USDA Natural Resources
Conservation Service

Ecological site R058AE199MT
Shallow Clay (SwC) RRU 58A-E 10-14" p.z.

Accessed: 05/13/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

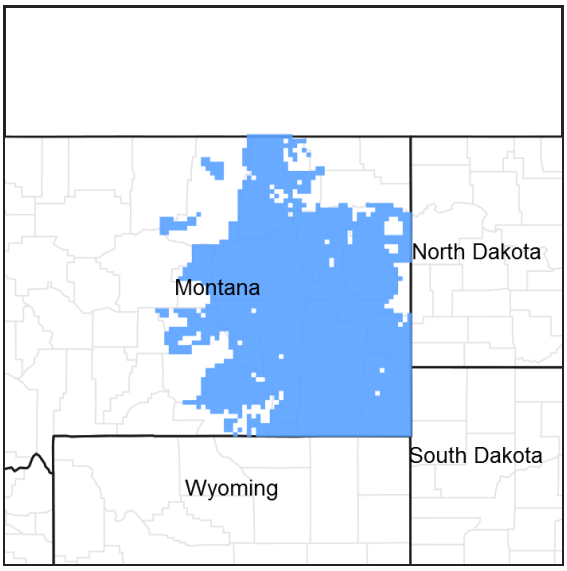


Figure 1. Mapped extent

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.**
R058AE004MT	**Silty-Steep (SiStp) RRU 58A-E 10-14" p.z.**
R058AE005MT	**Clayey-Steep (CyStp) 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.**
R058AE014MT	**Dense Clay (DC) RRU 58A-E 10-14" p.z.**
R058AE015MT	**Shale (Sh) RRU 58A-E 10-14" p.z.**
R058AE019MT	**Shallow (Sw) RRU 58A-E 10-14" p.z.**

Similar sites

R058AE002MT	**Clayey (Cy) RRU 58A-E 10-14" p.z.** Clayey sites have similar textures, but differ mainly by being over 20 inches to rock, and having significantly more production. The plant community can be similar because of the restrictive layers of clayey textures.

R058AE005MT	**Clayey-Steep (CyStp) RRU 58A-E 10-14" p.z.** The Clayey-Steep site is over 20 inches deep to root restricting materials, as well as occurring on slopes over 15%.
R058AE019MT	**Shallow (Sw) RRU 58A-E 10-14" p.z.** The Shallow site differs by having a different texture, and generally being over sandstone or loamy beds.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs mainly on hills, ridgetops, and upper sideslopes. It often occurs in complex with other ecological sites, particularly in rougher terrain. It occurs on all slopes and exposures. Aspect can become significant, especially on steep and very steep slopes. Slight variations in plant community composition and production can result due to aspect. Runoff and potential for water erosion can be important features of this site. The amount of exposed shale outcrop tends to increase with slope.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Hill (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	579–1,067 m
Slope	0–70%
Water table depth	152 cm

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.

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 with this site

Soil features

These soils are mainly clayey textures that are 10 to 20 inches deep to shale. Root penetration is restricted at that depth.

Table 4. Representative soil features

Surface texture	(1) Clay (2) Silty clay (3) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow to very slow
Soil depth	25–51 cm
Available water capacity (0-101.6cm)	5.08–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	1–10%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4

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). The Historic Climax Plant Community is described as a reference to understand the original potential of this site, and is not considered to be the management goal for every acre of rangeland. The

following descriptions should enable the landowner/ 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, this site can more readily return to the Historic Climax Plant Community (HCPC).
Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller, more palatable species such as green needlegrass and bluebunch wheatgrass. These plants will be replaced by western or thickspike wheatgrass, plains reedgrass, threadleaf sedge, blue grama, forbs, and Wyoming big sagebrush. Continued deterioration results in increased amounts of red threeawn, green and fringed sagewort, and rabbitbrush.

