Ecological site R046XN261MT
Very Shallow (VSw) RRU 46-N 15-19 PZ

Last updated: 7/19/2023
Accessed: 05/17/2024

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

R046XN250MT	**Shallow (Sw) RRU 46-N 13-19 PZ**
R046XN252MT	**Silty (Si) RRU 46-N 13-19 PZ**
R046XN589MT	**Shallow Clay (SwC) RRU 46-N 13-16 PZ**
R046XN594MT	**Silty Steep (SiStp) RRU 46-N 13-19 PZ**

Similar sites

R046XN250MT	**Shallow (Sw) RRU 46-N 13-19 PZ** The Shallow site differs by having a deeper soil profile over the root restricting layer, and having significantly more production.
R046XN601MT	**Gravelly (Gr) RRU 46-N 13-19 PZ** The Gravel site differs mainly in depth or texture.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Festuca campestris*

Physiographic features

This ecological site can occur on most upland positions including ridgetops, escarpments and shoulders of hills. It often occurs in complex with other ecological sites. This site occurs on slopes ranging from nearly level to very steep. It occurs on all exposures, and aspect sometimes becomes significant on steeper slopes. Variations in plant community composition and production can result due to aspect. Outcroppings of bedrock are characteristic and the amount tends to increase as slopes increase.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Hill
Flooding frequency	None
Ponding frequency	None
Slope	2–70%
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)	57-84 days
Freeze-free period (characteristic range)	109-120 days
Precipitation total (characteristic range)	381-432 mm
Frost-free period (actual range)	37-90 days
Freeze-free period (actual range)	101-122 days
Precipitation total (actual range)	356-432 mm
Frost-free period (average)	69 days
Freeze-free period (average)	114 days
Precipitation total (average)	406 mm

