USDA Natural Resources Conservation Service

Ecological site R058AE005MT
Clayey-Steep (CyStp) RRU 58A-E 10-14" p.z.

Accessed: 05/19/2024

General information

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

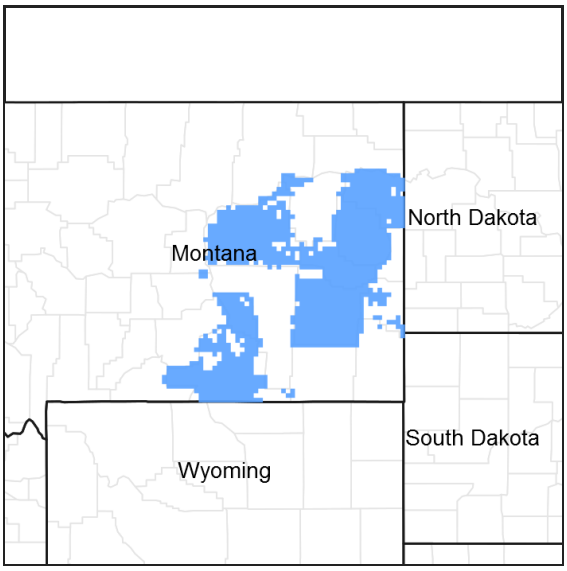


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Associated sites

R058AE002MT	**Clayey (Cy) RRU 58A-E 10-14" p.z.**
R058AE019MT	**Shallow (Sw) RRU 58A-E 10-14" p.z.**
R058AE199MT	**Shallow Clay (SwC) RRU 58A-E 10-14" p.z.**

Similar sites

R058AE199MT	**Shallow Clay (SwC) RRU 58A-E 10-14" p.z.** The Shallow Clay site differs mainly by being 20 inches or less to shale or other root limiting material.
R058AE004MT	**Silty-Steep (SiStp) RRU 58A-E 10-14" p.z.** The Silty-Steep site differs mainly in surface texture, being more loamy or silty.
R058AE002MT	**Clayey (Cy) RRU 58A-E 10-14" p.z.** The Clayey site differs mainly by being on slopes of less than 15%.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	Not specified

Physiographic features

This ecological site occurs on moderately steep to steep hills and side slopes. Slopes are mainly between 15% and 45%. This site occurs on all exposures and aspect can be significant. 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.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plain (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	579–1,067 m
Slope	15–45%
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/cgibin/state.pl?state=mt.

Table 3. Representative climatic features

Frost-free period (average)	145 days
Freeze-free period (average)	170 days
Precipitation total (average)	356 mm

Influencing water features

None

Soil features

These soils are granular clay loams, silty clay loams, silty clays, sandy clays, or clays on moderately steep, steep, or hilly landscapes. They are over 20 inches deep to any root limiting feature. The major limitation to plant growth is the potential for runoff.

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 moderately slow
Soil depth	51–152 cm
Available water capacity (0-101.6cm)	10.16–25.4 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
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 plant 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 (slope) 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 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 western wheatgrass, bluebunch wheatgrass, green needlegrass, little bluestem, and sideoats grama will occur. These plants will be replaced by a mixture of short grasses and sedges,

including Sandberg bluegrass, blue grama, threadleaf sedge, several species of non-palatable forbs, broom snakeweed, and Wyoming big sagebrush. Greasewood may replace Wyoming big sagebrush in MLRA 60B, Pierre Shales.

