USDA Natural Resources
Conservation Service

Ecological site R058AE002MT
Clayey (Cy) RRU 58A-E 10-14" p.z.

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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.

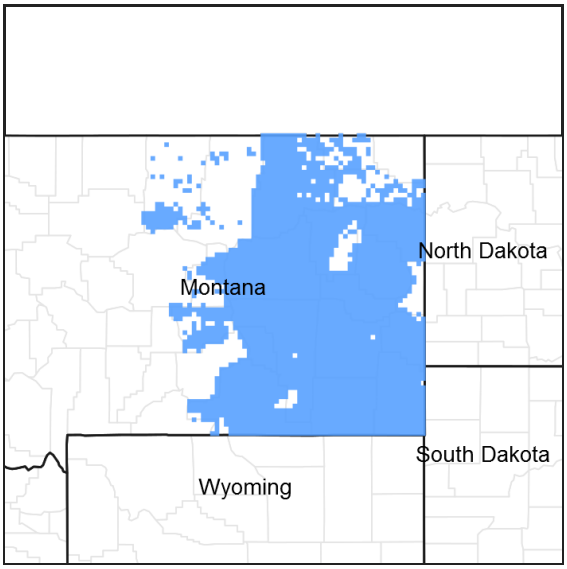


Figure 1. Mapped extent

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.**
R058AE005MT	**Clayey-Steep (CyStp) RRU 58A-E 10-14" p.z.**
R058AE013MT	**Claypan (Cp) RRU 58A-E 10-14" p.z.**
R058AE199MT	**Shallow Clay (SwC) RRU 58A-E 10-14" p.z.**

Similar sites

R058AY001MT	**Loamy (Lo) 10-14 P.Z.** The Silty site differs mainly by soil texture.
R058AE005MT	**Clayey-Steep (CyStp) RRU 58A-E 10-14" p.z.** The Clayey-Steep differs mainly by being on slopes greater than 15% and having lower production.
R058AE013MT	**Claypan (Cp) RRU 58A-E 10-14" p.z.** The Claypan site differs mainly by having a thinner surface over a hard argillic horizon, being sodium affected, and having lower production.

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, hills, terraces, and fans. The slopes range from 0-15%, but are mainly less than 8%. This site occurs on all exposures. Aspect is not significant

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Alluvial fan (3) Terrace
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 (characteristic range)	92-108 days
Freeze-free period (characteristic range)	117-127 days
Precipitation total (characteristic range)	305 mm
Frost-free period (actual range)	86-110 days
Freeze-free period (actual range)	116-132 days
Precipitation total (actual range)	305 mm
Frost-free period (average)	99 days
Freeze-free period (average)	123 days
Precipitation total (average)	305 mm

Climate stations used

- (1) ROCK SPRINGS [USC00247136], Angela, MT
- (2) COHAGEN [USC00241875], Cohagen, MT
- (3) FT PECK PWR PLT [USC00243176], Fort Peck, MT

Influencing water features

None

Soil features

These soils are granular clay loams, silty clay loams, silty clays, sandy clays, or clays more than 20 inches deep. Effective rooting depth is greater than 20 inches. There are no significant limitations to plant growth.

Table 4. Representative soil features

Surface texture	(1) Clay loam (2) Silty clay loam (3) Silty clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderate to slow
Soil depth	51–152 cm
Available water capacity (0-101.6cm)	12.7–25.4 cm
Calcium carbonate equivalent (0-101.6cm)	1–5%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4

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.