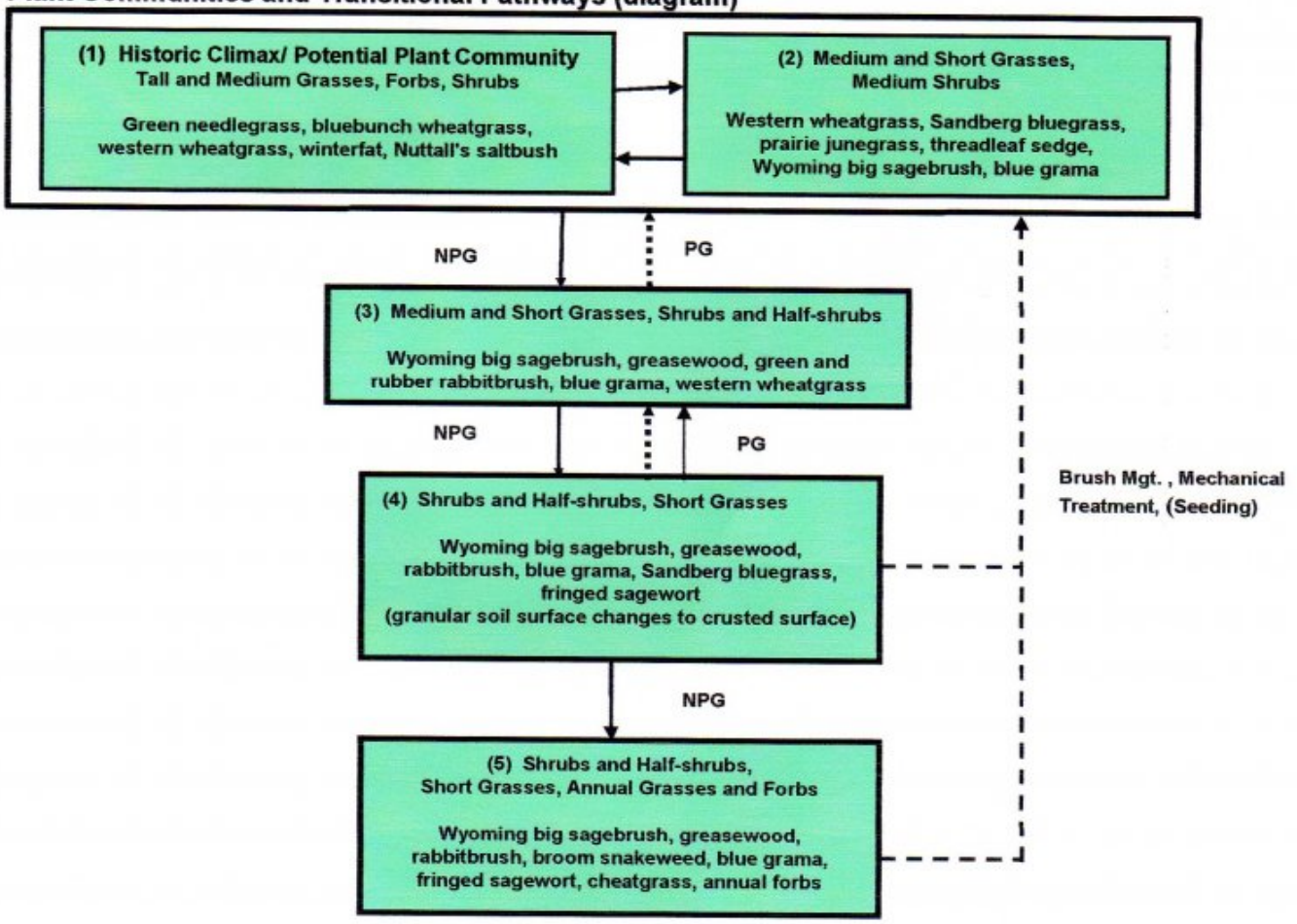
Plants that are not a part of the reference community that are most likely to invade are annual bromes, six-week fescue, false buffalograss, broom snakeweed, and thistles.

