USDA Natural Resources
Conservation Service

Ecological site R046XS116MT
Gravelly (Gr) RRU 46-S 13-19 PZ

Last updated: 7/19/2023
Accessed: 04/29/2024

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.

Associated sites

R046XS104MT	**Silty (Si) RRU 46-S 13-19 PZ**
R046XS114MT	**Shallow (Sw) RRU 46-S 13-19 PZ**

Similar sites

R046XS115MT	**Very Shallow (VSw) RRU 46-S 13-19 PZ** Very Shallow sites typically have a restrictive layer at less than 10 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

This ecological site can occur on outwash fans, hilltops, hills, plains and terrace escarpments. It often occurs in a complex with other ecological sites. This site occurs on all exposures and aspect can sometimes be significant. Variations in plant composition and production can occur due to aspect.

Table 2. Representative physiographic features

Landforms	(1) Outwash fan (2) Hill (3) Plain
Flooding frequency	None
Ponding frequency	None
Slope	0–70%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

See Climatic Data Sheet for more details (Section II of the Field Office Technical Guide) or reference the following climatic web site: http://www.wrcc.sage.dri.edu/ .

Table 3. Representative climatic features

Frost-free period (characteristic range)	49-96 days
Freeze-free period (characteristic range)	105-122 days
Precipitation total (characteristic range)	356-457 mm
Frost-free period (actual range)	47-99 days
Freeze-free period (actual range)	104-125 days
Precipitation total (actual range)	330-457 mm
Frost-free period (average)	76 days
Freeze-free period (average)	114 days
Precipitation total (average)	406 mm