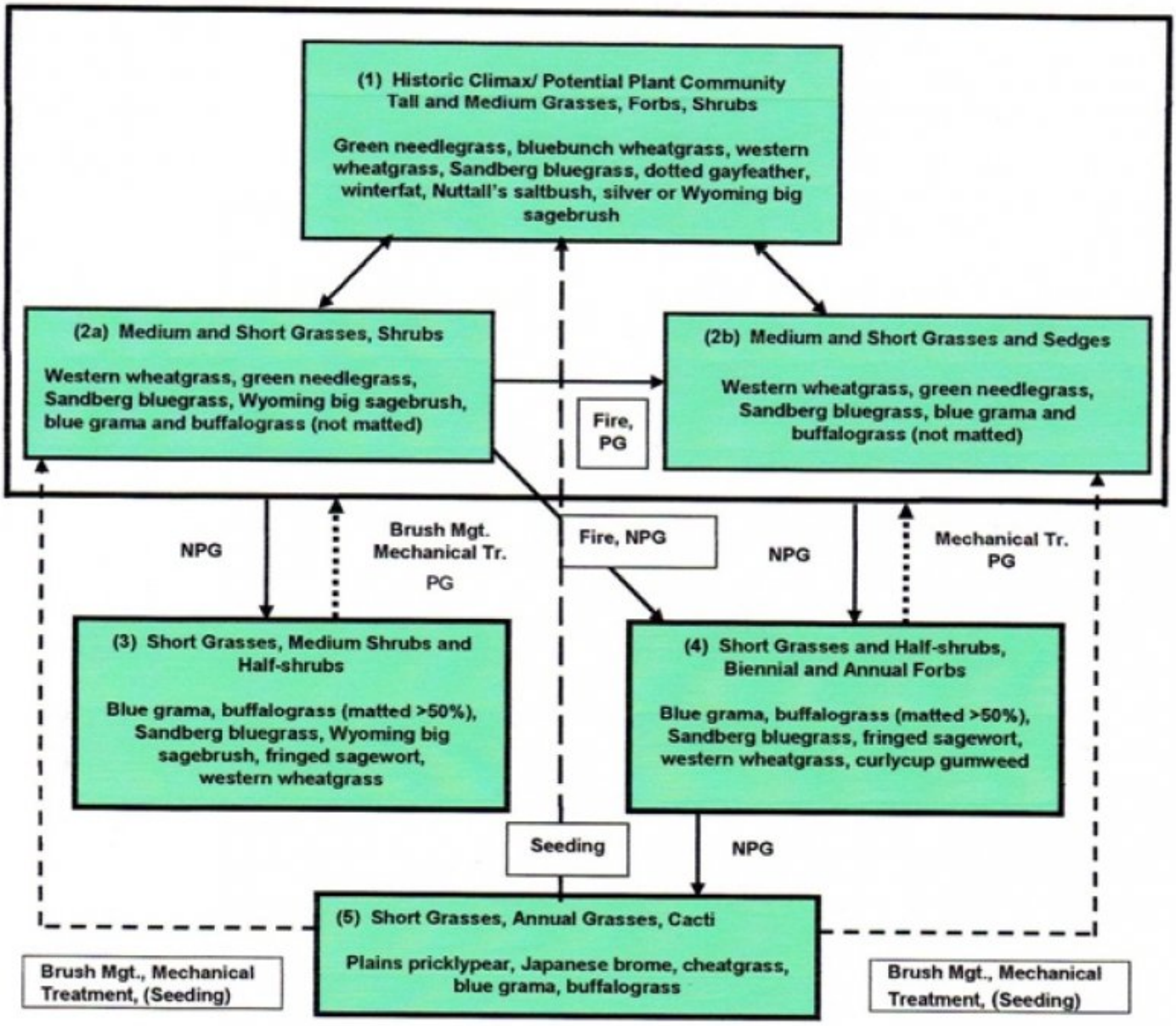
This site is considered highly resilient to disturbance as it has only minor soil limitations for plant growth. Changes may occur to the Historic Climax Plant Community due to management actions and/or climatic conditions. Under continued adverse impacts, a moderate to extreme decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments, this site can more readily return to a community resembling 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 green needlegrass, bluebunch wheatgrass, and western wheatgrass. These plants will be replaced by Sandberg bluegrass, blue grama, buffalograss, several species of non-palatable forbs, and Wyoming big and silver sagebrush. Greasewood may
replace Wyoming big sagebrush in MLRA 60B, Pierre Shales. Continued deterioration results in mats of short grasses, annual grasses and forbs, and cactus. Plants that are not a part of the climax community that are most likely to invade are cheatgrass and Japanese brome, annual and biennial forbs, and broom snakeweed.

