USDA Natural Resources
Conservation Service

Ecological site R058AE193MT
Silty-Saline (SiS) RRU 58A-E 10-14" p.z.

Accessed: 05/10/2024

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.

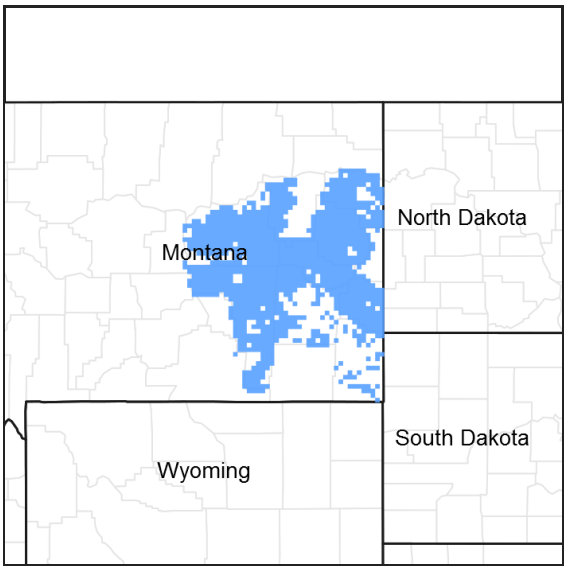


Figure 1. Mapped extent

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.**
R058AE002MT	**Clayey (Cy) RRU 58A-E 10-14" p.z.**
R058AE011MT	**Saline Upland (SU) RRU 58A-E 10-14" p.z.**
R058AE013MT	**Claypan (Cp) 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 the amount of plant cover and potential production is significantly more because of the extra moisture this site receives.
R058AE002MT	**Clayey (Cy) RRU 58A-E 10-14" p.z.** The Clayey site varies for the same reason, as well as surface texture.
R058AE011MT	**Saline Upland (SU) RRU 58A-E 10-14" p.z.** The Saline Upland site is dominated by salt tolerant species, the amount of plant cover is significantly less, and the production is also significantly less.
R058AY001MT	**Loamy (Lo) 10-14 P.Z.** The Silty site vaires by not being salt affected and not having the component of salt tolerant plants.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs on nearly level to strongly sloping sedimentary plains, terraces, and fans. The slopes range from 0 to 15 percent, but are mainly less than 8 percent. This site occurs on all exposures and aspect is not significant. This site is very similar to a normal Silty site, with some significant variations in the plant community composition.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Terrace (3) Fan
Flooding frequency	None
Ponding frequency	None
Elevation	579–1,067 m
Slope	0–15%
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 for this site.

Soil features

These soils are more than 20 inches deep and are mainly loams or silt loams and occasionally silty clay loams. They are strongly alkaline in the subsoil, usually within 6 to 12 inches of the surface. They tend to be slightly to moderately saline and very strongly alkaline in the upper 2 to 2.5 feet. In their "natural" condition, these soils will appear very similar to a "normal" silty ecological site. When tilled, however, they become very salty at the surface, severely limiting plant production and the potential for reseeding.

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
Soil depth	102–152 cm
Available water capacity (0-101.6cm)	12.7–25.4 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	2–20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	2–40
Soil reaction (1:1 water) (0-101.6cm)	7.9–10

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 only moderate 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 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 green needlegrass, alkali sacaton, winterfat and Nuttall's saltbush. These plants will be replaced by inland saltgrass, needleandthread, western or thickspike wheatgrass, threadleaf sedge, and blue grama. Disturbance induced forbs, fringed sagewort, Wyoming and silver sagebrush, and greasewood will become more prevalent.