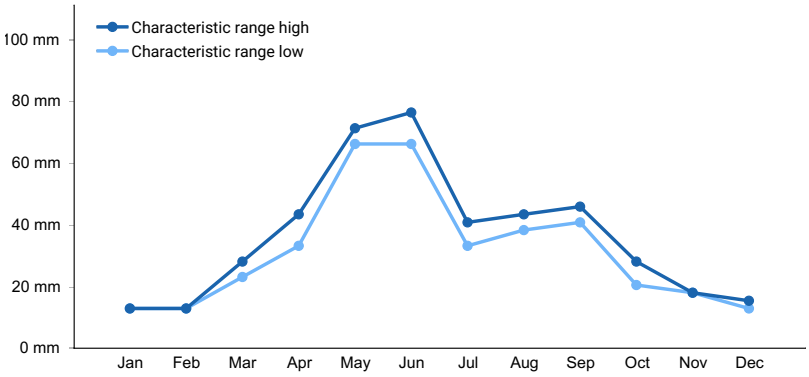


Figure 1. Monthly precipitation range

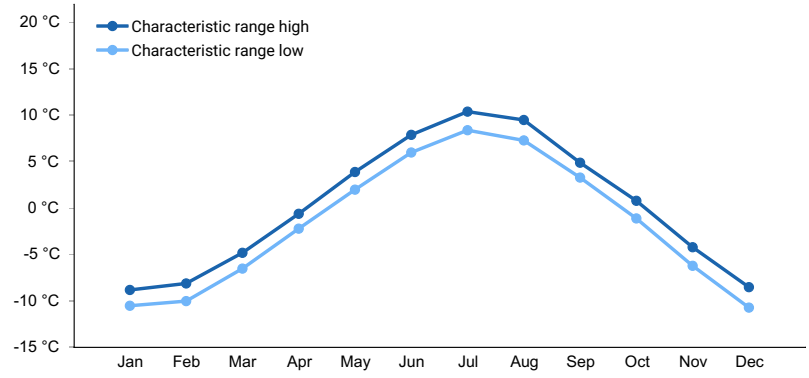


Figure 2. Monthly minimum temperature range

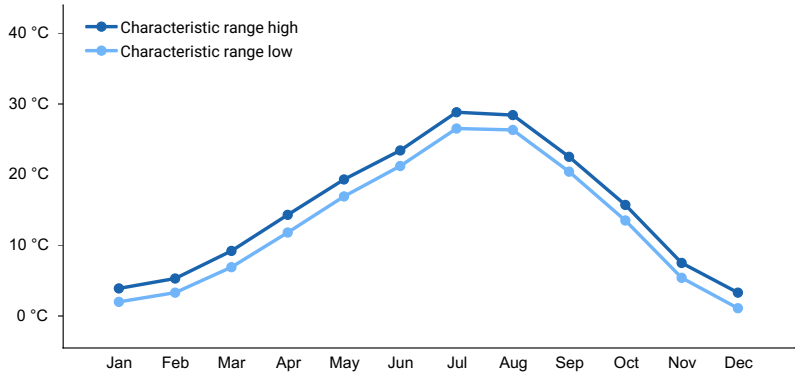


Figure 3. Monthly maximum temperature range

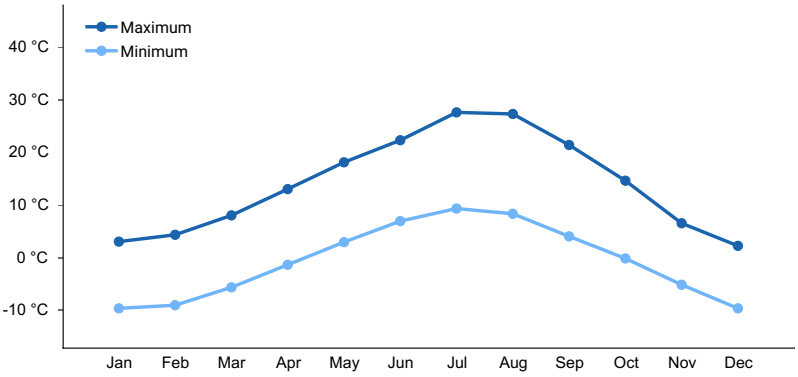


Figure 4. Monthly average minimum and maximum temperature

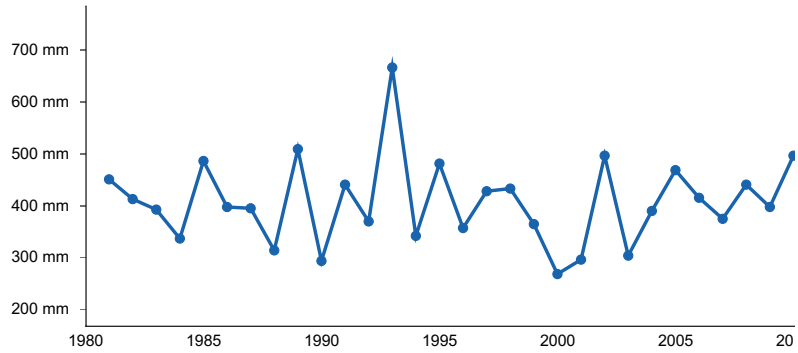


Figure 5. Annual precipitation pattern

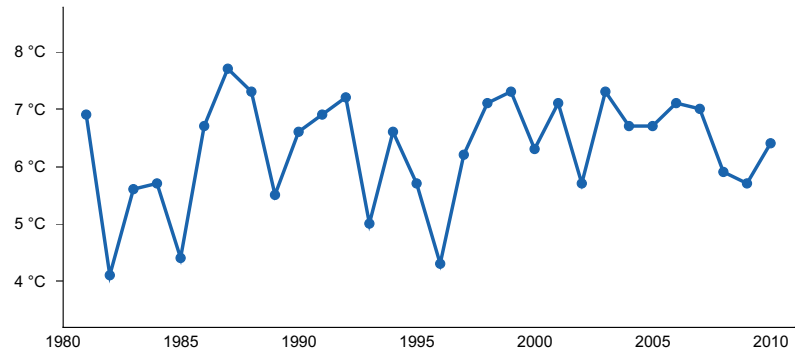


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BABB 6 NE [USC00240392], Babb, MT
- (2) AUGUSTA [USC00240364], Augusta, MT
- (3) CASCADE 5 S [USC00241552], Cascade, MT

- (4) ROGERS PASS 9 NNE [USC00247159], Wolf Creek, MT

Influencing water features

No influencing water features.

