USDA Natural Resources
Conservation Service

Ecological site R058AE011MT
Saline Upland (SU) RRU 58A-E 10-14" p.z.

Accessed: 05/14/2025

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.

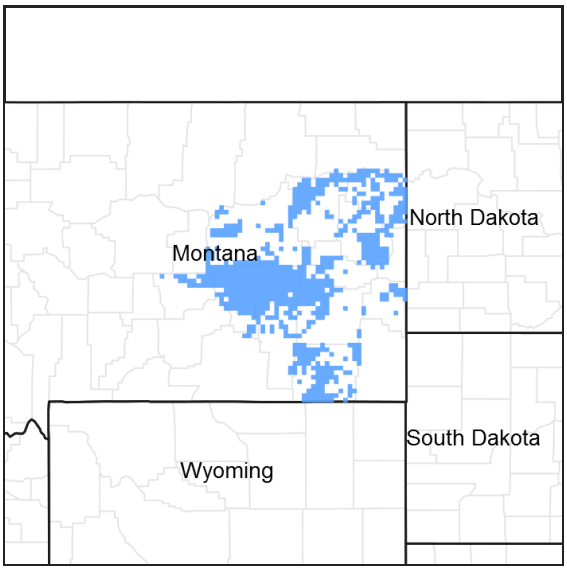


Figure 1. Mapped extent

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.**
R058AE002MT	**Clayey (Cy) RRU 58A-E 10-14" p.z.**
R058AE003MT	**Sandy (Sy) RRU 58A-E 10-14" p.z.** Rarely Sandy in Dawson and Richland Counties.
R058AE013MT	**Claypan (Cp) RRU 58A-E 10-14" p.z.**
R058AE014MT	**Dense Clay (DC) RRU 58A-E 10-14" p.z.**
R058AE193MT	**Silty-Saline (SiS) RRU 58A-E 10-14" p.z.**

Similar sites

R058AE012MT	**Saline Lowland (SL) RRU 58A-E 10-14" p.z.** The Saline Lowland site is also dominated by salt tolerant plants, but will have much greater production due to the extra water either from overflow or subirrigation.
R058AE014MT	**Dense Clay (DC) RRU 58A-E 10-14" p.z.** The Dense Clay site will have a hard restrictive layer in the soil at or near the surface. Salt tolerant plants may be present, but are rarely dominant.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs on uplands where salt and/or alkali accumulations are apparent and salt tolerant plants dominate the vegetative component. This site occurs on all exposures. Slopes are mainly less than 20 percent, but can range up to 35 or 40 percent.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plain (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	579–1,067 m
Slope	0–20%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

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 80º's F for July and August. Summertime temperatures will typically reach in the 100º's F at some point during the summer, and can reach 90º F any month between May and September. Conversely, winter temperatures can be cold, averaging in the mid teens to mid 20º'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 30–40º 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 (32º 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)	356 mm

Influencing water features

There are no influencing water features of this site.

Soil features

The soils associated with this site are mainly moderately to strongly saline. They are over 20 inches deep. Surface textures will vary and are not diagnostic for this site. Bare ground due to the salinity is significant. The soil surface is often crusted, and can be hard or very hard when dry. Salt crystals can often be observed in the sub-soil using a low power (i.e., 10 x) lens.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to slow
Soil depth	102–152 cm
Available water capacity (0-101.6cm)	10.16–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	5–10%
Electrical conductivity (0-101.6cm)	8–30 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	10–40
Soil reaction (1:1 water) (0-101.6cm)	7.9–9.6

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 high 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 the site can more readily return to a community that resembles the Historic Climax Plant Community.
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 alkali sacaton, western wheatgrass, winterfat, and Nuttall's saltbush. These plants will be replaced by inland saltgrass, Sandberg bluegrass, bottlebrush squirreltail, other less palatable grasses and forbs, and greasewood.