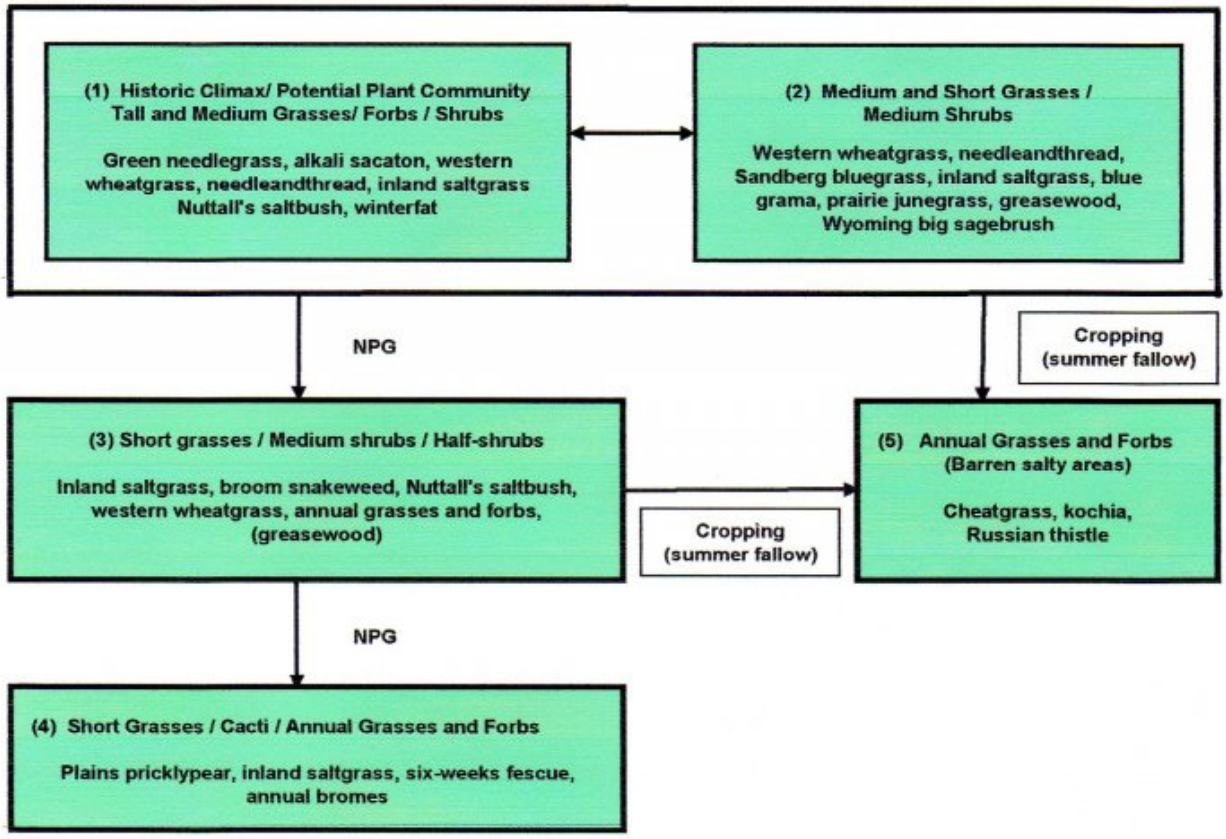
Continued deterioration results in increased amounts of bottlebrush squirreltail, broom snakeweed and cactus. The amount of salts on the soil surface can potentially increase as the plant cover deteriorates and bare ground increases.

Plants that are not a part of the climax community that are most likely to invade are annual bromes, six-weeks fescue, false buffalograss, and thistles.

State and transition model

MLRA: 58A – Sedimentary Plains, East
MLRA: 60B – Pierre Shale Plains, East
R058AE193MT, R060BE580MT

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/ 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 contains a good diversity of tall and medium height grasses (green needlegrass, western or thickspike wheatgrass, alkali sacaton), and short grasses and sedges (threadleaf or needleleaf sedge, prairie junegrass, Sandberg bluegrass, plains reedgrass, and blue grama). There are forbs, shrubs, and half-shrubs that occur in smaller percentages, including winterfat and Nuttall's saltbush. 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. 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 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	567	883	1388
Shrub/Vine	113	176	277
Forb	76	118	185
Total	**756**	**1177**	**1850**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	1-2%
Grass/grasslike foliar cover	65-75%
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	0-1%
Grass/grasslike basal cover	10-15%
Forb basal cover	1-3%
Non-vascular plants	0%
Biological crusts	1-2%
Litter	50-60%
Surface fragments >0.25" and <=3"	0-1%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	15-20%

