-14" p.z.
R058AE006MT	Sandy-Steep (SyStp) RRU 58A-E 10-14" p.z.
R058AE019MT	Shallow (Sw) RRU 58A-E 10-14" p.z.

Similar sites

R058AE018MT	Sands (Sa) RRU 58A-E 10-14" p.z. Sands sites have few coarse fragments, and are significantly more productive.
R058AE191MT	Shallow to Gravel (SwGr) RRU 58A-E 10-14" p.z. Shallow to Gravel sites are typically silt loams, loams, and sandy loams less than 20 inches deep over gravels or a layer with 35% or more gravels.
R058AE017MT	Very Shallow (VSw) RRU 58A-E 10-14" p.z. Very Shallow sites typically have a restrictive layer at less than 10 inches.

Table 1. Dominant plant species

Tree	Not specified
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Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs on hills, terraces, and terrace escarpments in this MLRA. This site often occurs in complex with other sites. Slopes range from 0 to 70 percent, and aspect can be significant. Slight variations in plant composition and production can occur due to exposure.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Terrace (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	1,900–3,500 ft
Slope	0–70%
Water table depth	60 in

Climatic features

MLRAs 58A and 60B are considered to have a continental climate characterized by cold winters, hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are typical. The climate is the result of this MLRA's location in the geographic center of North America. 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. Seasonal precipitation is often limiting for plant growth. Annual fluctuations in species composition and total production are typical depending on the amount and timing of rainfall.

Temperatures can be very extreme in this part of Montana. Summer daytime temperatures are typically quite warm, generally averaging in the mid to upper 80°s F for July and August. Summertime temperatures will typically reach in the 100°s F at some point during the summer, and can reach 90° F any month between May and September. Conversely, winter temperatures can be cold, averaging in the mid teens to mid 20°s F for December and January. There will typically be several days of below zero temperatures each winter. It is not uncommon for temperatures to reach 30–40° F below zero, or even colder, most any winter.

Spring can be windy throughout these MLRA's, with winds averaging over 10 mph about 15 percent of the time. Speeds of 50 mph or stronger can occasionally occur as a weather system crosses this part of Montana.

MLRAs 58AE and 60BE have been divided into two distinct precipitation zones for the purpose of developing ecological site descriptions: 10–14" Mean Annual Precipitation (MAP) and 15–19" MAP.

10–14 inch zone:

The majority of the rangeland in these areas falls within the 11 to 13 inch range. During an average year, 70 to 75 percent of the annual precipitation falls between April and September, which are the primary growing season months.

Snowfall is not heavy in the area, averaging 28 total inches in the 10-14 inch MAP (Yellowstone Valley). Heavy snowfall occurs infrequently, usually late in the winter or early spring. Snow cover is typically 1 to 3 inches.

The frost free (32° F.) season averages about 105 to 145 days each year in the uplands, to nearly 170 days along the Yellowstone River Valley.

For local climate station information, refer to <http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=mt>.

Table 3. Representative climatic features

Frost-free period (average)	145 days
Freeze-free period (average)	170 days
Precipitation total (average)	14 in

Influencing water features

There are no influencing water features for this site.

Soil features

These are moderately deep to very deep droughty soils formed in sand and gravel deposits. They typically have 15 to 25 percent or more pebbles and gravels in the upper part of the soil, and 50 percent or more pebbles, gravels and cobbles in the lower part, often within 12 inches of the surface.

Table 4. Representative soil features

Surface texture	(1) Gravelly loam (2) Very gravelly sandy loam (3) Extremely gravelly loamy sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Rapid to very rapid
Soil depth	40–60 in
Available water capacity (0-40in)	0–2 in
Calcium carbonate equivalent (0-40in)	5–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	70%
Subsurface fragment volume >3" (Depth not specified)	10%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). This community is described as a reference to understand the original potential of this site, and is not always considered to be the management goal for every acre of rangeland. The following descriptions should enable the landowner or manager to better understand which plant communities occupy their land, and assist with setting goals for vegetation management. It can also be useful to understand the environmental and economic values of each plant community.

This site is considered moderately resilient to disturbance as it has moderate to severe soil limitations for plant growth. Changes may occur to the Historic Climax Plant Community due to management actions and/or climatic conditions. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur.