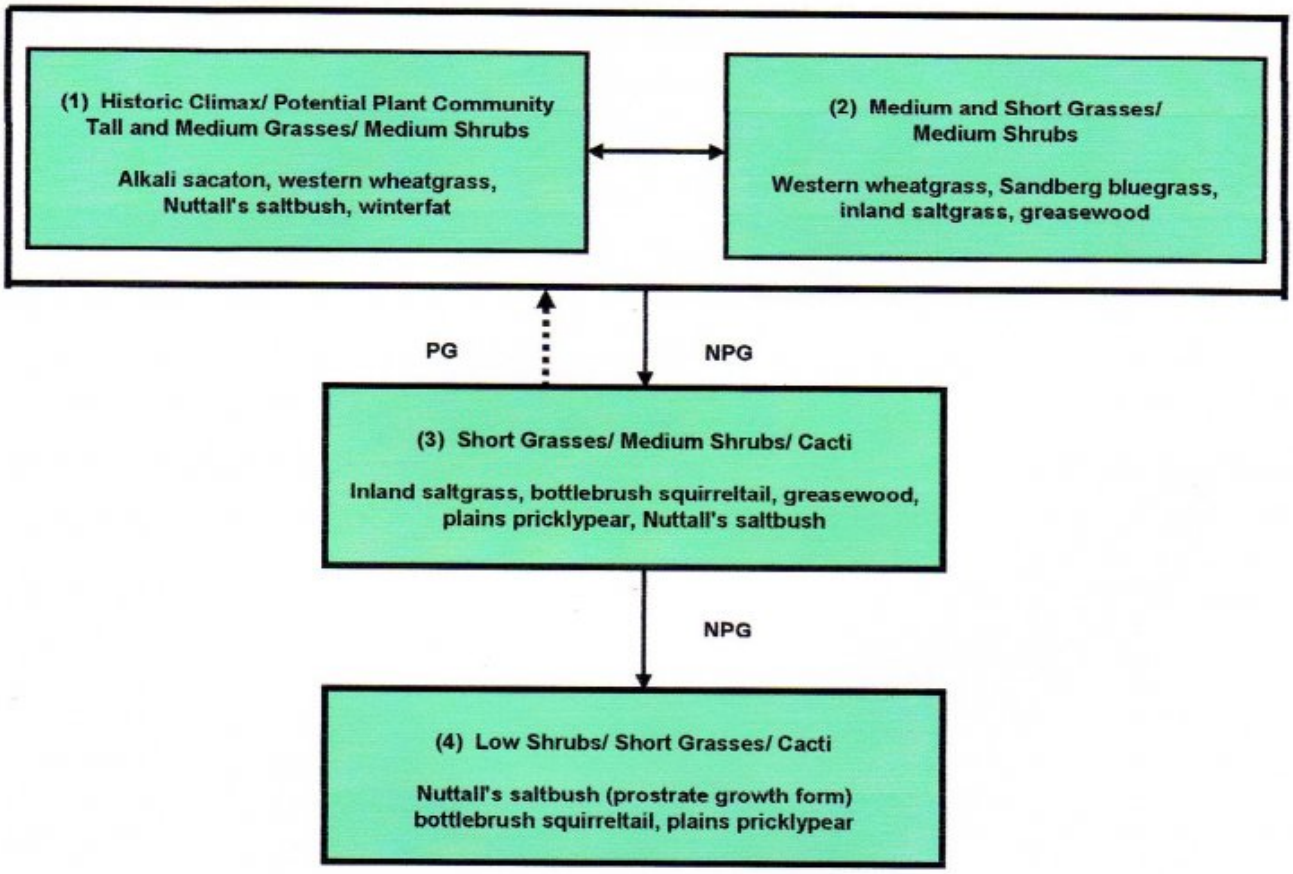
Continued deterioration results in a dominance of short grasses, especially inland saltgrass, annual grasses and forbs, and greasewood. Occasionally, this site can be dominated by a stand of Nuttall's saltbush that has a prostrate growth form from heavy use.

Plants that are not a part of the climax community that are most likely to invade are Japanese brome, cheatgrass, and annual and biennial forbs.

State and transition model

MLRA: 58A – Sedimentary Plains, East
MLRA: 60B – Pierre Shale Plains, East
R058AE011MT, R060BE572MT

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.