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	–	1-2%	65-75%	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 disturbances and degradation to the HCPC will result in a plant community where the taller, more palatable grasses such as green needlegrass are replaced by increasing amounts of western wheatgrass, needleandthread, short grasses, and inland saltgrass. The shrub component will tend to have increasing amounts of either greasewood or Wyoming big sagebrush. Typically, the component of salt tolerant species is mainly only one species. Grass biomass production and litter become reduced on the site as the taller grasses disappear, increasing evapotranspiration 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 / Half-shrubs

Community 3.1
Plant Community 3: Short Grasses / Medium Shrubs / Half-shrubs

With continued heavy disturbance the site will become dominated by inland saltgrass, shrubs such as greasewood, half-shrubs such as broom snakeweed, and annuals. This site tends to occur more in 60B, where the sagebrush is essentially replaced by greasewood.

State 4
Plant Community 4: Short Grasses/ Cacti/ Annuals

Community 4.1
Plant Community 4: Short Grasses/ Cacti/ Annuals

Further disturbance will result in a community that is dominated by plains pricklypear, Wyoming big sagebrush, inland saltgrass, and annuals. This occurs mainly in 58A. The remaining species will still be plants such as blue grama, Sandberg bluegrass with some western wheatgrass and needleandthread. This site is not highly productive and large areas of bare ground between the plants is 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.

State 5
Plant Community 5: Annual Grasses and Forbs

Community 5.1
Plant Community 5: Annual Grasses and Forbs

This barren, low producing community is the result of continuous farming and summer fallowing on this site. As salts are brought up to the surface the soils become extremely limited for plant growth, and the community shifts to one dominated by invader annual grasses and forbs, typically Japanese brome, cheatgrass, kochia, and Russian thistle. This community is very difficult to restore to a more productive stage.

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 and sedges**			567–1388	
	tufted wheatgrass	ELMA7	*Elymus macrourus*	151–740	–
	western wheatgrass	PASM	*Pascopyrum smithii*	151–740	–
	green needlegrass	NAVI4	*Nassella viridula*	113–648	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	38–278	–
	alkali sacaton	SPAI	*Sporobolus airoides*	38–278	–
	saltgrass	DISP	*Distichlis spicata*	38–278	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–185	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–185	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	0–92	–
	squirreltail	ELEL5	*Elymus elymoides*	8–92	–
	Grass, perennial	2GP	*Grass, perennial*	8–92	–
	blue grama	BOGR2	*Bouteloua gracilis*	8–92	–
	needleleaf sedge	CADU6	*Carex duriuscula*	8–92	–
	threadleaf sedge	CAFI	*Carex filifolia*	8–92	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	8–92	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	8–92	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–92	–
Forb					
2	**Native forbs**			76–185	
	Forb, perennial	2FP	*Forb, perennial*	8–92	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	8–92	–
	American vetch	VIAM	*Vicia americana*	8–92	–
Shrub/Vine					
3	**Native shrubs and half-shrubs**			113–277	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	8–185	–
	silver sagebrush	ARCA13	*Artemisia cana*	8–185	–
	prairie sagewort	ARFR4	*Artemisia frigida*	8–185	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	8–185	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	8–185	–
	Nuttall's saltbush	ATNU2	*Atriplex nuttallii*	8–92	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	8–92	–
4	**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 an abundance 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 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.

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. Additional rest or accelerated practices are often necessary for re-establishment of the desired species and to restore the stability and health of the site.

Plant Communities 4 and 5 have extremely reduced forage production (<300 pounds per acre), and are comprised of mostly of non-preferred species. As salts are brought up to the surface the soils become extremely limited for plant growth. These communities are very difficult to restore to a more productive stage.