Long-term non-use (>3 years) combined with the absence of fire will result in excessive litter and decadent plants in the bunchgrass communities at higher precipitation zones, 12-14 inches.

State and transition model

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.

Fire: Non-prescribed wildfire.

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 season grasses (green needlegrass, bluebunch wheatgrass, and western wheatgrass) and a diverse group of short grasses and sedges (Sandberg bluegrass, prairie junegrass, blue grama, and buffalograss). An abundance of forbs, shrubs, and half-shrubs in small percentages, including dotted gayfeather, winterfat, Nuttall's saltbush, and silver or Wyoming big sagebrush. 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 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	628	1166	1793
Forb	78	146	224
Shrub/Vine	78	146	224
Total	**784**	**1458**	**2241**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	1-5%
Grass/grasslike foliar cover	55-85%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	1-2%
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	1-2%
Grass/grasslike basal cover	5-15%
Forb basal cover	1-4%
Non-vascular plants	0%
Biological crusts	1-2%
Litter	35-60%
Surface fragments >0.25" and <=3"	0-4%
Surface fragments >3"	0%
Bedrock	0%

Water	0%
Bare ground	5-15%

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	–	1-5%	55-85%	5-10%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

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

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

Slight variations in the historical climax plant community result in a community where western wheatgrass increases slightly, green needlegrass decreases slightly, and short grasses and forbs may increase. Species that tend to dominate include western wheatgrass, green needlegrass, Sandberg bluegrass, Wyoming big sagebrush, blue grama, and buffalograss. The blue grama and buffalograss will be scattered throughout this community.

State 3
Plant Community 2b: Medium and Short Grasses and Sedges

Community 3.1
Plant Community 2b: Medium and Short Grasses and Sedges

Slight variation in the historical climax plant community can also occur which results in a plant community that is typically dominated by cool and warm season medium and short grasses and sedges. This plant community is similar to 2a except there is no shrub component. This community is dominated by western wheatgrass, green needlegrass, Sandberg bluegrass, blue grama, and buffalograss. This community often results from fire on Communities 1 or 2a. Grass biomass production and litter become reduced on Plant Communities 2a and 2b 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 4
Plant Community 3: Short Grasses/ Shrubs and Half-shrubs

Community 4.1
Plant Community 3: Short Grasses/ Shrubs and Half-shrubs

With continued heavy disturbance on community 2a, it tends to shift to one dominated by short grasses (blue grama, buffalograss, and Sandberg bluegrass), native perennial forbs, fringed sagewort, and Wyoming big sagebrush. Blue grama and buffalograss tend to occur more in thick mats, with greater than 50% canopy cover. Plains pricklypear and broom snakeweed may become more common. Green needlegrass is reduced to a minor component, if present at all.

State 5
Plant Community 4: Short Grasses/ Half-shrubs/ Biennial and Annual Forbs

Community 5.1
Plant Community 4: Short Grasses/ Half-shrubs/ Biennial and Annual Forbs

With continued heavy disturbance on community 2b, it tends to shift to one dominated by species such as blue grama and buffalograss (in thick mats greater than 50% cover), Sandberg bluegrass, fringed sagewort, curlycup gumweed, plains pricklypear, broom snakeweed, and annual bromes and forbs. Plant Communities 3 and 4 are much less productive than Plant Communities 1, 2a, or 2b, and have lost many of the attributes of a healthy rangeland. The loss of deep perennial root systems reduces total available moisture for plant growth. Reduction of plant litter will result in higher surface soil temperatures and increased evaporation losses. Annual species are often aggressive and competitive with seedlings of perennial plants. This community can respond positively to improved grazing management but it may take additional inputs, such as brush management, mechanical treatment, combined with prescribed grazing to move it towards a community similar in production and composition to that of Plant Community 1, 2a, or 2b.