Soil features

These soils are typically less than 10 inches deep to hard rock or soft beds of decomposed siltstone, sandstone, or shale. They form on alluvium, residuum, or colluvium. Soils that characterize this ecological site can include deep fragmental soils. Few roots penetrate deeper than 10 inches. Surface textures are variable. Cracks in the bedrock may allow deeper root penetration and have taller grasses, shrubs, or stunted trees. These soils are very droughty, having a total water holding capacity of 2 inches or less.

Table 4. Representative soil features

Surface texture	(1) Channery loam (2) Very channery sandy loam (3) Gravelly silt loam
Drainage class	Excessively drained
Permeability class	Moderate to rapid
Soil depth	25 cm
Surface fragment cover <=3"	0–3%
Surface fragment cover >3"	0–1%
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)	15–70%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

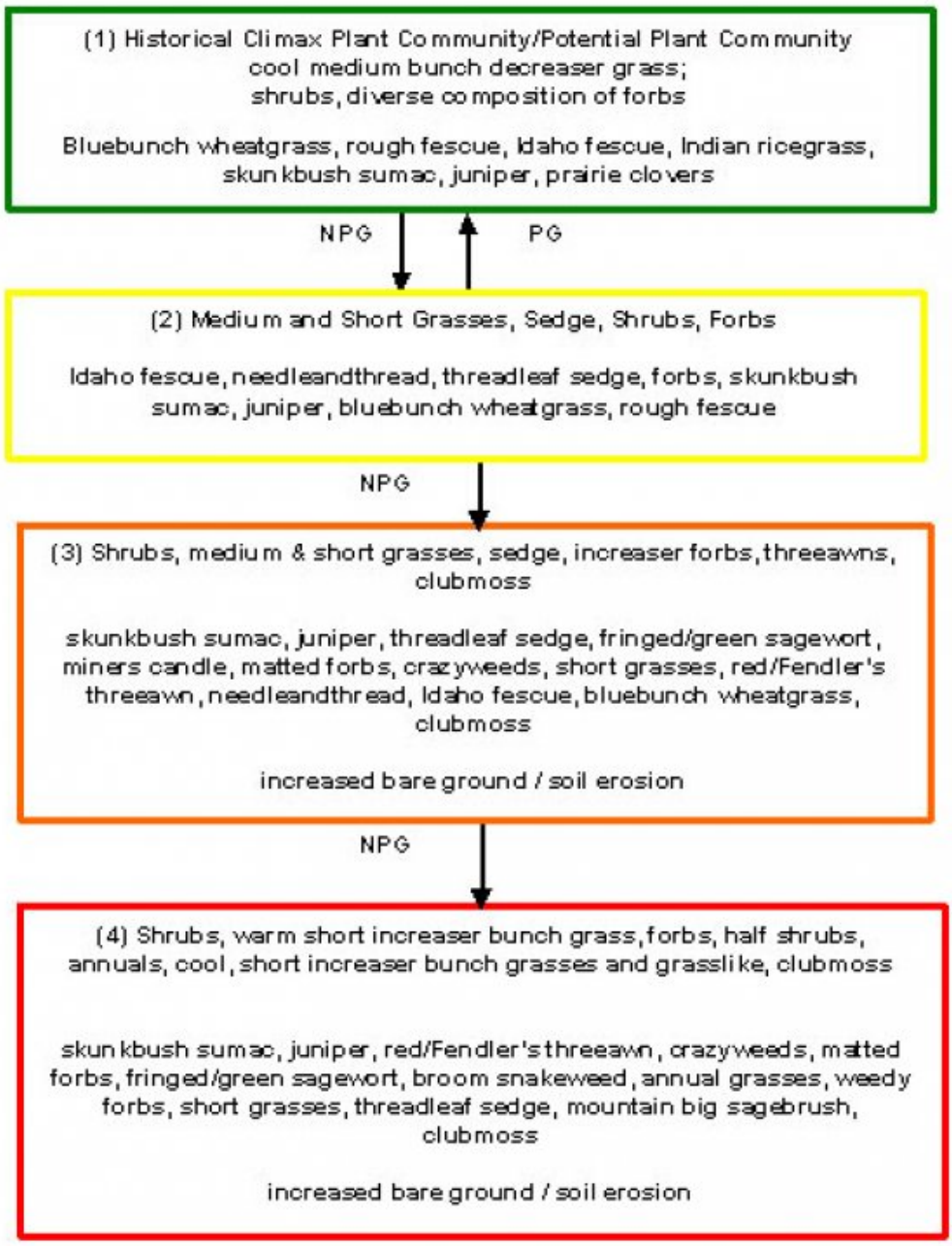
This site developed under Northern Rocky Mountain foothills climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). This community is described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

Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller, more palatable species such as rough fescue, bluebunch wheatgrass, Indian ricegrass, and plains muhly, and an increase in Idaho fescue, sedges, needleandthread, forbs, creeping juniper, and green sagewort.

Plants that are not a part of the climax community that are most likely to invade are annual grasses and forbs. Noxious weeds that are likely to invade are 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 Bunchgrasses, Shrubs, Forbs

Community 1.1
Tall Bunchgrasses, Shrubs, Forbs

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 and grasslikes (bluebunch wheatgrass, rough fescue, Idaho fescue, and Indian ricegrass), and short grasses and sedges (Sandberg bluegrass, prairie junegrass, threadleaf and needleleaf sedge). There are abundant forbs (prairie clovers) which occur in smaller percentages. Shrubs such as skunkbush sumac and creeping juniper can also be common 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 favorable 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	664	764	850
Forb	45	102	170
Shrub/Vine	45	76	113
Total	**754**	**942**	**1133**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-25%
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	10-15%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	10-15%
Bedrock	0%
Water	0%
Bare ground	40-50%

State 2
Medium and Short Grasses, Sedge, Forbs, Shrubs

Community 2.1
Medium and Short Grasses, Sedge, Forbs, Shrubs

Early stages of degradation, including non-prescribed grazing, will tend to change the HCPC to a community dominated by medium and short grasses and sedges such as Idaho fescue, needleandthread (mainly 15 inches MAP or less), prairie junegrass, Sandberg bluegrass, plains reedgrass, and threadleaf sedge. Shrubs such as skunkbush sumac and creeping juniper will tend to be more abundant. Most of the taller, more palatable grasses (bluebunch wheatgrass, rough fescue, Indian ricegrass) will still be present but in smaller amounts. Palatable and nutritious forbs will be replaced by less desirable and more aggressive species. Biomass production and litter become slightly reduced on the site with Community 2, as the taller grasses become replaced by shorter ones. Evapotranspiration tends to increase, moisture retention is reduced, and soil surface temperatures increase. Some natural ecological processes will be altered. This plant community provides for moderate soil stability. Increased amounts of bare ground can result in undesirable species invading. Common invaders can include spotted knapweed, leafy spurge, dalmation toadflax, and sulphur cinquefoil. 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
Shrubs, medium & short grasses, sedge, increaser forbs, threeawns, clubmoss

Community 3.1
Shrubs, medium & short grasses, sedge, increaser forbs, threeawns, clubmoss

Should the heavy disturbance continue, the site will become dominated by species such as skunkbush sumac, creeping juniper, threadleaf sedge, fringed or green sagewort, short grasses such as prairie junegrass and Sandberg bluegrass, Idaho fescue, needleandthread, and increaser forbs such as miner’s candle, and crazyweeds. There may still be remnant amounts of some of the late-seral species such as bluebunch wheatgrass and Indian ricegrass present. The taller grasses will occur only occasionally, often within creeping juniper plants. Palatable forbs will be mostly absent. Dense clubmoss will begin to be abundant on soils having either loamy, silty, or sandy textures. There is often an increase in the amount of bare ground that can result in significant loss of the very limited amount of topsoil that’s present. Plant community 3 is usually less productive than 1 or 2. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evapotranspiration rates, 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. 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 and a signinicant amount of time are usually required to move this plant community toward a higher successional stage and a more productive plant community.

