

## Ecological site R058AC045MT Overflow (Ov) RRU 58A-C 11-14" p.z.

Last updated: 6/14/2023  
Accessed: 05/03/2024

### 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.

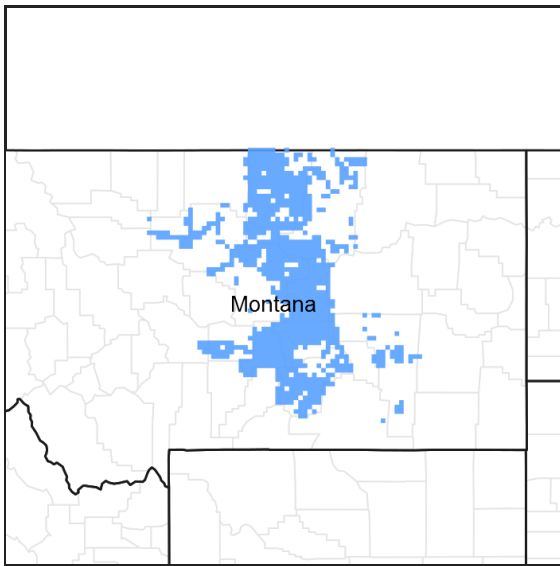


Figure 1. Mapped extent

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

R058AC040MT	<b>Silty (Si) RRU 58A-C 11-14" p.z.</b>
R058AC041MT	<b>Clayey (Cy) RRU 58A-C 11-14" p.z.</b>
R058AC042MT	<b>Sandy (Sy) RRU 58A-C 11-14" p.z.</b>
R058AC043MT	<b>Wet Meadow (WM) RRU 58A-C 11-14" p.z.</b>
R058AC044MT	<b>Subirrigated (Sb) RRU 58A-C 11-14" p.z.</b>
R058AC047MT	<b>Clayey-Steep (CyStp) RRU 58A-C 11-14" p.z. Deleted. Refer to site: R058AC049MT</b>

### Similar sites

R058AC618MT	<b>Saline Overflow (SOv) RRU 58A-C 11-14" p.z.</b> The Saline Overflow site differs mainly by being salt-affected.
R058AC617MT	<b>Riparian Subirrigated (RSb) RRU 58A-C 11-14" p.z.</b> The Riparian Subirrigated site differs mainly by being adjacent to perennial or intermittent streams and being frequently flooded.
R058AC043MT	<b>Wet Meadow (WM) RRU 58A-C 11-14" p.z.</b> The Wet Meadow site differs mainly by being wet at or near the surface for most of the growing season.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Symphoricarpos occidentalis</i> (2) <i>Prunus americana</i>
Herbaceous	(1) <i>Leymus cinereus</i> (2) <i>Nassella viridula</i>

## Physiographic features

This ecological site occurs in swales and narrow drainages where it receives more than normal moisture because of run-in from adjacent areas. It is associated mainly with ephemeral streams (those that flow only in direct response to a precipitation event or snow melt, and the water table is lower than the channel bottom).

**Table 2. Representative physiographic features**

Landforms	(1) Swale (2) Drainageway
Flooding frequency	None to rare
Ponding frequency	None
Elevation	686–1,372 m
Slope	0–4%
Ponding depth	0 cm
Water table depth	152 cm
Aspect	Aspect is not a significant factor

## Climatic features

Major Land Resource Area (MLRA) 58AC in Montana is 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 80's F for July and August. Summertime temperatures will typically reach in the 100's F at some point during the summer, and can reach 90° F any month between May and September. Conversely, winter temperatures can be cold, averaging in the mid teens to mid 20'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 30–40° F below zero, or even colder, most any winter.

Spring can be windy throughout this MLRA, 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.

The majority of the rangeland in MLRA 58AC is within the 11 to 14 inch Mean Annual Precipitation (MAP) 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 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 (32° 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)	135 days
Freeze-free period (average)	155 days
Precipitation total (average)	356 mm

### **Influencing water features**

Ephemeral, flowing only in direct response to snow melt or precipitation events. Ephemeral streams typically flow less than 30 consecutive days at a time. The bottom of the channel is above the water table at all times. The Rosgen system of classification does not apply to ephemeral systems.

