USDA Natural Resources
Conservation Service

Ecological site R046XN264MT
Thin Breaks (TB) RRU 46-N 13-19 PZ

Last updated: 7/19/2023
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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**
R046XN261MT	**Very Shallow (VSw) RRU 46-N 15-19 PZ**
R046XN589MT	**Shallow Clay (SwC) RRU 46-N 13-16 PZ**
R046XN594MT	**Silty Steep (SiStp) RRU 46-N 13-19 PZ**

Table 1. Dominant plant species

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

Physiographic features

This site is typically a complex of several ecological sites, primarily Shallow and Very Shallow with some other included sites such as Silty-Steep. It occurs on steep to very steep breaks, escarpments, bluffs, or ridges, usually in excess of 25 percent. Outcroppings of hard bedrock and soft sedimentary beds are major features.

Table 2. Representative physiographic features

Landforms	(1) Escarpment (2) Bluff (3) Ridge
Slope	25%
Water table depth	60 in
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)	15-17 in

Frost-free period (actual range)	37-90 days
Freeze-free period (actual range)	101-122 days
Precipitation total (actual range)	14-17 in
Frost-free period (average)	69 days
Freeze-free period (average)	114 days
Precipitation total (average)	16 in

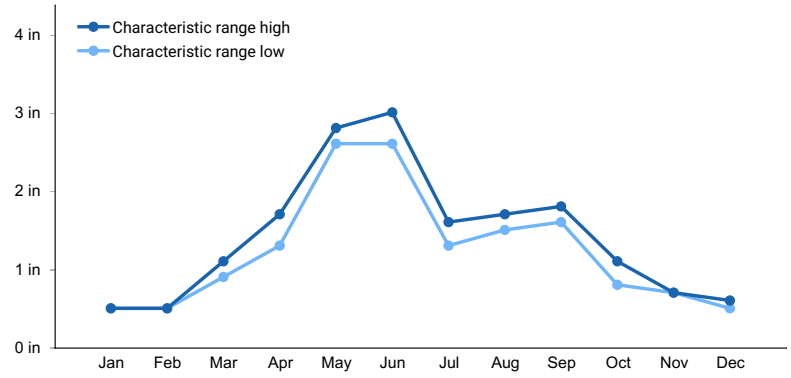

Figure 1. Monthly precipitation range

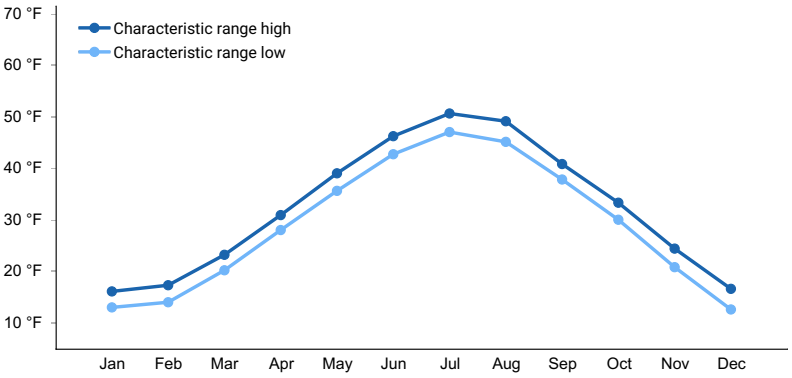

Figure 2. Monthly minimum temperature range

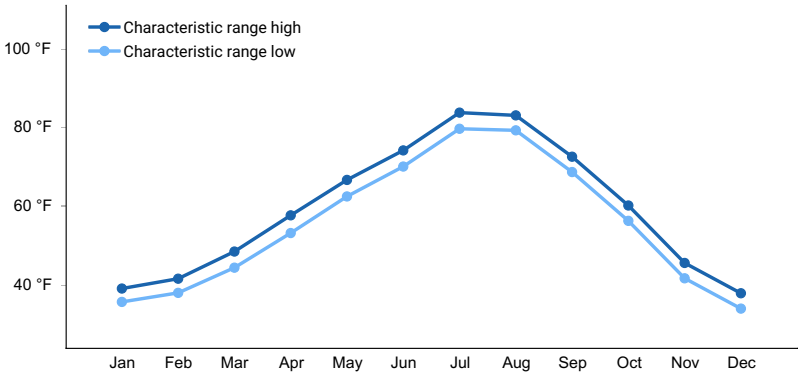