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

Community 1.1
Plant Community 1: Tall and Medium Grasses/ Medium 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 a mixture of cool and warm season grasses, including alkali sacaton, western and Montana wheatgrass, plus several short grasses such as alkali bluegrass and Nuttall's alkaligrass. Diversity of forbs is low on this site. Shrubs including Nuttall's saltbush, winterfat, and greasewood comprise nearly half of the plant community. Wyoming big sagebrush may also occur. This plant community is well adapted to the Northern Great

Plains climatic conditions. The diversity in plant species and the presence of tall, deep rooted perennial grasses allows for high drought tolerance, considering the limitations of the site. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable precipitation. Abundant plant litter is available for soil building and moisture retention. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This plant community provides for high soil stability and a functioning hydrologic cycle.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	364	448
Shrub/Vine	101	328	404
Forb	11	36	45
Total	**224**	**728**	**897**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	20-25%
Grass/grasslike foliar cover	10-15%
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	5-10%
Grass/grasslike basal cover	5-10%
Forb basal cover	1-2%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	10-15%
Surface fragments >0.25" and <=3"	0-1%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	60-80%

Table 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	20-25%	10-15%	1-5%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2
Plant Community 2: Medium and Short Grasses/ Medium Shrubs

Community 2.1
Plant Community 2: Medium and Short Grasses/ Medium Shrubs

Slight variations in the Historic Climax Plant Community often result in a community where western wheatgrass, Sandberg bluegrass, and inland saltgrass become more dominant. Greasewood often becomes prevalent on the site. 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/ Medium Shrubs/ Cacti

Community 3.1
Plant Community 3: Short Grasses/ Medium Shrubs/ Cacti

With continual heavy disturbance over several years, this site will experience a loss of topsoil and an increase of bare ground. Continued degradation in the plant community usually results in a community dominated by inland saltgrass, greasewood, and plains pricklypear. Other plants, such as Nuttall's alkaligrass, Sandberg bluegrass, and Nuttall's saltbush may still be present. Grasses such as bottlebrush squirreltail become common. Greasewood is often high in MLRA 60B.

State 4
Plant Community 4: Low Shrubs/ Short Grasses/ Cacti

Community 4.1
Plant Community 4: Low Shrubs/ Short Grasses/ Cacti

Some sites may retain a large amount of Nuttall's saltbush, even in what appears to be a deteriorated condition. The plants have a prostrate growth form, protecting them from further heavy grazing. This appears to be a stable and common community. Often, bottlebrush squirreltail, Sandberg bluegrass, one of the wheatgrasses, and a few forbs are the main associated species. This site is not highly productive. Large areas of bare ground between the plants are common. Plant Communities 3 and 4 have lost many of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy use.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Native grasses**			106–314	
	alkali sacaton	SPAI	*Sporobolus airoides*	56–359	–
	western wheatgrass	PASM	*Pascopyrum smithii*	34–179	–
	saltgrass	DISP	*Distichlis spicata*	11–90	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–45	–
2	**Native grasses**			2–135	
	Grass, perennial	2GP	*Grass, perennial*	2–11	–
	blue grama	BOGR2	*Bouteloua gracilis*	2–11	–
	squirreltail	ELEL5	*Elymus elymoides*	2–11	–
	Sandberg bluegrass	POSE	*Poa secunda*	2–11	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	2–11	–
Forb					
3	**Native forbs**			2–45	
	Forb, perennial	2FP	*Forb, perennial*	2–45	–
	aster	ASTER	*Aster*	2–45	–
	buckwheat	ERIOG	*Eriogonum*	2–45	–
	povertyweed	IVAX	*Iva axillaris*	2–45	–
	desertparsley	LOMAT	*Lomatium*	2–45	–
	American vetch	VIAM	*Vicia americana*	2–45	–
4	**Native forbs**			1–2	
	twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	1–2	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	1–2	–
Shrub/Vine					
5	**Native shrubs and half-shrubs**			101–404	
	Nuttall's saltbush	ATNU2	*Atriplex nuttallii*	34–269	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	11–179	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	11–90	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	0–45	–
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–45	–
6	**Native shrubs and half-shrubs**			1–2	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–2	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	1–2	–

Animal community

Livestock Grazing Interpretations:

Managed livestock grazing is suitable on this site as it has the potential to produce a moderate amount of high quality forage. Management objectives should include maintenance or improvement of the plant community. Shorter

grazing periods and adequate re-growth after grazing are recommended for plant maintenance and recovery. Heavy stocking and season long use of this site can be detrimental and will alter the plant community composition and production over time.

Whenever Plant Community 2 occurs (medium grasses and shrubs), 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 Community 3 and 4 have severely reduced forage production (< 400 pounds per acre). Once this site is occupied by Plant Community 3 or 4, it will be more difficult to restore it to a community that resembles the potential with grazing management alone. Additional growing season rest is often necessary for re-establishment of the desired species and to restore the stability and health of the site.