State 6
Plant Community 5: Short Grasses/ Annuals/ Cacti

Community 6.1
Plant Community 5: Short Grasses/ Annuals/ Cacti

Further disturbance and deterioration of Community 3 or 4 leads to a plant community that has excessive loss of topsoil and an increase of bare ground. The community will change to one dominated primarily by plains pricklypear, Japanese brome, cheatgrass, and blue grama/buffalograss. The blue grama and buffalograss tend to become matted. This plant community has extremely reduced productivity (< 300 lbs./acre), and low species diversity. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives blue grama a competitive advantage over the cool 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. Significant economic inputs and time would be required to move this plant community toward a higher successional stage and a more productive plant community. The most practical way to restore this community is through mechanical treatment and/or seeding.

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**			616–1569	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	39–897	–
	green needlegrass	NAVI4	*Nassella viridula*	157–673	–
	western wheatgrass	PASM	*Pascopyrum smithii*	118–560	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	39–224	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–112	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–112	–
2	**Native grasses and sedges**			8–224	
	Grass, perennial	2GP	*Grass, perennial*	8–112	–
	blue grama	BOGR2	*Bouteloua gracilis*	8–112	–
	needleleaf sedge	CADU6	*Carex duriuscula*	8–112	–
	threadleaf sedge	CAFI	*Carex filifolia*	8–112	–

	plains reedgrass	CAMO	*Calamagrostis montanensis*	8–112	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	8–112	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	8–112	–
	Sandberg bluegrass	POSE	*Poa secunda*	8–112	–
	alkali sacaton	SPAI	*Sporobolus airoides*	8–112	–
3	**Native grasses**			1–2	
	tumblegrass	SCPA	*Schedonnardus paniculatus*	1–2	–
Forb					
4	**Native forbs**			78–224	
	Forb, perennial	2FP	*Forb, perennial*	8–112	–
	onion	ALLIU	*Allium*	8–112	–
	pussytoes	ANTEN	*Antennaria*	8–112	–
	tarragon	ARDR4	*Artemisia dracunculus*	8–112	–
	milkvetch	ASTRA	*Astragalus*	8–112	–
	white prairie clover	DACA7	*Dalea candida*	8–112	–
	purple prairie clover	DAPU5	*Dalea purpurea*	8–112	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	8–112	–
	dotted blazing star	LIPU	*Liatris punctata*	8–112	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	8–112	–
	spiny phlox	PHHO	*Phlox hoodii*	8–112	–
	scurfpea	PSORA2	*Psoralidium*	8–112	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	8–112	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	8–112	–
	American vetch	VIAM	*Vicia americana*	8–112	–
5	**Native forbs (toxic properties)**			1–2	
	twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	1–2	–
	larkspur	DELPH	*Delphinium*	1–2	–
	white locoweed	OXSE	*Oxytropis sericea*	1–2	–
	deathcamas	ZIGAD	*Zigadenus*	1–2	–
Shrub/Vine					
6	**Native shrubs and half-shrubs**			78–224	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	8–50	–
	silver sagebrush	ARCA13	*Artemisia cana*	8–50	–
	prairie sagewort	ARFR4	*Artemisia frigida*	8–50	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	8–50	–
	Nuttall's saltbush	ATNU2	*Atriplex nuttallii*	8–50	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	8–50	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	8–50	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	8–50	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	8–50	–
7	**Native shrubs and half-shrubs**			1–2	

7	**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 high amount of high quality forage. This is often a preferred site for grazing by livestock, and animals tend to congregate in these areas due to the flat slopes and high forage quality. In order to maintain the productivity of this site, stocking rates must be managed carefully on adjoining sites with less production to be sure livestock drift onto the Clayey site is not excessive. 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 2a or 2b occurs (medium and short grasses), grazing management strategies need to be implemented to avoid further deterioration. These communities are still stable, productive, and healthy provided they receive 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 these communities back towards the potential community.

