USDA Natural Resources
Conservation Service

Ecological site R058AE019MT
Shallow (Sw) RRU 58A-E 10-14" p.z.

Accessed: 05/12/2025

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.

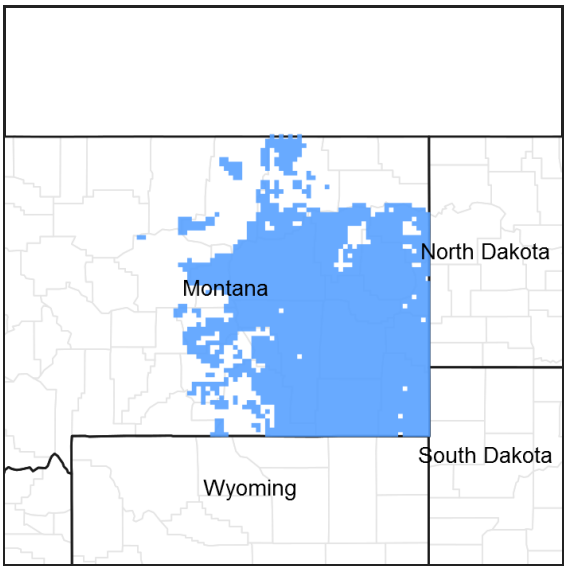


Figure 1. Mapped extent

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.**
R058AE003MT	**Sandy (Sy) RRU 58A-E 10-14" p.z.**
R058AE004MT	**Silty-Steep (SiStp) RRU 58A-E 10-14" p.z.**
R058AE006MT	**Sandy-Steep (SyStp) RRU 58A-E 10-14" p.z.**
R058AE017MT	**Very Shallow (VSw) RRU 58A-E 10-14" p.z.**

Similar sites

R058AY001MT	**Loamy (Lo) 10-14 P.Z.** The Sandy and Silty sites vary by being over 20 inches deep and on slopes less than 15%.
R058AE017MT	**Very Shallow (VSw) RRU 58A-E 10-14" p.z.** The Very Shallow site is less than 10 inches deep, or has a water holding capacity of 2 inches or less.
R058AE003MT	**Sandy (Sy) RRU 58A-E 10-14" p.z.** The Sandy and Silty sites vary by being over 20 inches deep and on slopes less than 15%.
R058AE004MT	**Silty-Steep (SiStp) RRU 58A-E 10-14" p.z.** The Silty-Steep site has soils greater than 20 inches deep and occurs on slopes greater than 15%.

R058AE199MT	**Shallow Clay (SwC) RRU 58A-E 10-14" p.z.** The Shallow Clay site varies by texture.

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. 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 are important features of this site. The amount of exposed rock outcrops tend to increase as slopes increase.

Table 2. Representative physiographic features

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

Climatic features

MLRAs 58A and 60B are considered to have a continental climate characterized by cold winters, hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are typical. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature. Seasonal precipitation is often limiting for plant growth. Annual fluctuations in species composition and total production are typical depending on the amount and timing of rainfall.
Temperatures can be very extreme in this part of Montana. Summer daytime temperatures are typically quite warm, generally averaging in the mid to upper 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)	14 in

Influencing water features

Soil features

These soils are mainly loamy textures that are 10 to 20 inches deep to hard rock or soft beds of decomposed siltstone or sandstone. Few plant roots can penetrate deeper than 20 inches. They are generally silt loams, loams, sandy loams, fine sandy loams, and very fine sandy loams

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	10–20 in
Available water capacity (0-40in)	2–4 in
Calcium carbonate equivalent (0-40in)	1–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	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 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).