### **Soil features**

The soils associated with this ecological site are moderately deep to very deep. Textures will vary since these soils are alluvial, having been deposited by stream flow events. Surfaces are often dark due to the supplemental moisture this site receives. Available water holding capacity is generally greater than 6 inches. Permeability is variable due to the various textures and patterns of deposition that occur.

**Table 4. Representative soil features**

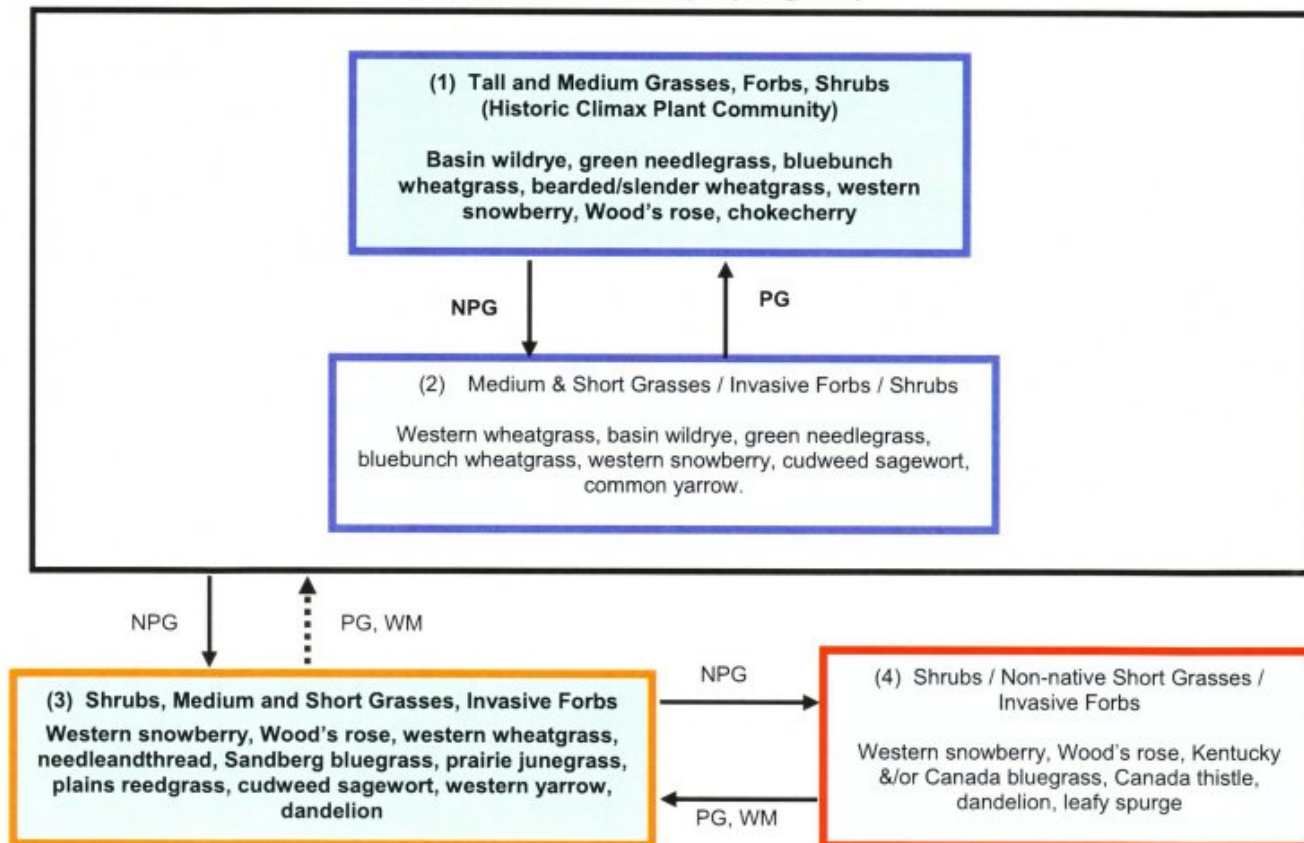
Soil depth	102–183 cm
Surface fragment cover <=3"	0–5%
Available water capacity (0-101.6cm)	15.24 cm