State and transition model

MLRA: 58A – Sedimentary Plains, East
MLRA: 60B – Pierre Shale Plains, East
R058AE199MT, R060BE577MT

10b. Plant Communities and Transitional Pathways (State and Transition Model): Transitions in plant community composition occur along a gradient that is not linear. Many processes are involved in the changes from one community to another. Changes in climate, elevation, soils, landform, fire patterns and frequency, and grazing all play a role in determining which of the plant communities will be expressed. The following model outlines some of the various plant communities that may occur on this site and provides a diagram of the relationship between plant community and type of use or disturbance.

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 high diversity of tall and medium height grasses (green needlegrass,

bluebunch wheatgrass, and western wheatgrass), short grasses and sedges(plains muhly, Sandberg bluegrass, prairie junegrass, threadleaf sedge and blue grama), and shrubs (winterfat and Nuttall's saltbush). There are also abundant forbs, and half-shrubs which occur in small percentages. These plant communities are 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 moderately high drought tolerance, considering the limited available water holding capacity 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 soil stability and a functioning hydrologic cycle. Plant communities 1 and 2 will shift back and forth with variations in weather/climate, soils, slope, and aspect coupled with grazing use.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	378	757	925
Shrub/Vine	76	112	185
Forb	50	101	123
Total	**504**	**970**	**1233**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-40%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-5%
Grass/grasslike basal cover	5-15%
Forb basal cover	1-4%
Non-vascular plants	0%
Biological crusts	1-2%
Litter	20-30%
Surface fragments >0.25" and <=3"	0-4%
Surface fragments >3"	0%
Bedrock	0%
Water	0%

Bare ground	25-40%

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	–	10-15%	20-40%	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

Disturbances to the historical climax plant community result in a community where the taller, more palatable grasses and shrubs decline. The community will become dominated by species such as western wheatgrass, Sandberg bluegrass, prairie junegrass, threadleaf sedge, Wyoming big sagebrush, and blue grama. 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: Medium and Short Grasses/ Shrubs and Half-shrubs

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

With continued heavy disturbance on Community 2, it tends to shift to one dominated by Wyoming big sagebrush or greasewood, rabbitbrush, blue grama, and western wheatgrass. This community tends to occur more in the Pierre shale areas of southeast Montana (MLRA 60B). In this community, greasewood may replace Wyoming big sagebrush, while the grass and forb component remain essentially the same.

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

Community 4.1
Plant Community 4: Shrubs and Half-shrubs/ Short Grasses

Continued degradation usually results in a community that is dominated by shrubs such as Wyoming big sagebrush or greasewood, rabbitbrush; short grasses such as blue grama and Sandberg bluegrass; along with fringed sagewort. As the Historic Climax plant community degrades, there is also a corresponding increase in the amount of bare ground. The typically granular surface of the soil often changes to a crusted surface, thus reducing infiltration and significantly altering the water and nutrient cycles. Plant communities 3 and 4 are much less productive than Plant Community 1 or 2. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, 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. These communities will respond positively to improved grazing management, but significant economic inputs and time would be required to move them toward a higher successional stage and a more productive plant community.

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

Community 5.1
Plant Community 5: Shrubs and Half-shrubs/ Short Grasses/ Annual Grasses and Forbs

Continued disturbance results in a community with excessive bare ground. This community is also comprised mainly of shrubs such as Wyoming big sagebrush, greasewood, or rubber rabbitbrush. A major difference is that the understory becomes dominated by annual grasses, annual forbs, and broom snakeweed. Fringed sagewort will continue to be common, as will blue grama. This community has extremely reduced productivity. Significant economic inputs and time would be required to move this plant community toward a higher successional stage and a more productive plant community.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Native grasses**			373–801	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	76–616	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	101–370	–
	western wheatgrass	PASM	*Pascopyrum smithii*	101–370	–
	green needlegrass	NAVI4	*Nassella viridula*	76–308	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	25–185	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	0–123	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	4–62	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–62	–
2	**Native grasses and sedges**			4–123	
	Grass, perennial	2GP	*Grass, perennial*	4–62	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	4–62	–
	blue grama	BOGR2	*Bouteloua gracilis*	4–62	–
	needleleaf sedge	CADU6	*Carex duriuscula*	4–62	–
	threadleaf sedge	CAFI	*Carex filifolia*	4–62	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	4–62	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	4–62	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	4–62	–
	Sandberg bluegrass	POSE	*Poa secunda*	4–62	–
Forb					
3	**Native forbs**			4–123	
	Forb, perennial	2FP	*Forb, perennial*	4–62	–
	onion	ALLIU	*Allium*	4–62	–
	pussytoes	ANTEN	*Antennaria*	4–62	–
	milkvetch	ASTRA	*Astragalus*	4–62	–