State 4
Shrubs, Threeawns, Forbs, Half shrubs, Annuals, Short Grasses and, clubmoss

Community 4.1
Shrubs, Threeawns, Forbs, Half shrubs, Annuals, Short Grasses and, clubmoss

Further deterioration of community 3 results in a plant community dominated by the shrubs skunkbush sumac and creeping juniper (especially in the northern part of this MLRU) and undesirable plants such as red threeawn, fringed sagewort, broom snakeweed, weedy forbs (e.g., pussytoes and thistles), annuals such as cheatgrass and Japanese bromes, threadleaf sedge, and yucca. Dense clubmoss will be common and abundant on medium to lighter textured soils. Many increaser short grasses such as prairie junegrass, plains reedgrass, and Sandberg bluegrass will be abundant. Frequently, a remnant population of climax species such as bluebunch wheatgrass will occur within the creeping juniper. Plains prickly pear cactus may also become common. The increase in the amount of bare ground may continue, resulting in significant loss of the very limited amount of topsoil that's present, leaving a surface similar to "desert pavement". Plant community 4 produces less usable forage 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, such as blue grama and cactus. The thick canopy cover of creeping juniper often results in precipitation being intercepted, thus not reaching the soil. Most of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy flow, have been lost. This community can respond positively to improved grazing management but it will take additional inputs and a significant amount of time to move it towards communities similar in production and composition to the others that have been described. However, because of the very shallow soils (and sometimes, steeper slopes) associated with this ecological site, practices such as mechanical treatment or seeding are generally not feasible nor recommended.

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**			45–113	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–56	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–56	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–56	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–56	–
	soapweed yucca	YUGL	*Yucca glauca*	0–56	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–1	–
Grass/Grasslike					
0	**Grasses and Sedges**			664–850	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	443–792	–
	rough fescue	FECA4	*Festuca campestris*	45–340	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–170	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–113	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–113	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–56	–
	Sandberg bluegrass	POSE	*Poa secunda*	45–56	–
	Grass, perennial	2GP	*Grass, perennial*	0–56	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	45–56	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–56	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–56	

	needleleaf sedge	CADU6	*Carex duriuscula*	0–56	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–56	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	45–56	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	0–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–28	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0–1	–
Forb					
0	**Forbs**			45–170	
	Forb, perennial	2FP	*Forb, perennial*	0–56	–
	pussytoes	ANTEN	*Antennaria*	0–56	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–56	–
	Hooker's sandwort	ARHO4	*Arenaria hookeri*	0–56	–
	aster	ASTER	*Aster*	0–56	–
	miner's candle	CRVI4	*Cryptantha virgata*	0–56	–
	prairie clover	DALEA	*Dalea*	9–56	–
	buckwheat	ERIOG	*Eriogonum*	0–56	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–56	–
	hymenaea	HYMEN	*Hymenaea*	0–56	–
	bitter root	LERE7	*Lewisia rediviva*	0–56	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–56	–
	beardtongue	PENST	*Penstemon*	0–56	–
	spiny phlox	PHHO	*Phlox hoodii*	0–56	–
	scurfpea	PSORA2	*Psoralidium*	0–56	–
	goldenweed	PYRRO	*Pyrrocoma*	0–56	–
	stonecrop	SEDUM	*Sedum*	0–56	–
	locoweed	OXYTR	*Oxytropis*	0–1	–
	larkspur	DELPH	*Delphinium*	0–1	–

Animal community

Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce a very 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. 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.

Using shorter grazing periods and providing for adequate re-growth after grazing are recommended for plant maintenance, health, and recovery. Continual over stocking and season-long use 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. 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.