Figure 3. Monthly maximum temperature range

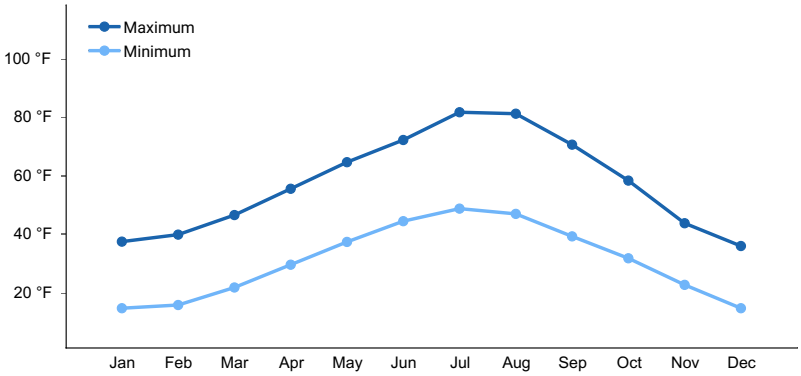

Figure 4. Monthly average minimum and maximum temperature

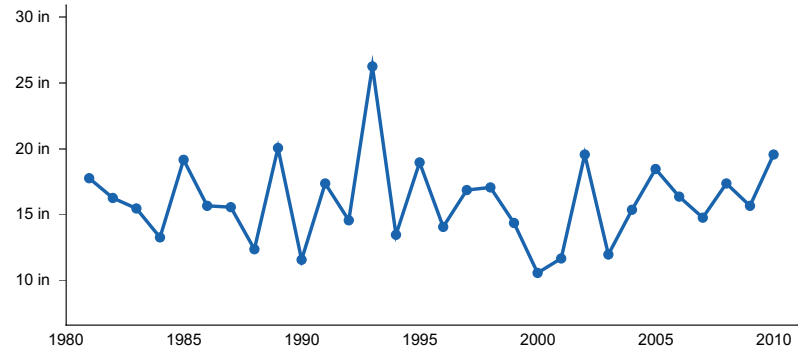

Figure 5. Annual precipitation pattern

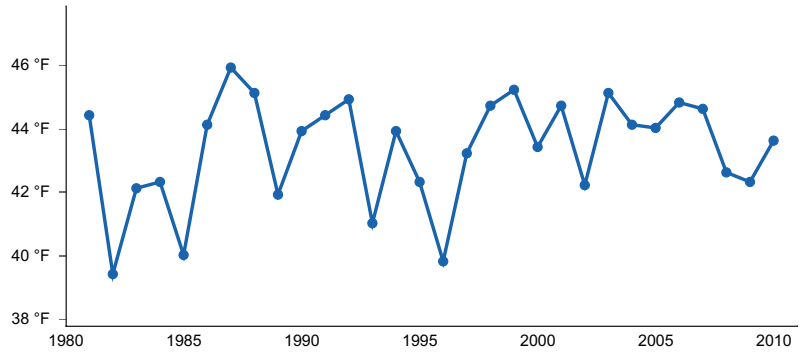

Figure 6. Annual average temperature pattern

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

The soils associated with this ecological site are highly variable. They will range from very shallow to deep, depending on landform and presence of ledges, etc. where pockets of deeper soils can accumulate. They form on residuum or colluvium on mixed, mainly sandstone and sedimentary beds. More detailed and specific information is available by using the ecological site description for the component of this site being investigated (e.g., Shallow).

Table 4. Representative soil features

Surface texture	(1) Gravelly sand (2) Flaggy loam (3) Stony
Drainage class	Well drained to excessively drained
Soil depth	40 in
Available water capacity (0-40in)	5 in
Soil reaction (1:1 water) (0-40in)	6.6–8.4

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 bluebunch wheatgrass, prairie sandreed, Indian ricegrass, and plains muhly and an increase in Idaho fescue, sedges, needleandthread, forbs, junipers, and skunkbush sumac. Some of the shrubs (skunkbush sumac) can also be adversely impacted by heavy use, including wildlife. Continued deterioration results in increased amounts of fringed sagewort, various increaser forbs, and clubmoss.