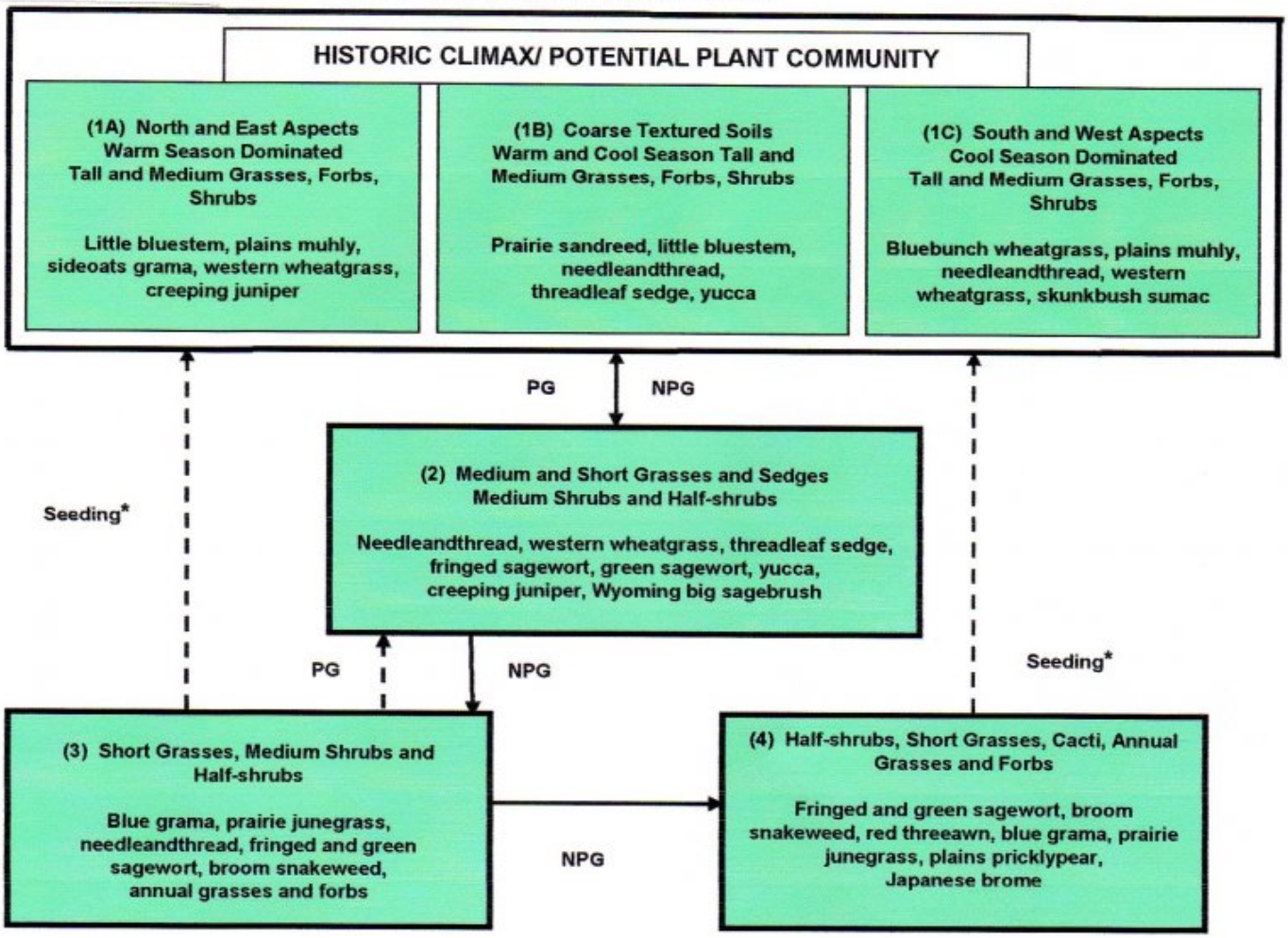
Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller, more palatable species such as bluebunch wheatgrass, prairie sandreed, little bluestem, plains muhly, sideoats grama, black samson, purple and white prairieclover, dotted gayfeather, winterfat, and skunkbush sumac. These plants will be replaced by needleandthread, sand dropseed, threadleaf sedge, blue grama, increaser forbs, yucca, rose, creeping juniper, and Wyoming big sagebrush. Continued deterioration results in increased amounts of red threeawn, fringed and green sagewort and plains pricklypear.