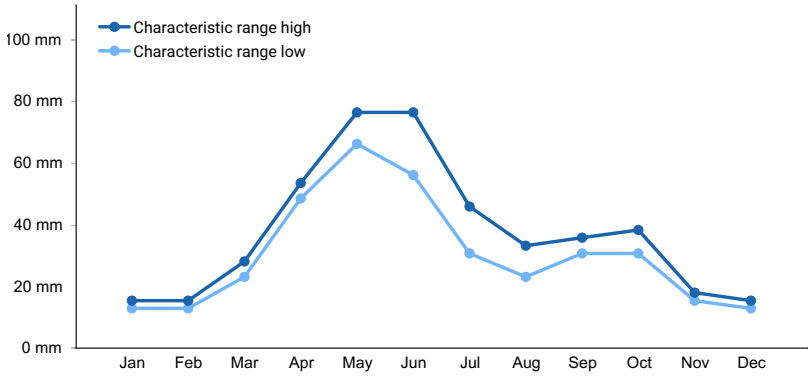


Figure 1. Monthly precipitation range

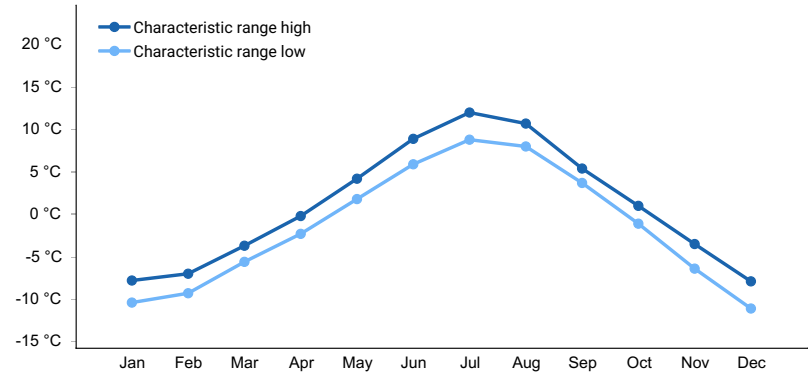


Figure 2. Monthly minimum temperature range

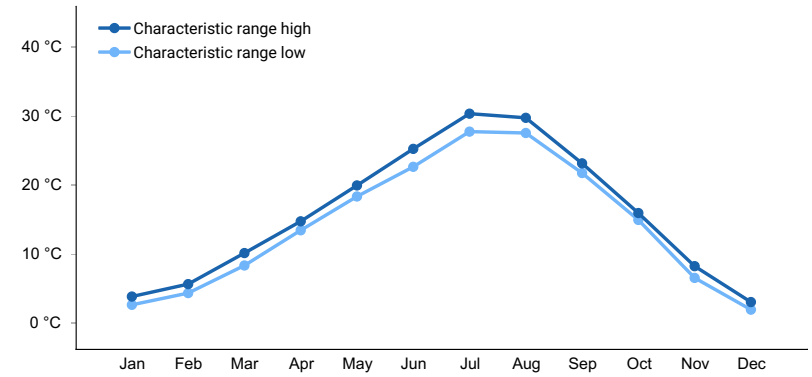


Figure 3. Monthly maximum temperature range

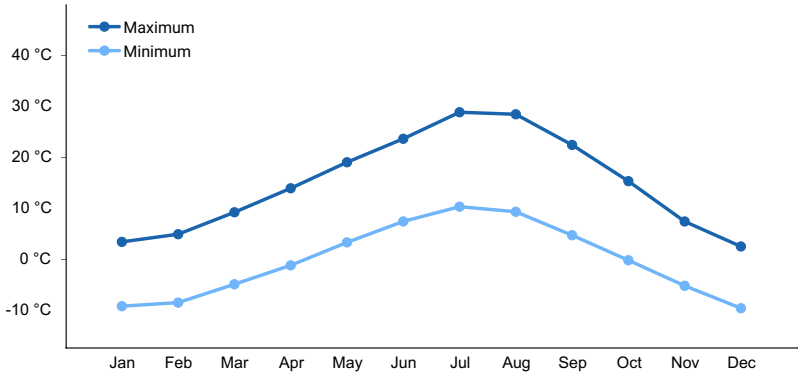


Figure 4. Monthly average minimum and maximum temperature

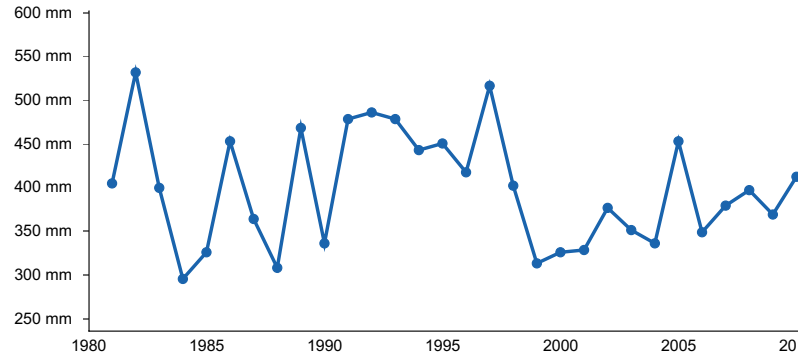


Figure 5. Annual precipitation pattern

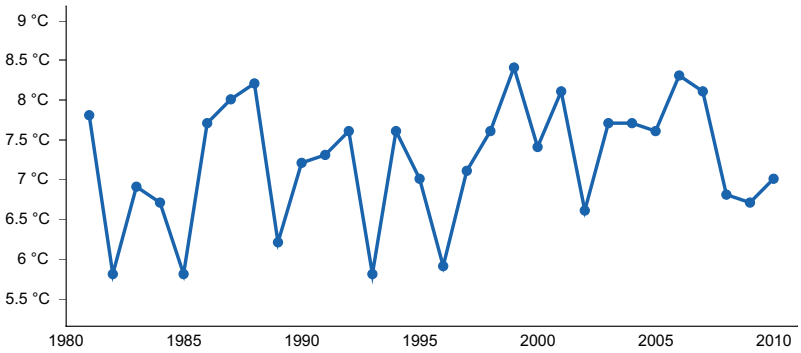


Figure 6. Annual average temperature pattern

Climate stations used

- (1) JOLIET [USC00244506], Joliet, MT
- (2) COLUMBUS [USC00241938], Columbus, MT
- (3) BIG TIMBER [USC00240780], Big Timber, MT
- (4) MELVILLE 4 W [USC00245603], Big Timber, MT
- (5) MARTINSDALE 3 NNW [USC00245387], Martinsdale, MT
- (6) NYE 2 [USC00246190], Fishtail, MT

Influencing water features

No influencing water features.

Soil features

These are moderately deep to very deep droughty soils formed in sand and gravel deposits of glacialfluvial origin. They typically have greater than 15% pebbles and gravels in the upper part of the soil, and 50% or more pebbles, gravels, and cobbles in the lower part, often within 12 inches of the surface.