Under favorable vegetative management treatments this site can more readily return to the Historic Climax Plant Community (HCPC).

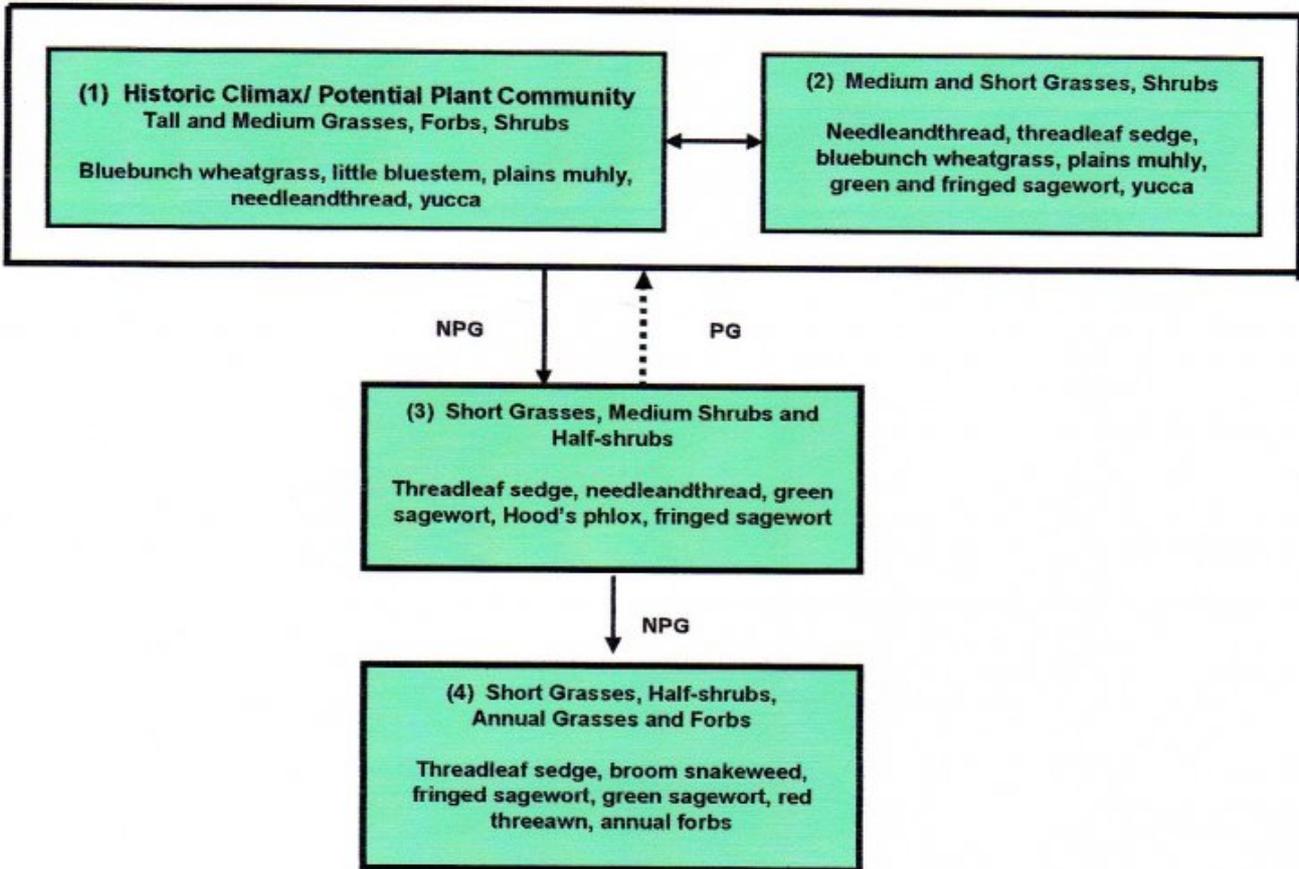
Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller, more palatable species such as bluebunch wheatgrass, little bluestem, and plains muhly and an increase in needleandthread, threadleaf sedge, green sagewort, and yucca.

Plants that are not a part of the climax community that are most likely to invade are annual grasses and forbs and broom snakeweed.