	white prairie clover	DACA7	*Dalea candida*	4–62	–
	purple prairie clover	DAPU5	*Dalea purpurea*	4–62	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	4–62	–
	buckwheat	ERIOG	*Eriogonum*	4–62	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	4–62	–
	desertparsley	LOMAT	*Lomatium*	4–62	–
	beardtongue	PENST	*Penstemon*	4–62	–
	spiny phlox	PHHO	*Phlox hoodii*	4–62	–
	scurfpea	PSORA2	*Psoralidium*	4–62	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	4–62	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	4–62	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	4–62	–
	American vetch	VIAM	*Vicia americana*	4–62	–
4	**Native forbs**			1–2	
	twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	1–2	–
	deathcamas	ZIGAD	*Zigadenus*	1–2	–
Shrub/Vine					
5	**Native shrubs and half-shrubs**			9–123	
	Nuttall's saltbush	ATNU2	*Atriplex nuttallii*	4–62	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	4–62	–
6	**Native shrubs and half-shrubs**			4–185	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	4–123	–
	silver sagebrush	ARCA13	*Artemisia cana*	4–123	–
	prairie sagewort	ARFR4	*Artemisia frigida*	4–123	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	4–123	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	4–123	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	4–123	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	4–123	–
	skunkbush sumac	RHTR	*Rhus trilobata*	4–123	–
	prairie rose	ROAR3	*Rosa arkansana*	4–123	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	4–123	–
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. This site has the potential to produce a moderate amount of high quality forage. Management objectives should include maintenance or improvement of the vegetation community. This is a droughty site and is very susceptible to disturbance. Recovery is limited, especially if any of the soil

surface has been eroded off. Shorter grazing periods and adequate re-growth after grazing are recommended for plant recovery. Season long use of this site can be detrimental and will alter the plant community over time.

Management strategies designed to maintain or improve the plant cover and vigor apply best to plant communities that are near, or similar to potential composition (i.e., Plant Communities 1 and 2). When the dominant community types are similar to 3 and 4, additional rest is often necessary for re-establishment of the desired species and to restore the stability and health of the site. Once the communities have moved to either 4 or 5, they are difficult to restore to a community that is near potential (1 or 2), because of the landform associated with this site and its droughtiness.
Plant Communities 1 and 2 are stable, productive, and healthy provided they receive proper management. 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.

Mechanical treatment and range seeding are generally not recommended on this ecological site because of the shallow soils and steeper slopes. Mechanical treatment may be considered when the site occurs on slopes less than 15%. Since this site often occurs as a component of several soil map units, it will often be included when a practice such as mechanical treatment is planned for a large area/ management unit. The response of this ecological site will be limited and should be considered in the planning process. An on-site evaluation should be done before the practice is to be applied.

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):
Complex topography and vegetative structure, along with the tendency to occur in a mosaic with other ecological sites, results in diverse wildlife habitat. The abundance and diversity of forbs and shrubs favor browsers and selective feeders like mule deer and pronghorn. Warm season grasses extend the availability of nutritious forage for grazers and mixed feeders including bison and elk. Large animal nutrition levels are relatively high yearlong because of the diversity of grasses, forbs and shrubs The general area often provides thermal and escape cover for big game animals. Shrub availability on steep, south slopes, provides important winter range for mule deer and elk. The majority of small mammals are seedeaters such as deer mice, pocket mice and kangaroo rats. Abundant prey and perch sites (on rock outcrops and scattered junipers) attract a variety of raptors. Sites having steeper, rocky topography provide habitat for interesting songbird species such as rock wrens, canyon wrens and spotted towhees. Scattered junipers and pines host field, chipping and lark sparrows.