### **Ecological dynamics**

The following are descriptions of several plant communities that may occupy this site:

### **State and transition model**

5c. 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. Yellow boxes indicate caution that the community may be in danger of crossing a threshold. Orange boxes represent communities that have crossed over thresholds from the HCPC and may be difficult to restore with grazing management alone. Red boxes represent communities that have severely shifted away from the HCPC and probably cannot be restored without mechanical inputs.

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.

WM = Weed Management using either chemical, mechanical or specially-designed grazing systems. Caution must be used with chemical applications on this Overflow site.

State 1

Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs (HCPC)

Community 1.1

Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs (HCPC)



Figure 2. 58AC Overflow

The physical aspect of this site in the Historical Climax (HCPC) is that of a swale grassland dominated by cool season grasses, with forbs and shrubs occurring in smaller percentages. Relative composition by weight of annual production on this ecological site is approximately 75-80% grasses and sedges, 5% forbs, and 5-10% woody species. The canopy cover of shrubs is 1 to 10%. This plant community contains a diversity of tall and medium height, cool season grasses (basin wildrye, green needlegrass, and bluebunch, slender, and bearded wheatgrass). Warm season grasses (prairie cordgrass) may also occasionally be present. There are numerous forbs that occur in smaller percentages. Shrubs such as western or common snowberry, Wood's rose and occasionally chokecherry, golden currant, or American plum can be common.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2309	2499	2712
Shrub/Vine	224	247	269
Forb	112	123	135
<b>Total</b>	<b>2645</b>	<b>2869</b>	<b>3116</b>

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	1-10%
Grass/grasslike foliar cover	80-90%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
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	10-15%
Forb basal cover	1-4%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	40-60%
Surface fragments >0.25" and <=3"	0-5%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	5%

**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	–	–	–	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	1-10%	80-90%	1-5%
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

## State 2

### Plant Community 2: Medium and Short Grasses/ Invasive Forbs/ Shrubs

#### Community 2.1

### Plant Community 2: Medium and Short Grasses/ Invasive Forbs/ Shrubs

Slight degradation in the Historic Climax Plant Community, including a beginning response to non-prescribed grazing, will tend to change the HCPC/PPC to a community represented by an increase in western wheatgrass and western snowberry and other grasses such as needleandthread, Sandberg bluegrass, prairie junegrass, and plains reedgrass. The medium and tall grasses such as basin wildrye, green needlegrass, bluebunch, bearded and slender wheatgrass will still be present, sometimes in relatively large amounts. There may be an increase in some non-palatable forbs such as cudweed sagewort and western yarrow. Biomass production and litter become reduced on the site as the taller grasses disappear, increasing evaporation and reducing moisture intake and retention. Additional open space in this community can result in undesirable invader species such as leafy spurge and Canada thistle moving in. This plant community provides for moderate soil stability.

## State 3

### Plant Community 3: Shrubs/ Medium and Short Grasses/ Invasive Forbs

#### Community 3.1

### Plant Community 3: Shrubs/ Medium and Short Grasses/ Invasive Forbs

With continued heavy disturbance, the site will become dominated by western or common snowberry. Western wheatgrass, needleandthread, Sandberg bluegrass, and plains reedgrass become more prevalent. The taller grasses (basin wildrye, green needlegrass, bluebunch, bearded, and slender wheatgrass) will still be present, but in

much smaller amounts. Palatable forbs will be mostly absent, having been replaced by species such as cudweed sagewort and western yarrow. Weedy species such as dandelion and thistle often become more abundant.