State and transition model

MLRA: 58A – Sedimentary Plains, East
 MLRA: 60B – Pierre Shale Plains, East
 R058AE016MT, R060BE569MT

Plant Communities and Transitional Pathways (diagram)



Smaller boxes within a larger box indicate that these communities will normally shift among themselves with slight variations in precipitation and other disturbances. Moving outside the larger box indicates the community has crossed a threshold (heavier line) and will require intensive treatment to return to Community 1 or 2. Dotted lines indicate a reduced probability for success.

NOTE: Not all species present in the community are listed in this table. Species listed are representative of the plant functional groups that occur in the community.

PG = Prescribed Grazing: Use of a planned grazing strategy to balance animal forage demand with available forage resources. Timing, duration, and frequency of grazing are controlled and some type of grazing rotation is applied to allow for plant recovery following grazing.

NPG = Non-Prescribed Grazing: Grazing which has taken place that does not control the factors as listed above, or animal forage demand is higher than the available forage supply.

11. Plant Growth Curves: Growth of native cool-season plants begins in April and continues to the end of June. Native warm-season plants begin growth about mid May and continue to about the end of August. Green up of cool-season plants can occur in September through October when adequate soil moisture is present. The following tables show the approximate percentage of total growth by month that is expected to occur in various plant communities on this site for a "typical" moisture year.

State 1

Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs

Community 1.1

Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. This plant community is dominated by tall and medium cool and warm season grasses (bluebunch wheatgrass, little bluestem, needleandthread, and plains muhly). A few forbs occur in small percentages. Yucca, prairie rose and Wyoming big sagebrush are the predominant shrubs that occur, along with creeping and Rocky Mountain juniper. Annual production is low on this site due to low available water for plant growth.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	200	440	560
Shrub/Vine	25	55	70
Forb	25	55	70
Total	250	550	700

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-25%
Grass/grasslike foliar cover	15-20%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-5%
Grass/grasslike basal cover	5-10%
Forb basal cover	1-4%
Non-vascular plants	0%
Biological crusts	1-2%
Litter	30-40%
Surface fragments >0.25" and <=3"	60-70%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	5-10%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	15-25%	15-20%	1-5%
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2

Plant Community 2: Medium and Short Grasses, Shrubs and Half-shrubs

Community 2.1

Plant Community 2: Medium and Short Grasses, Shrubs and Half-shrubs

Slight variations in the historical climax plant community result in a community dominated by medium and short grasses, with more half-shrubs and shrubs. Species that tend to dominate include needleandthread, with lesser amounts of bluebunch wheatgrass and little bluestem. Threadleaf sedge, green and fringed sagewort, and yucca become more prevalent. Grass biomass production and litter become reduced on the site as the taller grasses disappear, increasing evaporation and reducing moisture retention. Additional open space in the community can result in undesirable invader species. This plant community provides for moderate soil stability.

State 3

Plant Community 3: Short Grasses, Shrubs and Half-shrubs

Community 3.1

Plant Community 3: Short Grasses, Shrubs and Half-shrubs

With continued adverse impacts to Plant Community 2, the plant community tends to become dominated by species such as threadleaf sedge, needleandthread, green and fringed sagewort, and Hood's phlox.