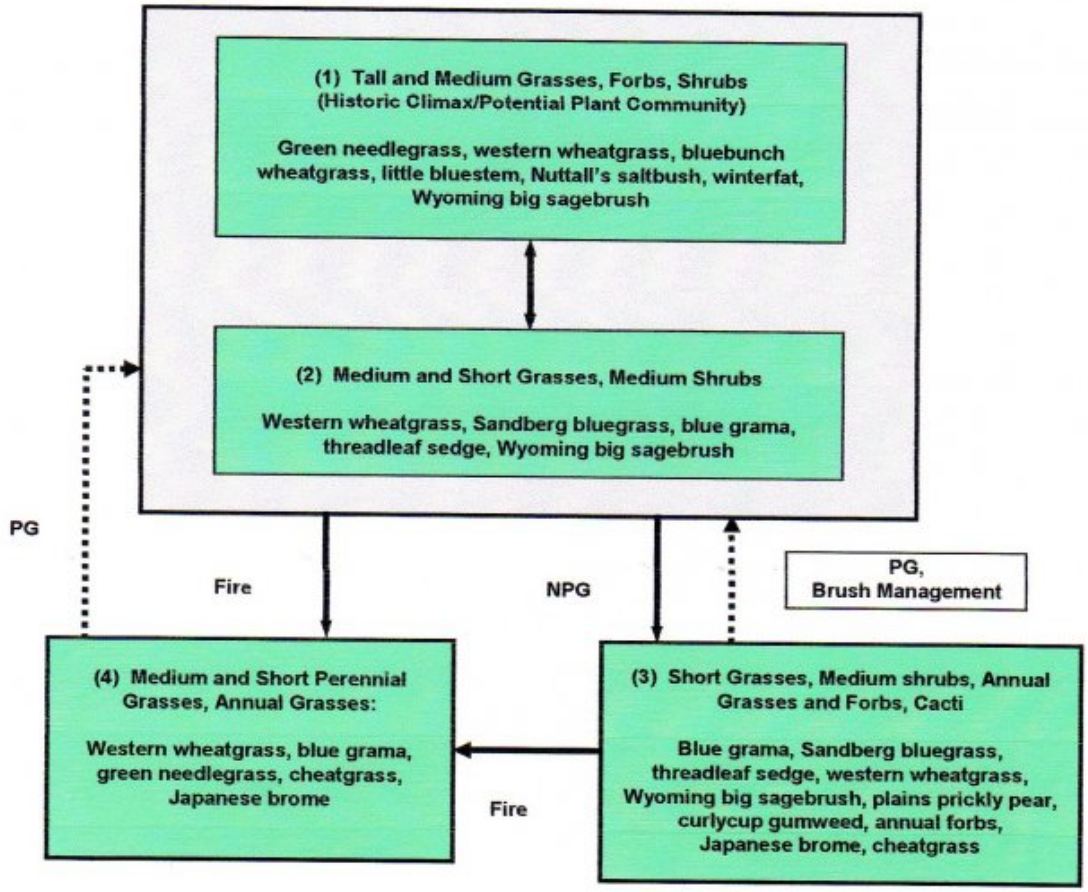
Continued deterioration results in an abundance of short grasses, annual grasses, annual forbs, and cacti. Plants that are not a part of the Historic Climax Plant Community that are most likely to invade are annual grasses (cheatgrass, Japanese brome), and annual and biennial forbs.

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

MLRA: 58A – Sedimentary Plains, East
MLRA: 60B – Pierre Shale Plains, East
R058AE005MT, R060BE583MT

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 contains a high diversity of tall and medium height, cool and warm season grasses (western wheatgrass, bluebunch wheatgrass (western portion of RRU), green needlegrass, little bluestem, sideoats grama,), and short grasses and sedges (plains muhly, prairie junegrass, threadleaf sedge, and blue grama). There

are abundant forbs, shrubs, and half-shrubs (Nuttall's saltbush, winterfat) which occur in small percentages. 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. Run-off from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship. This plant community provides for soil stability and a functioning hydrologic cycle.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	673	925	1177
Shrub/Vine	135	185	235
Forb	90	123	157
Total	**898**	**1233**	**1569**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	55-70%
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	1-3%
Grass/grasslike basal cover	6-10%
Forb basal cover	1-3%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	20-40%
Surface fragments >0.25" and <=3"	0-4%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	20-40%

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	–	5-10%	55-70%	1-5%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

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

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

Slight variations can result in a community similar to the HCPC/PPC but with higher proportions of medium and short grasses, such as western wheatgrass, Sandberg bluegrass, blue grama, and threadleaf sedge. The tall, more palatable grasses (green needlegrass, little bluestem, bluebunch wheatgrass) will be present in smaller percentages. There may be an increase in the amount of Wyoming big sagebrush and a corresponding decrease in winterfat and Nuttall's saltbush. Palatable and nutritious forbs will be replaced by less desirable and more aggressive species. Grass biomass production and litter become reduced on the site as the taller grasses disappear, increasing evaporation and reducing moisture retention. Additional open space in the community can result in undesirable invader species. This plant community provides for moderate soil stability.