## State 4

### Plant Community 4: Shrubs/ Non-native Short Grasses/ Invasive Forbs

#### Community 4.1

### Plant Community 4: Shrubs/ Non-native Short Grasses/ Invasive Forbs

If heavy disturbance continues, plant community 3 can deteriorate to one primarily composed of shrubs (snowberry, rose) and non-native short grasses (Kentucky/Canada bluegrass). Western wheatgrass may be present. The taller grasses will occur only rarely, often underneath the shrub canopy. Invasive forbs (e.g., thistles, leafy spurge) are likely to invade. Plant Communities 3 and 4 are significantly less productive than Plant Communities 1 or 2. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, thus eventually favoring species that are more adapted to drier conditions. These communities have lost many of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy flow. Kentucky and Canada bluegrass can be very difficult to eliminate once established. Practices such as seeding or brush management are not recommended mainly because of the potential for accelerated erosion when the soil surface is not protected by plant cover during an overflow event.

## Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Native grasses and sedges</b>			2248–2399	
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	1–2892	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	527–1244	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	263–779	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	135–465	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	135–465	–
	beardless wheatgrass	PSSPI	<i>Pseudoroegneria spicata ssp. inermis</i>	135–314	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	135–314	–
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	1–157	–
2	<b>Native grasses, sedges, and rushes</b>			1–314	
	Grass-like, perennial	2GLP	<i>Grass-like, perennial</i>	1–157	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	1–157	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	1–157	–
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	1–157	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	1–157	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	1–157	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	1–157	–
<b>Forb</b>					
3	<b>Native forbs</b>			1–157	
	Forb, perennial	2FP	<i>Forb, perennial</i>	1–157	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	1–157	–
	silverweed cinquefoil	ARAN7	<i>Argentina anserina</i>	1–157	–

	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	1–157	–
	aster	ASTER	<i>Aster</i>	1–157	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	1–157	–
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	1–157	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	1–157	–
	cinquefoil	POTEN	<i>Potentilla</i>	1–157	–
	goldenrod	SOLID	<i>Solidago</i>	1–157	–
	goldenbanner	THERM	<i>Thermopsis</i>	1–157	–
	American vetch	VIAM	<i>Vicia americana</i>	1–157	–
4	<b>Native forbs (toxic properties)</b>			1–3	
	larkspur	DELPH	<i>Delphinium</i>	1–3	–
	lupine	LUPIN	<i>Lupinus</i>	1–3	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	1–3	–
<b>Shrub/Vine</b>					
5	<b>Native shrubs</b>			135–314	
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	135–157	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	135–157	–
	American plum	PRAM	<i>Prunus americana</i>	135–157	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	135–157	–
	currant	RIBES	<i>Ribes</i>	135–157	–
	Woods' rose	ROWO	<i>Rosa woodsii</i>	135–157	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	135–157	–
	common snowberry	SYAL	<i>Symphoricarpos albus</i>	135–157	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	135–157	–

## Animal community

### Livestock Grazing Interpretations:

Managed livestock grazing is suitable on this site as it has the potential to produce an abundance of high quality forage. This is often a preferred site for grazing by livestock due to the succulent forage, and animals tend to congregate in these areas. In order to maintain the productivity of this site, stocking rates must be managed carefully on adjoining sites with less production to be sure livestock drift onto the Overflow site is not excessive. Management objectives should include maintenance or improvement of the plant community. Shorter grazing periods and adequate re-growth after grazing are recommended for plant maintenance and recovery. Heavy stocking and season-long use of this site can be detrimental and will alter the plant community composition and production over time.

Grazing this site early when the upper part of the soil may be wet can sometimes cause compaction. Hummocking (frost heaving) is often a common feature of this site. The hummocking can be exacerbated if grazing impact becomes excessive.

Whenever Plant Community 2 (medium and short grasses, invasive forbs, and shrubs) 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 since a good seed source of the taller grasses should still exist.

Plant Communities 3 and 4 have severely reduced forage production, and contain a high percentage of non-



palatable species. Once this site is occupied by these communities, it will be significantly more difficult to restore it to a community that resembles the potential with grazing management alone. Western snowberry and/or Wood's rose often develop dense thickets that are stable and can be very difficult to remove or reduce.