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 predominance of grasses plus a diversity of shrubs and half-shrubs in this community favors grazers and mixed feeders such as bison, pronghorn and elk. When this plant community is adjacent to large blocks of sagebrush-grassland, it can provide quality sage grouse lek sites and brood habitat. Complex plant structural diversity and litter cover provide habitat for a wide array of small mammals (both seed eaters, i.e., deer mice, and herbivores, (i.e. sagebrush vole) and neotropical migratory birds. Diverse prey populations are available for raptors such as ferruginous hawks and prairie falcons. The diversity of grass stature and life forms, along with scattered shrubs provides habitat for many bird species including the upland sandpiper, sharp-tailed grouse, loggerhead shrike, grasshopper and vesper sparrow, lark bunting, chestnut-collared longspur and western meadowlark. This community is especially favorable for ground-nesting birds because of the abundant residual plant material and litter available for nesting, escape and thermal cover.

Plant Community 2: Medium and Short Grasses/ Medium Shrubs:
An increase in sagebrush cover may benefit sagebrush-grassland obligates such as Brewer’s sparrow and sage grouse. Thermal and hiding cover for big game improves with an increase in shrub cover. Loss of tall preferred grasses, residual grass cover and litter generally reduces habitat value for ground-nesting birds. Some species, such as lark buntings, will use this community as sagebrush and/or greasewood cover increases somewhat. Small mammal species diversity declines as the herbaceous plant composition is simplified. The western harvest mouse may take advantage of an increase in greasewood.

Plant Community 3: Short Grasses/ Medium Shrubs / Half-shrubs:
The shift to short grasses and annuals plus a loss of ground cover and residual grass greatly reduces habitat value for ground-nesting birds. Small mammal species composition is simplified and dominated by seed-eaters, particularly deer mice. Nutritive value for ungulates suffers from the loss of desirable forbs, shrubs and half-shrubs and palatable grasses. The increase in greasewood may provide thermal cover for big game. The general loss of plant structural diversity significantly reduces wildlife habitat values.

Plant Community 4: Short Grasses/ Cacti/ Annuals:
This community has very limited habitat value for wildlife in general following the significant loss of plant species diversity and ground cover. Mountain plovers and horned larks may nest on the sparsely covered surface. Sage grouse may use this community for lek sites when it is adjacent to sagebrush-grassland.

Plant Community 5: Annual Grasses and Forbs: This community is found on “go back” land following abandonment of cropping. Wildlife habitat values are very limited because of a lack of plant species and structural diversity and

ground cover.

Hydrological functions

The runoff potential for this site is moderate, depending on slope and ground cover/health. Runoff curve numbers generally range from 66 to 84. The soils associated with this ecological site are generally in Hydrologic Soil Group B. The infiltration rates for these soils will normally be moderately slow.

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, 4, and 5) are generally considered to be in poor hydrologic condition as the majority of plant cover is from more shallow-rooted species 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 some recreational opportunities for hiking, horseback riding, big game and upland bird hunting. The forbs have flowers that appeal to photographers. This site provides valuable open space and visual aesthetics. Caution should be used during wet weather periods.

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): 2

BLM-Soil & Vegetation Inventory Method (SVIM) Data: 2

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

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 15

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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)	T.DeCock; R Kilian
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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.

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

3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is < 20%. Bare ground will occur as small areas less than 4 inches in diameter.

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. Plant litter remains in place and is not moved by erosional forces.

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. Surface Soil Aggregate Stability not under plant canopy should typically be 4 or slightly less.

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High grass canopy and basal cover and small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. A combination of shallow and deep rooted species has a positive effect on infiltration.

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.

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: Cool season, mid-stature, bunch grasses = Cool season, mid-stature, rhizomatous grasses

    Sub-dominant: Shrubs and half shrubs = Warm season, mid-stature, bunch grasses = Warm season, mid-stature, rhizomatous grasses > forbs = Cool season, short-stature, bunch grasses and sedges

    Other: Minor Components: Cool season, short-stature rhizomatous grasses and sedges = Warm season, short-stature, rhizomatous grasses

    Additional: (Blue grama should be grouped with warm season, short-stature, rhizomatous grasses due to its growth form)

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.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1350 to 1650 #/acre (13 to 14 inch precip. Zone) 675 to 1050 #/ac (10 to 12 inch precip. Zone).

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, Sulphur cinquefoil, common tansy, oxeye daisy, Leafy spurge, knapweeds, whitetop, Dalmatian toadflax, yellow toadflax, St. Johnswort, perennial pepperweed. Kentucky bluegrass 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.