State 3
Plant Community 3: Short Grasses/ Medium Shrubs/ Annuals & Biennials/ Cacti

Community 3.1
Plant Community 3: Short Grasses/ Medium Shrubs/ Annuals & Biennials/ Cacti

With continued heavy disturbance the site will become dominated by short grasses, such as blue grama, Sandberg bluegrass, prairie junegrass, and threadleaf sedge, plus Wyoming big sagebrush, annuals, and biennials. The taller grasses will occur only occasionally. Palatable shrubs and forbs will be mostly absent. Annuals and biennials, such as cheatgrass and curlycup gumweed, will be more abundant. This plant community is 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 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. This community will respond positively to improved grazing management, but significant economic inputs and time would be required to move this plant community toward a higher successional stage and a more productive plant community.

State 4
Plant Community 4: Annual Grasses/ Medium and Short Perennial Grasses

Community 4.1
Plant Community 4: Annual Grasses/ Medium and Short Perennial Grasses

Fire will often cause Plant Community 2 to lose the brush component. Medium and short grasses will dominate the community (western wheatgrass and blue grama), and annual grasses, including cheatgrass, will be present for a

period of time after fire. Green needlegrass will often respond if it was present under the sagebrush canopy prior to the fire. This plant community is less productive than the HCPC and has 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 to move it towards a community similar in production and composition to that of Plant Community 1 or 2.

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**			661–1020	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	90–628	–
	green needlegrass	NAVI4	*Nassella viridula*	90–549	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	90–392	–
	western wheatgrass	PASM	*Pascopyrum smithii*	135–314	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	90–314	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	9–78	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	9–78	–
2	**Native grasses and sedges**			9–157	
	Grass, perennial	2GP	*Grass, perennial*	9–78	–
	blue grama	BOGR2	*Bouteloua gracilis*	9–78	–
	needleleaf sedge	CADU6	*Carex duriuscula*	9–78	–
	threadleaf sedge	CAFI	*Carex filifolia*	9–78	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	9–78	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	9–78	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	9–78	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–78	–
	Sandberg bluegrass	POSE	*Poa secunda*	9–78	–
	alkali sacaton	SPAI	*Sporobolus airoides*	9–78	–
3	**Native grasses**			1–2	
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	1–2	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	1–2	–
Forb					
4	**Native forbs**			90–157	
	Forb, perennial	2FP	*Forb, perennial*	9–78	–
	pussytoes	ANTEN	*Antennaria*	9–78	–
	tarragon	ARDR4	*Artemisia dracunculus*	9–78	–
	milkvetch	ASTRA	*Astragalus*	9–78	–
	white prairie clover	DACA7	*Dalea candida*	9–78	–
	purple prairie clover	DAPU5	*Dalea purpurea*	9–78	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	9–78	–
	dotted blazing star	LIPU	*Liatris punctata*	9–78	–

	dotted blazing star	LIPU	*Liatris punctata*	9–78	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	9–78	–
	spiny phlox	PHHO	*Phlox hoodii*	9–78	–
	scurfpea	PSORA2	*Psoralidium*	9–78	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	9–78	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	9–78	–
	American vetch	VIAM	*Vicia americana*	9–78	–
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**			16–157	
	Nuttall's saltbush	ATNU2	*Atriplex nuttallii*	8–78	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	8–78	–
7	**Native shrubs and half-shrubs**			9–235	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	9–50	–
	silver sagebrush	ARCA13	*Artemisia cana*	9–50	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–50	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	9–50	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	9–50	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	9–50	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	9–50	–
	prairie rose	ROAR3	*Rosa arkansana*	9–50	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	9–50	–
8	**Native shrubs and half-shrubs**			1–2	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–2	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	1–2	–

Animal community

Livestock Grazing Interpretations:

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

The potential for seeding or using mechanical treatment to improve site health is limited due to steep slopes.