Table 4. Representative soil features

Surface texture	(1) Gravelly loam (2) Very gravelly sandy loam (3) Extremely gravelly loamy sand
Drainage class	Excessively drained
Permeability class	Moderate to rapid
Soil depth	51 cm
Available water capacity (0-101.6cm)	5.08 cm
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–50%
Subsurface fragment volume >3" (Depth not specified)	5–25%

Ecological dynamics

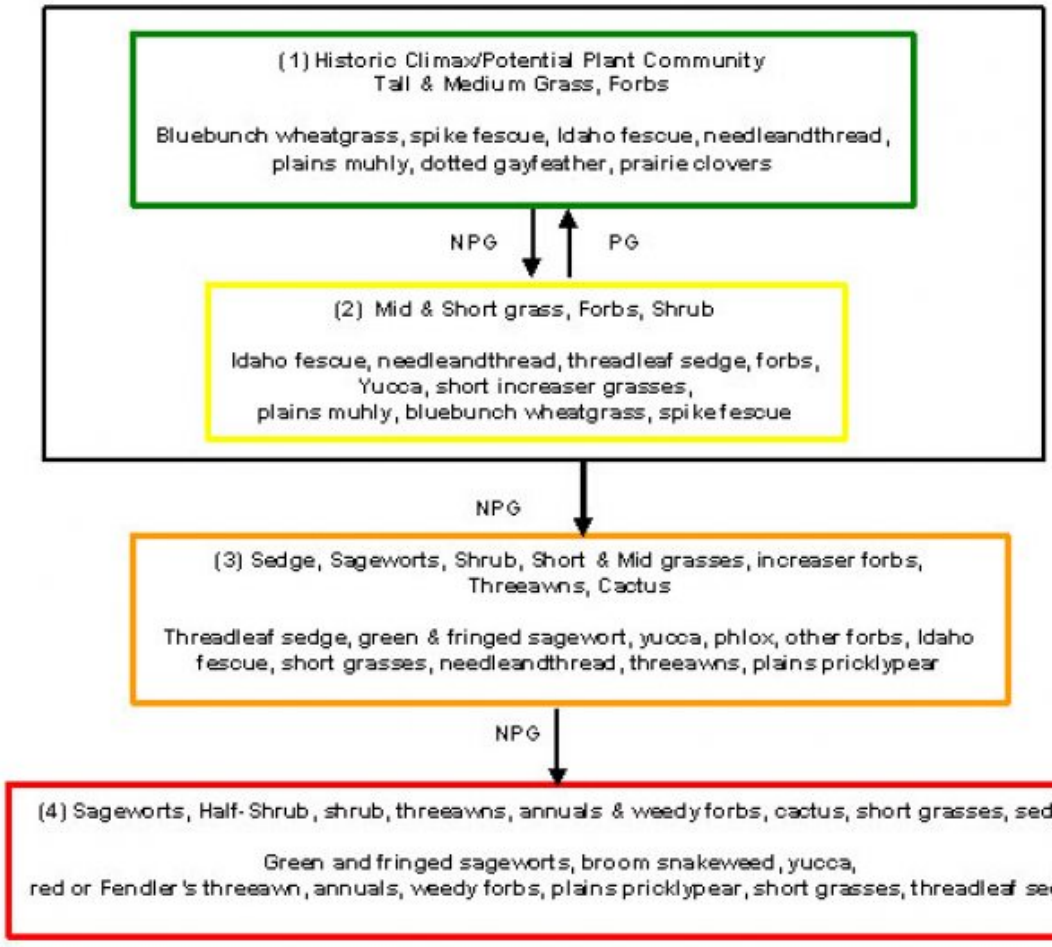
This site developed under Northern Rocky Mountain foothills climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). This community is described 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 moderate to severe soil limitations for plant growth. Changes may occur to the Historic Climax Plant Community due to management actions and/or climatic conditions. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments this site can more readily return to the Historic Climax Plant Community (HCPC).

Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller and more palatable species such as bluebunch wheatgrass, spike fescue, and plains muhly and an increase in Idaho fescue, needleandthread, threadleaf sedge, green sagewort, and yucca.

Plants that are not a part of the climax community that are most likely to invade are annual grasses and forbs and broom snakeweed. Noxious weeds that are likely to invade this site include spotted knapweed, dalmation toadflax, sulphur cinquefoil, and leafy spurge.