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/ Medium Shrubs (HCPC):

The high percentage of shrubs and half-shrubs in this community favors browsers and mixed feeders like pronghorn and mule deer. Thermal and escape cover is available for big game animals. The mix of warm and cool season grasses and shrubs provides nutritious forage for ungulates most of the year. The prevalence of bare ground limits ground-nesting bird habitat value although species such as Brewer’s, vesper and grasshopper sparrows, lark buntings and meadow larks use this plant community. Small mammal populations are dominated by seed-eaters like the deer mouse and harvest mouse. Voles are limited by low litter and residual vegetation cover.

Plant Community 2: Medium and Short Grasses/ Medium Shrubs:

The loss of warm season species such as alkali sacaton shortens the period of high nutrition for grazers and mixed feeders. Reductions in litter cover and residual vegetation further limit ground-nesting bird habitat value.

Plant Community 3: Short Grasses/ Medium Shrubs/ Cacti:

General wildlife habitat value and forage for big game species are considerably reduced with the loss of vegetative structural diversity. Thermal and hiding cover and some browse are available for big game animals. Increased bare ground and further reductions in litter and residual grass cover degrade habitat value for ground-nesting birds and small mammals. Brewer’s sparrows, lark buntings and meadowlarks are examples of songbird species which may use this community.

Plant Community 4: Low Shrubs/ Short Grasses/ Cacti:

Wildlife habitat is very low in general. Pronghorn and mule deer may use the prostrate Nuttall's saltbush for browse.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group D. The infiltration rates for these soils will normally be moderately slow to slow. The runoff potential for this site is moderate to high depending on slope and ground cover/health. Runoff curve numbers generally range from 78 to 90.

Good hydrologic conditions exist on rangelands if plant 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%. Sites in high similarity to HCPC (Plant Communities 1 and 2) generally have enough plant cover and litter to optimize infiltration, minimize runoff and erosion, and have a good hydrologic condition. The deep root systems of the potential vegetation help maintain or increase infiltration rates and reduce runoff.

Sites in low similarity (Plant Communities 3 and 4) are generally considered to be in poor hydrologic condition as

the majority of plant cover is from more shallow-rooted grasses and shrubs.

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. Plant cover and litter helps retain soil moisture for use by the plants. Maintaining a healthy stand of perennial vegetation will optimize the amount of precipitation that is received. (Reference: Engineering Field Manual, Chapter 2 and Montana Supplement 4).

Recreational uses

This site provides valuable open space and visual aesthetics. This site provides marginal recreational opportunities for hiking, big game and upland bird hunting. Caution should be used during wet weather periods. The forbs have flowers that appeal to photographers.

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)/(0.46AUM/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): 1

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

NRCS-Range Condition Record (ECS-2): 5

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 44

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.

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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:** Rills should not be present.

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2. **Presence of water flow patterns:** Water flow paths are broken and irregular in appearance, discontinuous, with numerous debris dams.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals up to 0.5 inch high are common. Some 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):** Bare ground is < 60%. Bare ground will occur in large 6 to 12 inches wide and irregularly shaped.

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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.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Plant litter movement of fine materials is expected for short distances (5-6 inches)

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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 3. Surface Soil Aggregate Stability not under plant canopy should typically be 2 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 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:** Sparse plant canopy (45% maximum), slow to moderately slow infiltration rates, and the high amount of bare ground contribute to a naturally high runoff rate even in Reference condition.

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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 would be expected; light soil surface crusting is typical.

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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: Shrubs and half shrubs = Warm season, mid-stature, bunch grasses

    Sub-dominant: Cool season, mid-stature, rhizomatous grasses = Cool season, mid-stature, bunch grasses > Warm season, mid-stature, rhizomatous grasses

    Other: Minor components: Cool season, short-stature, bunch grasses and sedges = forbs = Warm season, short-stature, rhizomatous grasses and sedges

    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):** Some plant mortality and decadence (10 to 15%) is expected on this site.

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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):** 725 to 800 #/acre (13 to 14 inch precip. Zone) 200 to 650 #/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:** Halogeton, Leafy spurge, knapweeds, whitetop, Dalmatian toadflax, yellow toadflax, St. Johnswort, perennial pepperweed. Kentucky bluegrass and smooth brome can be invasive on the eastern boarder of Montana for these MLRAs.

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