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

State and transition model

MLRA: 58A – Sedimentary Plains, East
MLRA: 60B – Pierre Shale Plains, East
R058AE019MT, R060BE576MT

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 improve or change the plant community. Dashed lines returning to a state (within the heavy lines) indicates a reduced probability of success, and will usually require major economic inputs, or a more intensive grazing strategy.

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.

* See comments in narrative under livestock grazing.

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 1A, 1B, 1C: Tall and Medium Grasses/ Forbs/ Shrubs

Community 1.1
Plant Community 1A, 1B, 1C: Tall and Medium Grasses/ Forbs/ Shrubs

These are the interpretive plant communities and are considered to be the Historic Climax Plant Community (HCPC) for this site. The variations between 1A, 1B, and 1C result from slight differences in soils and aspect, which alter the amount of effective moisture that plants receive for growth. These plant communities contain a high diversity of tall grasses (prairie sandreed, little bluestem, big bluestem, needleandthread, Indian ricegrass, and bluebunch wheatgrass), short grasses and sedges (sand dropseed, plains muhly, prairie junegrass, threadleaf sedge and blue grama), and shrubs (skunkbush sumac and winterfat). There are also abundant forbs, and half-shrubs which occur in small percentages. 1A. Warm Season Dominated: This plant community occurs primarily on cooler eastern and north aspects, or on flat slopes that receive additional moisture. The dominant grasses are little bluestem, plains muhly, sideoats grama, western wheatgrass, and short grasses such as threadleaf sedge, prairie junegrass, and Sandberg bluegrass. Creeping juniper is often common on this aspect. 1B. Coarse Textured Soils: This plant community occurs on more coarse textured sandy soils, and the dominant grasses are prairie sandreed, little bluestem, sideoats grama, needleandthread, and short grasses such as threadleaf sedge, prairie junegrass, and Sandberg bluegrass. Yucca is often common on this aspect. 1C. Cool Season Dominated: This plant community occurs primarily on warmer south and west aspects. Due to the droughty nature of this aspect, bluebunch wheatgrass tends to be more dominant. It will grow in association with plains muhly, needleandthread, and western or thickspike wheatgrass. This aspect is likely to have skunkbush sumac and yucca present. 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.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	350	630	910
Shrub/Vine	100	180	260
Forb	50	90	130
Total	**500**	**900**	**1300**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-30%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-5%

Grass/grasslike basal cover	5-10%
Forb basal cover	1-4%
Non-vascular plants	0%
Biological crusts	1-2%
Litter	15-25%
Surface fragments >0.25" and <=3"	0-5%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	30-50%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	10-15%	20-30%	1-5%
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

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

Community 2.1
Plant Community 2: Medium and Short Grasses/ Medium Shrubs and Half-shrubs

Slight disturbances and degradation to the HCPC will result in a plant community dominated by needleandthread, western wheatgrass, threadleaf sedge, fringed and green sagewort, hairy goldenaster, prairie rose, and Wyoming big sagebrush. The tall, more palatable grasses (little bluestem, bluebunch wheatgrass) will be present in smaller percentages. Creeping juniper and yucca may also increase. Grass biomass production and litter become reduced on the site as the taller grasses disappear, increasing evaporation and reducing moisture retention. Additional open space in the community can result in undesirable invader species. This plant community provides for moderate soil stability.

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

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

With continued heavy disturbance the site will become dominated by short grasses, such as blue grama, prairie junegrass and threadleaf sedge. Needleandthread will still be present in low amounts. Palatable shrubs and forbs will be mostly absent. Much of the production is from green and fringed sagewort and broom snakeweed. Annual grasses and forbs begin to invade the site. This plant community is less productive than Plant Community 1 or 2 (< 750 pounds per acre). 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. There are limitations to using mechanical treatment on this site due to the shallow soils.