The potential for using seeding and/or mechanical treatment to improve site health may be limited, due mainly because of the landscape position and potential for increased soil erosion from stream flow events.

#### Wildlife Interpretations:

This ecological site is a "hotspot" of biodiversity as a result of extra moisture availability in ephemeral drainage ways. The run-in moisture provides more wildlife habitat complexity because of greater plant species and structural diversity compared to surrounding semi-arid uplands. The linear, meandering drainage pattern common to this site connects a wide variety of upland types and provides secure travel corridors for big game and many other wildlife species as they move between required seasonal habitats. Moisture availability and resulting habitat structural diversity provide for the food, cover and nesting needs of resident and transitory neotropical migratory birds. Invasive plant species are common on this site under non-use as well as season-long livestock and big game grazing. Canada thistle, leafy spurge, houndstongue and burdock are often found here. Prescribed grazing strategies can keep native vegetation more competitive with these invasive weeds. Wildlife habitat diversity is often degraded on this site under season-long grazing strategies because livestock are attracted to the green forage, particularly during the dry season. Seeps and springs common in association with this site provide drinking water for many wildlife species as well as habitat for less common invertebrates, reptiles and amphibians, birds and small mammals.

#### Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs (HCPC):

This moist site supports a variety of grasses and succulent forbs, which provide feeding substrate for numerous pollinating insects and other invertebrates. The insect food source, in combination with available moisture and habitat complexity, supports amphibians and reptiles such as Woodhouse's toad and the common garter snake. Amphibians can be considered

a "keystone species" because of their susceptibility to environmental degradation and resulting indicator value. The combination of tall and medium grasses, forbs and shrub patches provides high value nesting and escape cover for many breeding bird species. Gray catbirds, brown thrashers and spotted towhees rely on chokecherry, silver buffaloberry and rose/snowberry patches. Northern harriers hunt over, and nest within, low shrub and mesic grassland habitats. Sage grouse broods depend on invertebrate foods and succulent forbs available in overflow areas and associated springs and seeps. Sharp-tailed grouse use shrub patches for winter cover and feeding. Habitat complexity extra moisture provide habitat for a variety of small mammals including herbivorous meadow voles and seed-eating western harvest mice. The diversity of grasses, forbs and shrubs supports grazers and mixed feeders such as bison and elk as well as selective feeders such as mule deer and white-tailed deer.

#### Plant Community 2: Medium & Short Grasses/ Invasive Forbs/ Shrubs:

Invertebrate abundance and species diversity declines with the reduction in desirable forbs, which reduces the attractiveness of this site to a variety of insectivorous wildlife species. Amphibian and reptile habitat value declines with the reduction in ground cover and invertebrate diversity. Breeding bird habitat value declines along with plant species diversity and ground cover. Sage grouse still find critical foods in the form of succulent forbs (i.e. dandelion and salsify), and insects. Cover value for small mammals and big game declines with the loss of taller grasses and forbs, although the potential increase in snowberry and rose compensates somewhat. An increase in invasive weeds often simplifies habitat structure even more.

#### Plant Community 3: Shrubs/ Medium & Short Grasses/ Invasive Forbs:

Long-term continuous grazing simplifies the plant community significantly so the site provides fewer wildlife habitat niches as compared to Plant Communities 1 and 2, above. Insect populations are less diverse and productive. Ground level temperature rises and soil moisture levels decrease with loss of litter cover to the detriment of amphibian and reptile populations. Breeding and migratory birds find less cover and food resources; species favoring drier sites may increase although bird species diversity decreases significantly. Sage grouse broods still find some succulent forbs (dandelions, salsify) but sharp-tailed grouse winter habitat is all but eliminated. Small mammal diversity declines and big game species suffer loss of cover, food and travel corridor quality. Springs and seeps may partially dry up as less water is stored in the soil following loss of ground cover.