State and transition model



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.

Figure 7. State and Transition Model

State 1
Tall and Medium Grasses, Forbs

Community 1.1
Tall and Medium Grasses, Forbs

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. This plant community is dominated by tall and medium cool and warm season grasses (bluebunch wheatgrass, spike fescue, Idaho fescue, needleandthread, and plains muhly). A few forbs such as dotted gayfeather and prairie clover occur in small percentages. Yucca, creeping and Rocky Mountain juniper are the predominant woody plants that occur. Annual production is low on this site due to low available water for plant growth. This plant community is well adapted to the Northern Rocky Mountain foothills climatic conditions. The

diversity in plant species allows for drought tolerance. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation, and temperature). This plant community is well suited to managed livestock grazing and provides diverse habitat for many wildlife species. Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable moisture conditions. This plant community provides for soil stability and a properly functioning hydrologic cycle. 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. The soils associated with this site provide a marginal soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	986	1255	1524
Shrub/Vine	62	118	191
Forb	62	118	191
Total	**1110**	**1491**	**1906**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	15-20%
Forb foliar cover	1-5%
Non-vascular plants	0-1%
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	5-10%
Forb basal cover	1-4%
Non-vascular plants	0-1%
Biological crusts	0%
Litter	30-40%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	30-50%
Bedrock	0%
Water	0%
Bare ground	5-15%

State 2

Medium and Short Grasses, Forbs, Shrub

Community 2.1
Medium and Short Grasses, Forbs, Shrub

Slight variations in the historical climax plant community result in a community dominated by medium and short grasses, with more half-shrubs and shrubs. Species that tend to dominate include needleandthread, with lesser amounts of bluebunch wheatgrass and spike fescue. Threadleaf sedge, green and fringed sagewort, and yucca become more prevalent. Biomass production and litter become reduced on the site with as the taller grasses become replaced by shorter ones, especially the non-native grasses. Evapotranspiration tends to increase, moisture retention is reduced, and soil surface temperatures increase. Some natural ecological processes will be altered. These plant communities provide for moderate soil stability. Increased amounts of bare ground can result in undesirable species invading. Common invaders can include spotted knapweed, dalmation toadflax, sulphur cinquefoil, and leafy spurge. This plant community will readily respond to improved grazing management, but a significant amount of time can be necessary to move it toward a higher successional stage and a more productive plant community similar to community 1.

State 3
Sedge, Sageworts, Shrub, Short and Mid Increaser Grasses, Increaser Forbs, Threeawns, and Cactus

Community 3.1
Sedge, Sageworts, Shrub, Short and Mid Increaser Grasses, Increaser Forbs, Threeawns, and Cactus

With continued heavy disturbance, the site will become dominated by short and medium increaser sedges and grasses such as threadleaf sedge, prairie junegrass, and Idaho fescue, green and fringed sagewort, and increaser forbs such as pussytoes and hairy goldenaster. There may still be remnant amounts of some of the late-seral species such as bluebunch wheatgrass and spike fescue present. The taller grasses will occur only occasionally. Palatable forbs will be mostly absent. Undesirable species such as Fendler’s or red threeawn, plains pricklypear cactus and broom snakeweed may become common. Annuals and weedy species may begin to be apparent. This plant community is the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing. Repeated spring grazing depletes stored carbohydrates, resulting in weakening and eventual death of the cool season tall and medium grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. This community will respond positively to improved grazing management, but significant economic inputs along with a significant amount of time and extended rest are usually required to move it toward a higher successional stage and a more productive plant community. Using seeding and/or mechanical treatments on this site due to the shallow soils.