State 4
Plant Community 4: Half-shrubs/ Short Grasses and Sedges/ Cacti/ Annuals

Community 4.1
Plant Community 4: Half-shrubs/ Short Grasses and Sedges/ Cacti/ Annuals

With continual heavy disturbance over several years, this site will experience a loss of topsoil and an increase of bare ground. The community will change to one dominated primarily by fringed sagewort, broom snakeweed, red threeawn, short grasses, and annual grasses and forbs. Plains prickly pear expands onto the site. This community has extremely reduced productivity of perennial grasses (< 300 pounds per acre). 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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Native grasses**			345–780	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	100–650	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	50–390	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	50–260	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	25–195	–
	western wheatgrass	PASM	*Pascopyrum smithii*	25–195	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	25–130	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	25–130	–
2	**Native grasses and sedges**			5–130	
	Grass, perennial	2GP	*Grass, perennial*	5–65	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	5–65	–
	blue grama	BOGR2	*Bouteloua gracilis*	5–65	–
	threadleaf sedge	CAFI	*Carex filifolia*	5–65	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	5–65	–
	squirreltail	ELEL5	*Elymus elymoides*	5–65	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	5–65	–
	green needlegrass	NAVI4	*Nassella viridula*	5–65	–
	Sandberg bluegrass	POSE	*Poa secunda*	5–65	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	5–65	–
3	**Native grasses**			1–2	
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	1–2	–
Forb					
4	**Native forbs**			50–130	
	Forb, perennial	2FP	*Forb, perennial*	5–65	–
	common yarrow	ACMI2	*Achillea millefolium*	5–65	

	common yarrow	ACMI2	*Achillea millefolium*	5–65	–
	pussytoes	ANTEN	*Antennaria*	5–65	–
	tarragon	ARDR4	*Artemisia dracunculus*	5–65	–
	Barr's milkvetch	ASBA	*Astragalus barrii*	5–65	–
	tufted milkvetch	ASSP6	*Astragalus spatulatus*	5–65	–
	milkvetch	ASTRA	*Astragalus*	5–65	–
	miner's candle	CRVI4	*Cryptantha virgata*	5–65	–
	white prairie clover	DACA7	*Dalea candida*	5–65	–
	purple prairie clover	DAPU5	*Dalea purpurea*	5–65	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	5–65	–
	buckwheat	ERIOG	*Eriogonum*	5–65	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	5–65	–
	dotted blazing star	LIPU	*Liatris punctata*	5–65	–
	evening primrose	OENOT	*Oenothera*	5–65	–
	beardtongue	PENST	*Penstemon*	5–65	–
	spiny phlox	PHHO	*Phlox hoodii*	5–65	–
	scurfpea	PSORA2	*Psoralidium*	5–65	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	5–65	–
	American vetch	VIAM	*Vicia americana*	5–65	–
Shrub/Vine					
5	**Native shrubs and half-shrubs**			100–260	
	skunkbush sumac	RHTR	*Rhus trilobata*	25–130	–
	prairie rose	ROAR3	*Rosa arkansana*	5–65	–
	soapweed yucca	YUGL	*Yucca glauca*	5–65	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	5–65	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	5–65	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	5–65	–
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	5–65	–
	prairie sagewort	ARFR4	*Artemisia frigida*	5–65	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	5–65	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	5–65	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	5–65	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–2	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	1–2	–

Animal community

Livestock Grazing Interpretations:

Managed livestock grazing is suitable on this site as it has the potential to produce a moderate amount of high quality forage. Forage production is somewhat limited by steep slopes and shallow soils, and the potential for runoff, which reduces the effectiveness

of the precipitation received for plant growth. The steeper slopes may also limit livestock travel and result in poor grazing distribution, especially in areas away from water. 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 (medium and short grasses) occurs, grazing management strategies need to be implemented to avoid further deterioration. This community is still stable, productive, and healthy provided it receives proper management. This community will respond fairly quickly to improved grazing management including increased growing season rest of key forage plants. Grazing management alone can usually move this community back to one more similar to potential if a good seed source of the taller grasses still exists.
Plant Communities 3 and 4 have significantly reduced forage production (200-600 lbs./acre). Once this site is occupied by either 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.

Some practices such as seeding and mechanical treatment are typically not recommended on shallow soils, such as those associated with this ecological site. However, in this MLRA/MLRU, this ecological site is often a minor component of larger map units containing deeper soils. In these situations, treating the shallow site is often only incidental to treating the larger area of deeper soils. Also, to avoid the shallow component of these areas often becomes impractical. In some locations, shallow soils have been cultivated as part of a field composed of mainly deeper soils. Reseeding is generally feasible and practical in these situations.