State 4

Plant Community 4: Half-shrubs/ Short grasses/ Annual Grasses and Forbs

Community 4.1

Plant Community 4: Half-shrubs/ Short grasses/ Annual Grasses and Forbs

With adverse disturbances to Plant Community 3, the plant community tends to become dominated by short grasses, annual grasses and forbs, and half-shrubs. Bare ground increases substantially and forbs and soil erosion will occur, typically resulting in a significant amount of erosion "pavement". Species that tend to dominate the site include threadleaf sedge, broom snakeweed, green and fringed sagewort, red threeawn, and annuals. Plant Communities 3 and 4 are less productive than Plant Communities 1 or 2. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives short grasses a competitive advantage over the cool and warm season tall and medium grasses. This community has lost many of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy flow. These communities will respond positively to improved grazing management, but significant economic inputs and time would be required to move them toward a higher successional stage and a more productive plant community.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Native grasses			200–490	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	50–350	–
	little bluestem	SCSCS	<i>Schizachyrium scoparium</i> var. <i>scoparium</i>	50–350	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–105	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	25–105	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	12–70	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–35	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	2–35	–
2	Native grasses and sedges			2–70	
	Grass, perennial	2GP	<i>Grass, perennial</i>	2–35	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	2–35	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	2–35	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	2–35	–
3	Native grasses			1–2	
	purple threeawn	ARPUP6	<i>Aristida purpurea</i> var. <i>purpurea</i>	1–2	–
Forb					
4	Native forbs			25–70	
	Forb, perennial	2FP	<i>Forb, perennial</i>	2–35	–
	sagebrush rockcress	ARCO	<i>Arabis cobrensis</i>	2–35	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	2–35	–
	aster	ASTER	<i>Aster</i>	2–35	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	2–35	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	2–35	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	2–35	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	2–35	–
	desertparsley	LOMAT	<i>Lomatium</i>	2–35	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	2–35	–
	white milkwort	POAL4	<i>Polygala alba</i>	2–35	–
	scurfpea	PSORA2	<i>Psoralea</i>	2–35	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	2–35	–
5	Native forbs			1–2	
	white locoweed	OXSE	<i>Oxytropis sericea</i>	1–2	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	1–2	–
Shrub/Vine					
6	Native shrubs and half-shrubs			25–70	
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	2–35	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	2–35	–
	prairie sagebrush	ARCA13	<i>Artemisia frigida</i>	2–35	–

	prairie sagewort	ANIN14	<i>Artemisia tridentata</i>	2-35	-
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	2-35	-
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	2-35	-
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	2-35	-
	prairie rose	ROAR3	<i>Rosa arkansana</i>	2-35	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	2-35	-
7	Native shrubs and half-shrubs			1-2	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	1-2	-
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	1-2	-

Animal community

Livestock Grazing Interpretations:

There are limited amounts of suitable forage for livestock grazing on this site. On the steeper slopes livestock travel may be limited which can result in poor grazing distribution, especially in areas away from water. Management objectives should include maintenance or improvement of the vegetation community. Short grazing periods and adequate re-growth after grazing are recommended for plant recovery. Season long use of this site can be detrimental, causing an increase in bare ground and altering the plant community over time.

Whenever Plant Community 2 occurs (medium and short grasses), grazing management strategies need to be implemented to avoid further deterioration. This community is still stable, productive, and healthy provided it receives proper management. This community will respond fairly quickly to improved grazing management including increased growing season rest of key forage plants. Grazing management alone can usually move this community back to one more similar to potential if a good seed source of the taller grasses still exists.

Plant Communities 3 and 4 have severely reduced forage production for livestock (< 300 pounds per acre). It may not be feasible to improve the site when the dominant community type is similar to 3 or 4. Often, when this site is in this condition, there is a significant amount of erosion pavement and bare ground present. Community 4 has lost most of the attributes of healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy use.

Wildlife Interpretations:

The following is a description of habitat values for the different plant communities that may occupy the site:

Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs (HCPC):

The scattered, "wooly" warm and cool season grasses in this community are often not used by grazing animals without treatments such as fire or crowd grazing by cattle and bison. The diversity and abundance of forbs and half-shrubs favors selective feeders like pronghorn, whitetails and mule deer. The open, pebbly surface may attract nesting mountain plovers and common nighthawks on relatively level sites.

Plant Community 2: Medium and Short Grasses/ Medium Shrubs and Half-shrubs:

Pronghorn, whitetails and mule deer feed on forbs and half-shrubs to some extent. Mountain plovers and common nighthawks will nest on the pebbly surface.

Plant Community 3 and 4: Short Grasses/ Shrubs and Half-shrubs/ Annuals:

These communities have very low overall wildlife habitat value. Mountain plovers and common nighthawks may nest on the pebbly surface.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group A. The infiltration rates for these soils will normally be rapid to very rapid. The runoff potential for this site is low, depending on slope and ground

cover/health. Runoff curve numbers generally range from 49 to 79.

For arid and semi-arid rangelands, good hydrologic conditions exist if cover (grass, litter, and brush canopy) is greater than 70%. Fair conditions exist when cover is between 30 and 70%, and poor conditions exist when cover is less than 30%.

Erosion is minor for sites in high similarity. Rills and gullies should not be present. Water flow patterns, if present, will be barely observable. Plant pedestals are essentially non-existent. Plant litter remains in place and is not moved by erosion. Soil surfaces should not be compacted or crusted.