Plant Community 2: Medium and Short Grasses/ Medium Shrubs:
A reduction in Nuttall's's saltbush and winterfat decreases winter nutrition for pronghorn and mule deer. Loss of warm season mid-grasses and green needlegrass shortens the green feed period for grazers such as bison and elk. Litter cover and residual grass declines which deprives ground-nesting birds of reproductive habitat. Small mammal and song bird populations decrease with loss of vegetative structural diversity.

Plant Community 3: Medium and Short Grasses/ Shrubs and Half-shrubs:
Winter habitat for sage grouse, Brewer's sparrow and mule deer may improve with an increase in big sagebrush, although further reductions in litter and residual grass cover degrade ground-nesting bird habitat in general. The period of high nutrition for all grazers and mixed feeders is considerably shortened after loss of grass, forb, shrub and half-shrub availability. Dominance by greasewood may increase lark bunting use on relatively level topography. Small mammal species diversity is reduced with loss of vegetative structural diversity.

Plant Community 4: Shrubs and Half-shrubs/ Short Grasses:
Loss of western wheatgrass further reduces habitat value for ground-nesting birds as well as forage value for grazers. Tall shrub cover may provide winter cover for pronghorn, mule deer and sage grouse. Summer feed value for grazers and mixed feeders is greatly reduced following loss of grass and forb diversity. Breeding bird use is similar to Plant Community 3 above.

Plant Community 5: Shrubs and Half-shrubs/ Short Grasses/ Annual Grasses and Forbs:
In general, wildlife habitat value is low. Sagebrush cover may provide winter cover for sage grouse and mule deer. Forage value for grazers and mixed feeders is poor. Ground-nesting bird habitat is very poor. Common nighthawks

may nest on the sparsely covered ground surface. Seed-eating small mammals, such as deer mice, may be relatively abundant after an increase in annual grasses and forbs.

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 slow to very slow. The runoff potential for this site is moderate to high, depending on slope and ground cover/health. Runoff curve numbers generally range from 79 to 94.

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 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 big game and upland bird hunting. The forbs have flowers that appeal to photographers. This site provides valuable open space and visual aesthetics.

Other information

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

Example of total annual production amounts by type of year:
Favorable years = 2200 lbs/acre
Normal years = 1480 lbs/acre
Unfavorable years = 1200 lbs/acre

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

Sample Calculations using Favorable Year production amounts:

< 30% slopes: AUM/AC = [(2200-500)(0.25)]/915 lbs/month for one AU = 0.46 AUM/AC
AC/AUM = (1.0 AU)/(0.46AUM/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): 14

BLM-Soil & Vegetation Inventory Method (SVIM) Data: 12

NRCS-Range Condition Record (ECS-2): 22

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 42

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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:** None.

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2. **Presence of water flow patterns:** None on slopes less than 25%. On slopes 25 – 40% water flow patterns may be 2-3 feet long and 4 inches wide.

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3. **Number and height of erosional pedestals or terracettes:** No pedestals on slopes < 20% On slopes > 20% pedestals up to 0.5 inch high are common. No to minor 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 < 40%. Bare ground will occur as small areas less than 4 inches in diameter.

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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.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Plant litter remains in place and is not moved by erosional forces on slopes less than 25%. Herbaceous litter may move up to 4 inches on slopes > 25%.

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 greater.

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

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

    Other: Minor components : Warm season, short-stature rhizomatous grasses and sedges = Warm season, mid-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): 1000 to 1100 #/acre (13 to 14 inch precip. Zone) 450 to 900 #/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.