State 4
Sageworts, Half Shrub, Shrub, Threeawns, Cactus, Annuals and Weedy Species, Short Grasses

Community 4.1
Sageworts, Half Shrub, Shrub, Threeawns, Cactus, Annuals and Weedy Species, Short Grasses

Further deterioration of community 3 results in a plant community dominated by undesirable plants such as green and fringed sagewort, broom snakeweed, yucca, plains pricklypear cactus, weedy forbs (e.g., pussytoes and hairy goldenaster), annuals such as cheatgrass and Japanese bromes, and threeawns. Many increaser sedges and short grasses such as threadleaf sedge and prairie junegrass will be abundant. Most of the climax species such as bluebunch wheatgrass will be gone. Plant community 4 produces less usable forage for wildlife and livestock than the others described. The continuation of the downward trend and degradation of this site has resulted in higher soil surface temperatures, reduced water infiltration, and higher evapotranspiration. This has resulted in plant species that are more adapted to drier conditions, including cactus. Most of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy flow, have been lost. Community 4 can respond positively to improved grazing management but it will take several years along with significant additional

inputs and extended rest to move it towards communities similar in production and composition to others that have been described. The feasibility and potential for using seeding or mechanical treatment to improve site health is extremely limited due to the gravel content and droughtiness of the soil, as well as landscape features.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Shrubs and Half-shrubs**			62–191	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–95	–
	silver sagebrush	ARCAV2	*Artemisia cana ssp. viscidula*	0–95	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–95	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–95	–
	Woods' rose	ROWO	*Rosa woodsii*	0–95	–
	common snowberry	SYAL	*Symphoricarpos albus*	0–95	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
Grass/Grasslike					
0	**Grasses and Sedges**			986–1524	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	493–1334	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–286	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	62–191	–
	spike fescue	LEKI2	*Leucopoa kingii*	0–191	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–191	–
	Sandberg bluegrass	POSE	*Poa secunda*	62–95	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	62–95	–
	Grass, perennial	2GP	*Grass, perennial*	0–95	–
	needleleaf sedge	CADU6	*Carex duriuscula*	62–95	–
	threadleaf sedge	CAFI	*Carex filifolia*	62–95	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	62–95	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–48	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–48	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0–1	–
Forb					
0	**Forbs**			62–191	
	Forb, perennial	2FP	*Forb, perennial*	0–95	–
	common yarrow	ACMI2	*Achillea millefolium*	0–95	–
	pussytoes	ANTEN	*Antennaria*	0–95	–
	hairy false goldenaster	HEVIF	*Heterotheca villosa var. foliosa*	0–95	–
	bitter root	LERE7	*Lewisia rediviva*	0–95	–
	dotted blazing star	LIPU	*Liatris punctata*	12–95	–
	desertparsley	LOMAT	*Lomatium*	0–95	–
	lupine	LUPIN	*Lupinus*	0–1	–
	deathcamas	ZIGAD	*Zigadenus*	0–1	–
	larkspur	DELPH	*Delphinium*	0–1	–

Animal community

Managed livestock grazing is suitable on this site as it has the potential to produce a limited amount of high quality forage. Grazing must be managed carefully on this site to be sure livestock drift onto the better, more productive sites is not excessive. Management objectives should include maintenance or improvement of the plant community.

Using shorter grazing periods and providing for adequate re-growth after grazing are recommended for plant maintenance, health, and recovery. Continual non prescribed grazing of this site can be detrimental and will alter the plant composition and production over time. The result will be plant communities that resemble numbers 3 and 4, depending on how long this grazing management is used as well as other circumstances such as weather conditions and fire frequency.

Whenever Plant Community 2 (medium and short grasses) occurs, grazing management strategies that will prevent further degradation need to be implemented. This community is still stable, productive, and healthy provided it receives proper management. It will respond fairly quickly to improved grazing management, including increased growing season rest of key forage plants. Grazing management alone can usually move this back towards the potential / historic climax community.

Plant community 3 is the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing. Repeated heavy early spring grazing, especially during stem elongation (generally mid May through mid June), can also have detrimental affects on the taller, key forage species. Repeated spring grazing depletes stored carbohydrates, resulting in weakening and eventual death of the cool season tall and medium grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur.

It becomes critical at this point to implement a grazing strategy that will restore the stability and health of the site. Rest, usually for a number of years, can sometimes help with re-establishment of the desired species, depending on the amount of desirable species remaining.

Plant Community 4 has a high percentage of aggressive, less-desirable species. It has lost most of the attributes of a healthy rangeland. Grazing management alone is seldom able to restore the site to one that resembles the HCPC once this plant community has become established. There are limitations to using seeding and/or mechanical treatment on this site due to the droughty soils and often hilly landscape.

Calculating Safe Stocking Rates: Proper stocking rates should be incorporated into a grazing management strategy that protects the resource, maintains or improves rangeland health, and is consistent with management objectives. Safe stocking rates will be based on useable forage production, and should consider ecological condition and trend of the site, and past grazing use history.