Sites in low similarity (Plant Communities 3 and 4) are generally considered to be in less than good hydrologic condition. Sites in low similarity may have a high percentage of cover, but from shallow rooted species (e.g., threadleaf sedge). The deep root systems of the potential vegetation will help maintain or increase infiltration rates and reduce runoff. (Reference: Engineering Field Manual, Chapter 2 and Montana Supplement 4).

Recreational uses

This site supports sparse vegetation and recreational access is often difficult. The forbs have flowers that appeal to photographers. This site provides valuable open space and visual aesthetics.

Other information

The following is an example of how to calculate the recommended stocking rate. This example does not use production estimates from this specific ecological site. You will need to adjust the annual production values and run the calculations using total annual production values from the ecological sites encountered on each individual ranch/pasture. Before making specific recommendations, an on-site evaluation must be made.

Example of total annual production amounts by type of year:

Favorable years = 2200 lbs/acre

Normal years = 1480 lbs/acre

Unfavorable years = 1200 lbs/acre

It is recommended that on slopes of 30% or less, stocking rate should be derived from the total annual production pounds minus 500 pounds for residual dry matter and 25% harvest efficiency. On slopes over 30%, stocking rate is derived from total annual production pounds minus 800 pounds for residual dry matter and 25% harvest efficiency. Refer to the NRCS National Range and Pasture Handbook for a list of Animal Unit Equivalents.

Sample Calculations using Favorable Year production amounts:

< 30% slopes: $AUM/AC = [(2200-500)(0.25)]/915$ lbs/month for one AU = 0.46 AUM/AC
 $AC/AUM = (1.0 AU)/(0.46 AUM/AC) = 2.2 AC/AUM$

> 30% slopes: $AUM/AC = [(2200-800)(0.25)]/915$ lbs/month for one AU = 0.38 AUM/AC
 $AC/AUM = (1.0 AU)/(0.38 AUM/AC) = 2.6 AC/AUM$

NOTE: 915 lbs/month for one Animal Unit is used as the baseline for maintenance requirements. This equates to 30 lbs/day of air-dry forage (1200 lb cow at 2.5% of body weight).

Inventory data references

NRCS-Production & Composition Record for Native Grazing Lands (Range-417): 4

BLM-Soil & Vegetation Inventory Method (SVIM) Data: 5

NRCS-Range Condition Record (ECS-2): 10

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 18

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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.

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Date	06/11/2014
Approved by	Jon Siddoway
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** None on slopes less than 15%. On slopes 15 – 40% water flow patterns may be 2-3 feet long and 5 inches wide.

3. **Number and height of erosional pedestals or terracettes:** Not evident on slopes < 15%. On slopes greater than 15% erosional pedestals up to .5 inches high may be present with terracettes present at debris dams.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is < 10%. (60 to 70% of the soil surface is cover by coarse fragments.)

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present. Existing gullies should be "healed" with a good vegetative cover.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement occurs on slopes < 15%. Small herbaceous litter movement does occur on slopes > 15%.

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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):** Surface Soil Aggregate Stability under plant canopy should typically be 5 or greater. Surface Soil Aggregate Stability not under plant canopy should typically be 3 or slightly less.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil survey series description.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** A combination of shallow and deep rooted species have a positive effect on infiltration rate.
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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer or soil surface crusting should be evident
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Warm season, mid-stature, bunch grasses
- Sub-dominant: Cool season, mid-stature, bunch grasses > forbs = shrubs and half shrubs = Cool season, short-stature, bunch grasses and sedges
- Other: Minor components: Warm season, tall-stature, rhizomatous grasses = Warm season, short-stature, rhizomatous grasses = Warm season, mid-stature, rhizomatous grasses
- Additional: (Blue grama should be grouped with warm season, short-stature, rhizomatous grasses due to its growth form)
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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very low.
-
14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 625 to 700 #/acre (13 to 14 inch precip. Zone) 250 to 550 #/ac (10 to 12 inch precip. Zone).
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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:** Sulphur cinquefoil, Leafy spurge, knapweeds, whitetop, Dalmatian toadflax, yellow toadflax, St.

Johnswort, perennial pepperweed.

17. **Perennial plant reproductive capability:** All species are capable of reproducing.