Plants that are not a part of the climax community that are most likely to invade are threeawns, broom snakeweed, 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 and Medium Grasses, Shrubs, Forbs

Community 1.1

Tall and Medium Grasses, Shrubs, Forbs

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. It contains a high diversity of tall grasses (bluebunch wheatgrass, prairie sandreed, Indian ricegrass, and plains muhly), short grasses and sedges (Idaho fescue, threadleaf sedge, prairie junegrass, plains reedgrass, and sand dropseed), and shrubs (skunkbush sumac, and junipers). There are also abundant forbs which occur in small percentages. Ponderosa pine or limber pine trees are often a component of this plant community. Douglas fir can also occur on more favorable sites. 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 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 limited soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	475	630	785
Shrub/Vine	75	193	365
Forb	35	48	60
Total	**585**	**871**	**1210**

Table 6. Ground cover

Tree foliar cover	0-10%
Shrub/vine/liana foliar cover	5-20%
Grass/grasslike foliar cover	20-50%
Forb foliar cover	5-10%
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	0-1%
Shrub/vine/liana basal cover	1-3%
Grass/grasslike basal cover	3-8%
Forb basal cover	0-1%
Non-vascular plants	0-3%
Biological crusts	0%
Litter	30-60%
Surface fragments >0.25" and <=3"	0%

Surface fragments >3"	15-20%
Bedrock	0%
Water	0%
Bare ground	30-60%

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

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

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 needleandthread, thickspike / western wheatgrass, threadleaf sedge, Idaho fescue, prairie junegrass, and Sandberg bluegrass. Most of the taller and more palatable plants (bluebunch wheatgrass, prairie sandreed) will still be present but in smaller amounts. There may be an increase in the amount of some shrubs, such as juniper. Palatable and nutritious forbs will be replaced by less desirable and more aggressive species such as hairy goldenaster, penstemons, and miner’s candle. The tree component, if present, may also increase. 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
Shrubs, Half Shrubs, Increaser Grasses and Sedge, Increaser Forbs

Community 3.1
Shrubs, Half Shrubs, Increaser Grasses and Sedge, Increaser Forbs

With continued heavy disturbance, the site will become dominated by shrubs (junipers, rose, yucca, big sagebrush), fringed sagewort, short and medium increaser grasses and sedges (prairie junegrass, threadleaf sedge, Sandberg bluegrass, plains reedgrass, , western or thickspike wheatgrass, and Idaho fescue needleandthread), and increaser forbs such as hairy goldenaster, Hood’s phlox, and miner’s candle. There may still be remnant amounts of some of the late-seral species such as bluebunch wheatgrass and prairie sandreed present. The taller grasses will occur only occasionally. Palatable forbs will be mostly absent. Undesirable species such as 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 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. There are severe limitations to using seeding and/or mechanical treatment on this site because of the very steep slopes, preponderance of shallow and very shallow soils, and amount of rock outcrop.

State 4
Shrubs, Half Shrubs, Invader & Annual Grasses, Short Grasses, Weedy Forbs, Cactus

Community 4.1
Shrubs, Half Shrubs, Invader & Annual Grasses, Short Grasses, Weedy Forbs, Cactus

Further deterioration of community 3 results in a plant community dominated by shrubs (juniper, yucca and

sagebrush) and undesirable plants such as, fringed sagewort, red threeawn, broom snakeweed, weedy forbs (e.g., pussytoes and thistles), and annual grasses (cheatgrass and Japanese bromes and sixweeks fescue). Dense clubmoss will be common and abundant on medium to lighter textured soils. Creeping juniper can become abundant, especially in the northern part of this MLRU. Many increaser short grasses such as threadleaf sedge, blue grama, needleandthread, prairie junegrass and Sandberg bluegrass will be abundant. Skunkbush sumac will still occur, but will typically have a “clubbed” apprarance, indicating repeated heavy use. Frequently, a remnant population of climax species such as bluebunch wheatgrass and prairie sandreed will occur within the creeping juniper. Plains prickly pear cactus may also become common. Plant community 4 produces significantly 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. A 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 to move it towards communities similar in production and composition to others that have been described.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Shrubs and Half-shrubs**			75–365	
	skunkbush sumac	RHTR	*Rhus trilobata*	75–240	–
	Woods' rose	ROWO	*Rosa woodsii*	75–240	–
	soapweed yucca	YUGL	*Yucca glauca*	0–60	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–60	–
	needlepod rush	JUSC	*Juncus scirpoides*	0–60	–
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–60	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–60	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–60	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–1	–
Grass/Grasslike					
0	**Grasses and Sedges**			475–785	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	290–725	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	35–180	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–120	–
	rough fescue	FECA4	*Festuca campestris*	0–120	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	35–120	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–120	–
	green needlegrass	NAVI4	*Nassella viridula*	35–120	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–60	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–60	–
	Grass, perennial	2GP	*Grass, perennial*	0–60	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–60	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–60	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–60	–
	poverty oatgrass	DASP2	*Danthonia spicata*	0–60	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	0–60	–