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 complex topography and vegetative structure of this site, 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 such and mule deer and pronghorn. Warm season grasses (1a. and 1b.) 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 (1c.). The majority of small mammals found on this site are seed-eaters such as deer mice and kangaroo rats. Abundant prey and perch sites (on rock outcrops and scattered trees) 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 Rocky Mountain juniper and Ponderosa pine host field sparrows and chipping sparrows.

Plant Community 2: Medium and Short Grasses/ Medium Shrubs and Half-shrubs:
The loss of warm season grasses shortens the green feed period for grazers and mixed feeders such as bison and elk. Loss of vegetative structural diversity reduces habitat value for big game, small mammals and birds. Pronghorn and deer habitat suffers from a loss of forb diversity. Potential increases in big sagebrush and rabbitbrush cover may provide sage grouse nesting and winter habitat and browse for deer and pronghorn. Sagebrush/ grassland obligates such as Brewer’s and sage sparrows may also benefit. However, the reduction in residual grass and litter cover reduces habitat value for ground-nesting birds.

Plant Community 3: Short Grasses/ Medium Shrubs and Half-shrubs:
The period of high nutrition levels for grazers and mixed feeders is shortened considerably with the loss of grass and forb diversity. Small mammal populations are dominated by deer mice as annual plants increase. Breeding bird habitat value declines with loss of residual plant material and litter.

Plant Community 4: Half-shrubs/ Short Grasses/ Cacti/ Annual Grasses & Forbs: Sparse vegetation and greater coverage of bare ground may provide suitable habitat for mountain plovers, horned larks and McCown’s longspurs. However, a lack of complex vegetation structure and residual cover makes this community poor habitat in general for most ground-nesting birds and relatively poor big game habitat. Pronghorn and mule deer may forage in this community spring through fall.

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. The infiltration rates for these soils will normally be moderate to moderately rapid.
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 1a, 1b, 1c, and 2) generally have enough plant cover and litter to optimize infiltration, minimize runoff and erosion, and have a good hydrologic condition. The deep root systems of the potential vegetation help maintain or increase infiltration rates and reduce runoff.

Sites in low similarity (Plant Communities 3 and 4) are generally considered to be in poor hydrologic condition as the majority of plant cover is from shallow-rooted species such as blue grama, annual grasses, and shrubs.

Erosion is minor for sites in high similarity. Rills and gullies should not be present. Water flow patterns, if present, will be barely observable. Plant pedestals are essentially non-existent. Plant litter remains in place and is not moved by erosion. Soil surfaces should not be compacted or crusted. Plant cover and litter helps retain soil moisture for use by the plants. Maintaining a healthy stand of perennial vegetation will optimize the amount of precipitation that is received. (Reference: Engineering Field Manual, Chapter 2 and Montana Supplement 4).

Recreational uses

This site provides recreational opportunities for big game and upland bird hunting, and hiking. 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): 9

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

NRCS-Range Condition Record (ECS-2): 62

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 30

Contributors

Bob Leinard
JVF, REL, RSN, MJR, SKW, SVF, POH

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
Contact for lead author	Tammy DeCock
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 < 15%. Water flow patterns < 2 feet long may occur on slopes > 15%.

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3. **Number and height of erosional pedestals or terracettes:** None.

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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 < 30%. Bare ground will occur as small irregular shaped areas less than 5 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.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement occurs on slopes < 15%. Small herbaceous litter may move up to 4 inches on slopes > 15%.

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 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 = Warm season, mid-stature, bunch grasses

    Sub-dominant: Warm season, tall-stature, rhizomatous grasses = shrubs and half shrubs > Cool season, mid-stature, rhizomatous grasses > forbs = Warm season, mid-stature, rhizomatous grasses = Cool season, bunch grasses and sedge

    Other: Minor components: 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):** 1100 to 1300 #/acre (13 to 14 inch precip. Zone) 500 to 900 #/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:** 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.