Calculations used to determine a safe stocking rate are based on the amount of useable forage available, taking into account the harvest efficiency of the animal and the grazing strategy to be implemented. Average annual production must be measured or estimated to properly assess useable forage production and stocking rates.

Stocking rates are calculated from average forage production values using a 25% Harvest Efficiency factor for preferred and desirable plants, and 10% Harvest Efficiency for less desirable species. AUM calculations are based on 915 pounds (air-dry) per animal unit month (AUM) for a 1,000-pound cow with calf up to 4 months. No adjustments have been made for site grazability factors, such as steep slopes, site inaccessibility, or distance to drinking water.

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 AU! M/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).

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group A. The infiltration rates for these soils will normally be rapid to very rapid. The runoff potential for this site is low, depending on slope and ground cover/health. Runoff curve numbers generally range from 49 to 79.

For arid and semi-arid rangelands, good hydrologic conditions exist if 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%.

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.

Sites in low similarity (Plant Communities 3 and 4) are generally considered to be in less than good hydrologic condition. Sites in low similarity may have a high percentage of cover, but from shallow rooted species (e.g., threadleaf sedge). The deep root systems of the potential vegetation will help maintain or increase infiltration rates and reduce runoff. (Reference: Engineering Field Manual, Chapter 2 and Montana Supplement 4).

Recreational uses

This site provides some recreational opportunities for hiking,
horseback riding, big game and upland bird hunting. The forbs have flowers that appeal to photographers.
This site provides valuable open space and visual aesthetics.

Wood products

None

Contributors

Matt Ricketts
Robert L. Ross
Robert Leinard; Barbara Gibbons; Loretta Metz; Peter Husby, Matt Ricketts, Jon Siddoway

Approval

Kirt Walstad, 7/19/2023

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)	G. Petersen
Contact for lead author	grant.petersen@usda.gov
Date	03/01/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not present in the reference condition.

2. **Presence of water flow patterns:** Water flow patterns are not present in the reference condition.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are typically not evident in the reference condition. If present, they will be on slopes greater than 25% and associated with waterflow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 10-20%.

5. **Number of gullies and erosion associated with gullies:** Gullies are not present in the reference condition.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scoured, or depositional areas are not evident in the reference condition.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is infrequent across gentle slopes.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** The average soil stability rating is 4-5 under plant canopies and 3-5 plant interspaces. The A horizon is 2-6” inches thick.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil Structure at the surface is typically strong to medium fine granular. A Horizon should be 2-6 inches thick with color, when wet, typically ranging in Value of 4 or less and Chroma of 3 or less.

   Local geology may affect color, it is important to reference the Official Series Description (OSD) for characteristic range. https://soilseries.sc.egov.usda.gov/osdname.aspx

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration of the Shallow to Gravel ecological site is high and the site is well drained. An even distribution of mid stature grasses, 70-80% of site production, cool season shortgrasses (10-15%) of site production along with a mix of rhizomatous grasses (5-15%), forbs (5-10%) and shrubs (5-10%).

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** A compaction layer is not present in the reference condition.

---

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: Mid-statured, cool season, perennial bunchgrasses (Primarily bluebunch wheatgrass)

    Sub-dominant: Shortgrass grasses & Grasslikes (Idaho fescue, needle and thread) ≥ Rhizomatous grass > Forbs ≥ Shrubs

    Other:

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers is 3% or less.

---

14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 30 to 40 percent of very thin depth.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production is 1330. Low: 990 High 1700. Production varies based on effective precipitation and natural variability of soil properties for this ecological site.

---

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:** Potential invasive (including noxious) species (native and non-native). Invasive species on this

ecological site include (but not limited to) smooth brome, sulphur cinquefoil, dandelion, annual bromes, spotted knapweed, salsify, leafy spurge, ventenata, etc.
Native species such as Rocky Mountain juniper, Limber pine, ponderosa pine, Douglas fir, creeping juniper, dense clubmoss, lupine, broom snakeweed, Sandberg bluegrass, etc. when their populations are significant enough to affect ecological function, indicate site condition departure.

---

17. **Perennial plant reproductive capability:** In the reference condition, all plants are vigorous enough for reproduction either by seed or rhizomes in order to balance natural mortality with species recruitment.