Wildlife Interpretations:

The Clayey-Steep ecological site provides generally good habitat for deer because of the sloping topography and the diversity of forb and shrub production. It is generally fair habitat for antelope, for the same landscape factors. It provides diverse habitat for many other prairie wildlife species. Some species of special emphasis, such as the mountain plover and swift fox, will use the habitat provided by this site for portions of their life cycle. 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 high proportion of grasses plus a diversity of forbs, shrubs and half-shrubs in this community favors grazers and mixed feeders such as bison, pronghorn and elk. Also, the combination of steep topography and complexity of aspect results in higher shrub density and diversity compared to a Clayey Ecological Site. This provides winter feeding habitat (shrubs) on warm exposures and thermal and escape cover (topography) for mule deer.

Large animal nutrition levels are relatively high year-long with the diversity of warm and cool season grasses, forbs and shrubs. Complex plant structural diversity and litter cover provide habitat for a wide array of small mammals (both seed- eaters, i.e. deer mice and herbivores, i.e. voles) and neo-tropical migratory birds. Diverse prey populations are available for raptors like ferruginous hawks and golden eagles. The diversity of grass and forb life forms and heights, along with scattered shrubs and junipers, provides habitat for many bird species including the spotted towhee, field sparrow, western meadowlark, chipping sparrow and loggerhead shrike.

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

A reduction in warm season grass cover shortens the green feed period for grazers. Selective and mixed feeders may benefit from an increase in forbs. Winter range nutrition levels decline for big game species as winterfat and Nuttall’s saltbush decrease. Sage grouse, Brewer’s sparrows and sage thrashers may make use of the increased sagebrush cover. General habitat structural diversity decreases with the loss of the taller warm and cool season bunch grasses.

Plant Community 3: Short Grasses/ Wyoming Big Sagebrush/ Annuals & Biennials/ Cacti:

Wildlife habitat value is quite low as the plant community is simplified. Winter range nutrition levels for game animals decline following loss of the tall, palatable grasses and shrubs. Loss of residual plant cover and litter degrades nest cover for many bird species. Small mammal species composition shifts to seed-eaters, like deer mice, with loss of ground cover and an increase in annual plants.

Plant Community 4: Annual Grasses/ Medium and Short Perennial Grasses:

Removal of shrubs by wildfire decreases winter habitat value for big game animals as well as general wildlife habitat structural diversity. The period of high nutrition levels for grazers and mixed feeders is shortened considerably with the loss of shrubs and a decrease in grass and forb diversity. Small mammal populations are dominated by deer mice as annual plants increase. The value of breeding bird habitat declines with loss of residual plant material and litter. Fire, followed by good management, may result in excellent wildlife value over time as the plant community recovers.

Hydrological functions

The runoff potential for this site is high to very high, depending on slope and ground cover. Runoff curve numbers generally range from 77 to 92. The soils associated with this ecological site are generally in Hydrologic Soil Group C or D. The infiltration rates for these soils will normally be moderate to moderately slow.

Good hydrologic conditions exist on rangelands if plant cover (grass, litter, and brush canopy) is greater than 70%. Fair conditions exist when cover is between 30 and 70%, and poor conditions exist when cover is less than 30%. Sites in high similarity to HCPC (Plant Communities 1 and 2) generally have enough plant cover and litter to optimize infiltration, minimize runoff and erosion, and have a good hydrologic condition. The deep root systems of the potential vegetation help maintain or increase infiltration rates and reduce runoff. Sites in low similarity (Plant Communities 3 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 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 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): 4

BLM-Soil & Vegetation Inventory Method (SVIM) Data: 16

NRCS-Range Condition Record (ECS-2): 30

NRCS-Range/Soil Correlation Observations & Soil 232 notes: 5

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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.

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

3. **Number and height of erosional pedestals or terracettes:** Pedestals up to 0.5 inch high are common. No terracettes.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is < 35%. Bare ground will occur as small areas less than 5 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):** 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%.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Surface Soil Aggregate Stability under plant canopy should typically be 5 or greater. Surface Soil Aggregate Stability not under plant canopy should typically be 5 or slightly less.

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

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** 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.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer 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, bunch grasses

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

    Other: Minor components: 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):** 1250 to 1400 #/acre (13 to 14 inch precip. Zone) 800 to 1100 #/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

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