Communities 3, 4, and 5 have lost many of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy use. Once this site is occupied by these communities it will be more difficult to restore it to a community that resembles the potential with grazing management alone. Additional growing season rest combined with accelerated practices (e.g. range seeding, chiseling) are 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 Grasses/Forbs/Shrubs (HCPC):

The predominance of grasses plus high diversity of forbs, shrubs and half-shrubs in this community favors grazers and mixed feeders such as bison, pronghorn and elk. Suitable thermal and escape cover for mule deer is limited because of low shrub cover. Large animal nutrition levels are relatively high year-long with the diversity of grasses, sedges, forbs and shrubs. When this plant community is adjacent to large blocks of sagebrush-grassland, it can provide quality sage grouse lek sites and brood habitat. The complex plant structural diversity provides habitat for a wide array of small mammals and neotropical migratory birds. Diverse prey populations are available for raptors such as ferruginous and Swainson’s hawks. The mix of grass stature and life forms along with scattered shrubs and a variety of forbs provides habitat for many bird species including the upland sandpiper, sharp-tailed grouse, loggerhead shrike, Baird’s, grasshopper and savanna sparrow, chestnut-collared longspur and western meadowlark. This community is especially favorable for ground-nesting birds because of the abundant residual spring cover and litter cover available for nesting, escape and thermal cover.

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

Wyoming big sagebrush, with canopy cover of 15-30%, and an understory of grasses and forbs, is excellent nesting, winter, brood-rearing and foraging habitat for sage grouse. Other obligate sagebrush-grassland species, notably Brewer’s sparrow, also benefit from an increase in sagebrush cover. Baird’s and grasshopper sparrows, on the other hand, will decrease as shrub cover becomes denser. When residual grass and litter cover decrease in this community, ground nesting bird habitat values decline. This community often provides important winter range for mule deer and pronghorn. The sagebrush crowns break up hard crusted snow and provide about 15% protein and 40-60% digestibility for ungulates.

Plant Community 2b: Medium and Short Grasses/ Forbs:

The partial loss of structural diversity makes this plant community somewhat less attractive to the diversity of wildlife species using the HCPC. A decrease in residual plant material and litter cover is usually associated with degradation of the HCPC, which makes this community less attractive for ground-nesting birds. Pronghorn make considerable use of this type because of forb availability in the generally open landscape.

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

This community may represent important sage grouse winter habitat when big sagebrush makes up over 20% canopy cover. However, nesting habitat quality for all ground-nesting birds declines significantly as residual grass cover and mid-grasses disappear. Succulent forbs such as salsify, dandelion, curlycup gumweed and prickly lettuce are selected by sage grouse broods. Sage grouse will use openings as lek sites. Brewer's sparrow will benefit from an increase in big sagebrush cover.

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

This community has relatively low habitat value for most wildlife species except when it occurs in prairie dog towns. It may provide lek sites for sage grouse when it is found adjacent to stands of big sagebrush and is used by foraging pronghorn seasonally. Mountain plovers and horned larks may nest in this community.

Plant Community 5: Short Grasses/ Annuals/ Cacti:

This community has very low wildlife habitat value because of the lack of plant species diversity and complex vegetative structure. Pronghorn forage on forbs and shrubs.

Hydrological functions

The runoff potential for this site is low to moderate, depending on slope and ground cover/health. Runoff curve numbers generally range from 78 to 90. The soils associated with this ecological site are generally in Hydrologic Soil Group C. Soils have a slow infiltration rate when thoroughly wetted and consist chiefly of soils with moderately fine to fine textures.

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, 2a and 2b) 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 shallow-rooted species such as blue grama and annual grasses.

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): 13

BLM-Soil & Vegetation Inventory Method (SVIM) Data: 6

NRCS-Range Condition Record (ECS-2): 302

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 46

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Approval

Kirt Walstad, 6/14/2023

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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Approved by	Kirt Walstad
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 2 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 or greater. Surface Soil Aggregate Stability not under plant canopy should typically be 5 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.

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

    Sub-dominant: Cool season short-stature bunch grasses and sedges = forbs = shrubs and half shrubs

    Other: Minor components: Warm season, short - stature rhizomatous grasses > Warm season, mid-stature bunch grasses > Warm season short- stature bunch 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.

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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):** 1600 to 2000 #/acre (13 to 14 inch precip. Zone) 700 to 1300 #/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, common tansy, oxeye daisy, 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.