#### Plant Community 4: Shrubs/ Non-native Short Grasses/ Invasive Forbs:

Wildlife habitat quality is very low in this greatly simplified community characterized by annual grasses, Kentucky bluegrass, dense patches of low shrubs and invasive weeds. Insect populations (grasshoppers) may be abundant in some years but no longer represent a reliable, diverse food resource for insectivorous wildlife. Amphibian habitat quality is very low as the site has dried out significantly. Reptiles are now represented by dry site tolerant species. Bird habitat is suitable for only a handful of species such as horned larks and longspurs. Big game find little cover and food in this potential travel corridor. Small mammal diversity is very low. Deer mice and pocket gophers may be fairly abundant.

## Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group C. The infiltration rates for these soils will generally be moderate. The runoff potential for this site is low. Runoff curve numbers generally range from 64 to 89.

## 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:  $AUM/AC = [(2200-500)(0.25)]/915 \text{ lbs/month for one AU} = 0.46 \text{ AUM/AC}$   
 $AC/AUM = (1.0 \text{ AU})/(0.46 \text{ AUM/AC}) = 2.2 \text{ AC/AUM}$

> 30% slopes:  $AUM/AC = [(2200-800)(0.25)]/915 \text{ lbs/month for one AU} = 0.38 \text{ AUM/AC}$   
 $AC/AUM = (1.0 \text{ AU})/(0.38 \text{ AUM/AC}) = 2.6 \text{ AC/AUM}$

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

Supporting Data for Site Development:

NRCS Production & Composition Record for Native Grazing Lands (Range-417): 3

BLM Soil & Vegetation Inventory Method (SVIM) Data: 5

NRCS Range Condition Record (ECS-2): 10

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

Ecological Site Reference: NRCS 417 No.: Golden Valley County 501

Field Offices where this site occurs within the state:

Big Sandy  
Big Timber  
Billings  
Chinook  
Columbus  
Crow Agency  
Fort Belknap  
Hardin  
Harlowton  
Joliet  
Lewistown  
Malta  
Roundup  
Stanford  
White Sulphur Springs  
Winnett

## Other references

Site Documentation:

Authors: Original: NRCS, 1983

Revised: Matthew J. Ricketts, Robert E. Leiland, Rhonda Sue Noggles, Peter O. Husby, 2003

## Contributors

MJR, REL, RSN, POH  
RSN

## Approval

Kirt Walstad, 6/14/2023

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Loretta Metz
Contact for lead author	
Date	04/10/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** Minor rills (less than 0.5 to 1.0 inches in depth; less than 2.5 feet long) may be present in

the reference state.

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2. **Presence of water flow patterns:** Water flow patterns are generally not evident.

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3. **Number and height of erosional pedestals or terracettes:** These should not be evident in the reference state.

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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 less than 5% in the reference state.

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5. **Number of gullies and erosion associated with gullies:** Gully erosion is not evident in the reference state.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** These are not present in the reference state.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement varies by size and depth of litter. In the reference state, litter should be coarse, anywhere from 1.5 inches up to 4 inches in length, and will not move more than a couple of feet from where it originated.

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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):** Stability values of 4-5 in plant interspaces. Stability values of 5-6 under plant canopies and at plant bases.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Granular structure, brown to dark brown color. Organic matter in A-horizon approximately 3-6%.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Deep-rooted native perennial grasses optimize infiltration and runoff. Grasses should be spaced approximately 0.5-1.0 feet apart in the reference state.

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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 present in the reference state.

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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-height, native perennial bunchgrasses > warm season, mid- and short- height native perennial bunchgrasses >> native shrubs > native forbs.

Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Plant mortality is very low; decadence is minimal except in prolonged periods of drought (>3-4 years).
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14. **Average percent litter cover (%) and depth ( in):**
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2360 – 2780 #/acre.
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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:** western snowberry, Kentucky bluegrass, Canada bluegrass, cheatgrass, Japanese brome, thistle, leafy spurge, etc.
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17. **Perennial plant reproductive capability:** This is not impaired in the reference state. Except in extended periods of drought, plants are able to reproduce sexually or vegetatively.
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