	blue grama	BOGR2	*Bouteloua gracilis*	0–60	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–60	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–60	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0–1	–
Forb					
0	**Forbs**			35–60	
	prairie clover	DALEA	*Dalea*	7–36	–
	dotted blazing star	LIPU	*Liatris punctata*	7–36	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	0–24	–
	desertparsley	LOMAT	*Lomatium*	0–24	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–24	–
	locoweed	OXYTR	*Oxytropis*	0–24	–
	beardtongue	PENST	*Penstemon*	0–24	–
	spiny phlox	PHHO	*Phlox hoodii*	0–24	–
	scurfpea	PSORA2	*Psoralidium*	0–24	–
	Forb, perennial	2FP	*Forb, perennial*	0–24	–
	common yarrow	ACMI2	*Achillea millefolium*	0–24	–
	onion	ALLIU	*Allium*	0–24	–
	pussytoes	ANTEN	*Antennaria*	0–24	–
	aster	ASTER	*Aster*	0–24	–
	milkvetch	ASTRA	*Astragalus*	0–24	–
	balsamroot	BALSA	*Balsamorhiza*	0–24	–
	miner's candle	CRVI4	*Cryptantha virgata*	0–24	–
	Bonneville shootingstar	DOCO	*Dodecatheon conjugens*	0–24	–
	old man's whiskers	GETR	*Geum triflorum*	0–24	–
	larkspur	DELPH	*Delphinium*	0–1	–
	deathcamas	ZIGAD	*Zigadenus*	0–1	–

Animal community

Livestock Grazing Interpretations: 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, and more accessible sites is not excessive. Management objectives should include maintenance or improvement of the native plant community. Livestock accessibility is a significant limitation with this ecological site.

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. Additional growing season rest, often combined with facilitating practices (e.g., water developments, fencing), is usually necessary for re-establishment of the desired native species and to restore the stability and health of the site.

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. Seeding and/or mechanical treatment on this site is not feasible.

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 Groups C and D. The infiltration rates for these soils are variable, depending on surface texture. The runoff potential for this site is high to very high, depending on slope and ground cover/health. Runoff curve numbers generally range from 78 to 94.

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. Plant cover and litter helps retain soil moisture for use by the plants. Maintaining a healthy stand of perennial native vegetation with deep root systems will optimize the amount of precipitation that is received, help maintain or increase infiltration rates and reduce runoff.

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%.

Sites in high similarity to the HCPC (Plant Communities 1 & 2) generally have enough plant cover and litter to optimize infiltration, minimize runoff and erosion, and have a good hydrologic condition. 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 as the majority of plant cover is from shallow rooted species.

(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

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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.

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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 greater than 25% and with only 60% 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, especially where there is more mineral soil.

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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 or more 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 40% on this site.

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5. **Number of gullies and erosion associated with gullies:** Current gully erosion may be evident on this site from the recent past, but there may be evidence of gullies which have “healed” from past storm events.

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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. Larger areas with exposed rock will increase runoff on this site and cause more erosion below these sites.

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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, Indian ricegrass)

    Sub-dominant: shrubs > cool season mid-grasses (Needleandthread) = cool season rhizomatous grasses (thickspike wheatgrass) = warm season rhizomatous grass (prairie sandreed) = warm season bunchgrass (plains muhly) > cool season short grasses (Sandberg bluegrass) = perennial forbs

    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):** This ecological site has a low and thin litter cover due to the patchiness of the vegetation.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 700 - 1200 #/acre. This would be the expected production for the reference state during adequate moisture years. 1050 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, blue grama, Rocky Mountain juniper, red threeawn, Japanese brome, a variety of annual or biennial weedy forbs, fringed/green sagewort, curlycup gumweed, broom snakeweed, big sagebrush,

plains prickly pear, yucca, 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.