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 Communities 3 and 4 have a high percentage of aggressive, less-desirable species. Once these have become established, it is significantly more difficult using grazing management alone to restore the site to one that resembles the HCPC. It becomes critical at this point to implement a grazing strategy that will restore the stability and health of the site. Additional growing season rest, or rest for an entire year(s) is often the only alternative for re-establishment of the desired species, and restoration of the stability and health of this site.

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 are highly variable, requiring an on-site evaluation. The runoff potential for this site is low to moderate, depending on slope and ground cover/health. Runoff curve numbers generally range from 54 to 73.

The hydrologic condition of this site has a significant affect on runoff. The hydrologic condition considers the effects

of cover, including litter, and management on infiltration. Good hydrologic condition indicates that the site usually has a lower runoff potential.

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.

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.

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%. (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. Caution should be used during wet weather periods.

Wood products

None.

Contributors

Robert Leinard; Barbara Gibbons; Loretta Metz; Peter Husby

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)	J Siddoway, R. Bandy, G. Petersen
Contact for lead author	grant.petersen@usda.gov
Date	04/19/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slopes most common on this site are between 0–45% and with only 70% of the soil surface covered, rills will occur in bare areas after moderate to extreme convection storms – rills in this case could potentially be

rather numerous and greater than 10 feet in length.

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2. **Presence of water flow patterns:** Will be evident on this site with the steeper slopes, and with areas of bare ground, there may be areas which show accumulations of litter due to water movement, even after minor storm events.

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3. **Number and height of erosional pedestals or terracettes:** Wind erosion will be rare on this site, but water erosion on the steeper slopes may have plants that could have pedestals and terracettes which could be 0.5 inch in height at the top of the slope and 1.0 inch towards the bottom of the slope.

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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 will be approximately 30% on this site.

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5. **Number of gullies and erosion associated with gullies:** Current gully erosion will not be evident on this site, but there may be gullies which have “healed” from the distant past.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Appearance or evidence of these erosional features or the landscape would be rare on this site.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement will be minimal on the gradual slopes, however on the steeper slopes there will be evidence of litter movement (i.e. debris dams) which may travel greater than 10 feet on steeper slopes.

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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):** Resistance to erosion will be less than other ecological sites due to more bare ground. Areas within the site that are covered may have soil stability values of 4 to 5; areas of bare soil on this site may have values less than 3 if not under plant canopy.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is blocky; A horizon depth is 1 – 2”.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Dominance of taller, deep rooted bunchgrasses will maximize infiltration and minimize runoff on most of the site, but areas with bare soil will have a higher potential for runoff and poorer infiltration rates.

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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):** Will not be present generally, but there may be areas that have “healed” from former bison trails and wallows as well as more current livestock trails which could have a compaction layer below the

soil surface.

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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, taller grasses (bluebunch wheatgrass)

    Sub-dominant: shrubs > cool season mid-grasses (Idaho fescue, needle and thread) = perennial forbs > cool season rhizomatous grasses (thickspike wheatgrass) = cool season short grasses (Sandberg bluegrass) = warm season bunchgrass (plains muhly)

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Will be low for all functional groups in a given year. Prolonged droughts which last more than 3 years may show increases in mortality and decadence for all plant groups.

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14. **Average percent litter cover (%) and depth (in):** Thin cover of litter is expected to be around 30 to 35%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 800 - 1000 #/acre. This would be the expected production for the reference state during adequate moisture years. 950 pounds would be the expected production in a 17 inch precipitation 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:** Dense clubmoss, skunkbush sumac, blue grama, Rocky Mountain juniper, red threeawn, field brome, a variety of annual or biennial weedy forbs, fringed/green sagewort, broom snakeweed, mountain big sagebrush, cheatgrass.

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17. **Perennial plant reproductive capability:** During adequate moisture years bunchgrasses will generally produce seeds, however the cool season rhizomatous grasses may not necessarily produce seed even with adequate moisture.
