

Ecological site R046XC599MT Thin Breaks (TB) RRU 46-C 13-19 PZ

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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.

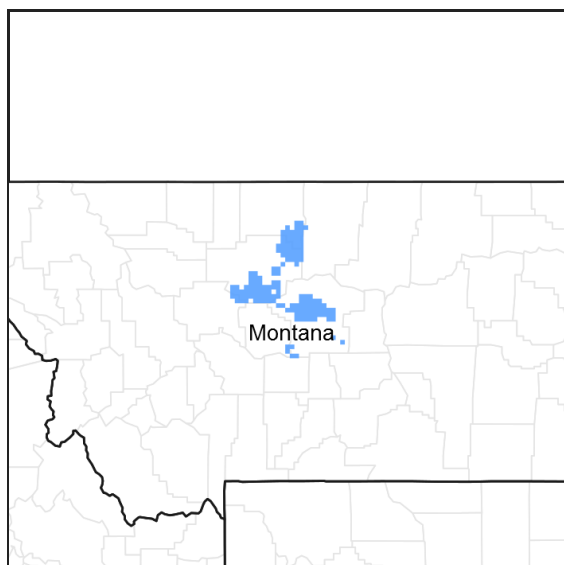


Figure 1. Mapped extent

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

Associated sites

R046XC506MT	Shallow (Sw) RRU 46-C 13-19 PZ
R046XC516MT	Silty Steep (SiStp) RRU 46-C 13-19 PZ
R046XC517MT	Very Shallow (VSw) RRU 46-C 13-19 PZ
R046XC598MT	Shallow Clay (SwC) RRU 46-C 13-19 PZ

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Achnatherum hymenoides</i>

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 slopes, usually in excess of 25 percent. Landforms include breaks, escarpments, bluffs, and ridges. Outcroppings of hard bedrock and soft sedimentary

beds are major features. It occurs on all aspects. Aspect can be significant.

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)	67-87 days
Freeze-free period (characteristic range)	111-124 days
Precipitation total (characteristic range)	15-17 in
Frost-free period (actual range)	53-88 days
Freeze-free period (actual range)	104-126 days
Precipitation total (actual range)	14-19 in
Frost-free period (average)	76 days
Freeze-free period (average)	116 days
Precipitation total (average)	17 in

Climate stations used

- (1) RAYNESFORD 2 NNW [USC00246902], Raynesford, MT
- (2) STANFORD [USC00247864], Stanford, MT
- (3) LEWISTOWN MUNI AP [USW00024036], Lewistown, MT
- (4) ZORTMAN [USC00249900], Zortman, MT
- (5) DENTON [USC00242347], Denton, MT
- (6) HOBSON [USC00244193], Hobson, 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. Soils form in residuum and colluvium of mixed origin (mainly sandstone and sedimentary beds). Textures varies and is mainly sandy and loamy. Soil surface permeability varies depending on texture. Available water holding capacity varies and is mainly less than 5. 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

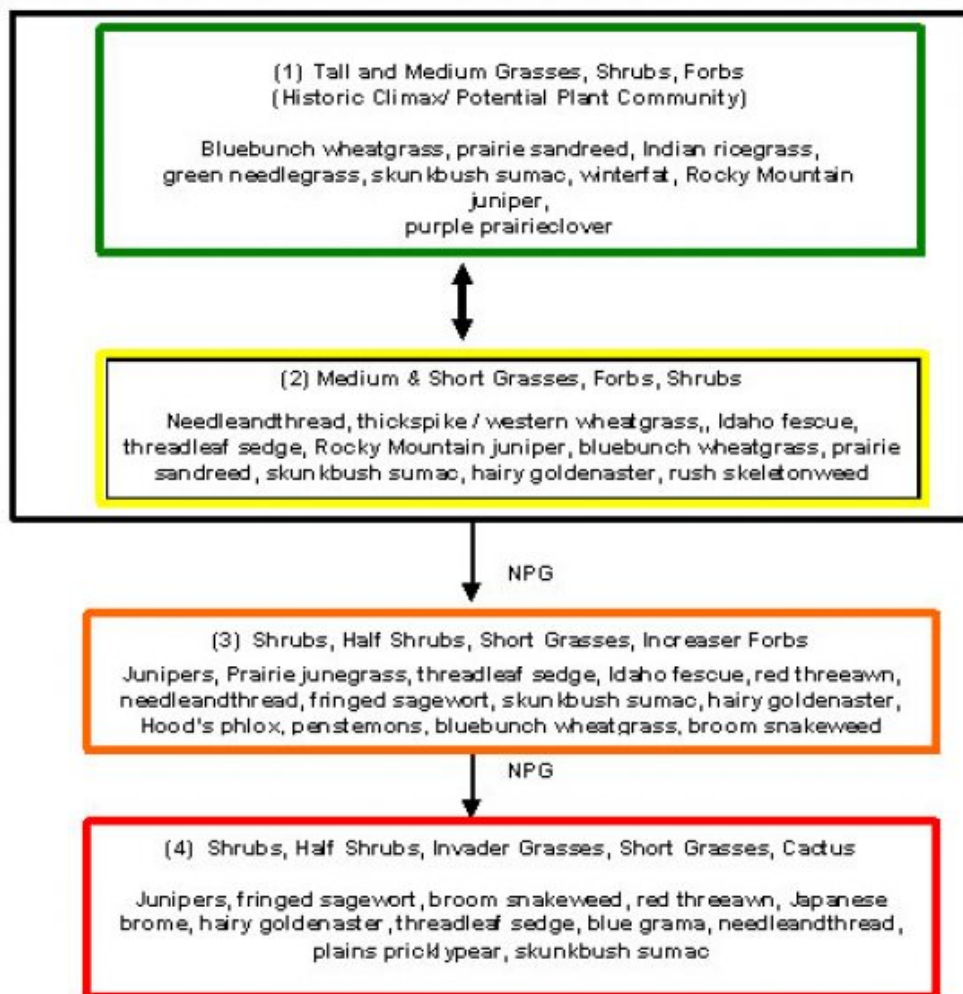
This site developed under Northern Rocky Mountain foothills climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). This community is described 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, little bluestem, 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, and various increaser forbs.

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 8. 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, little bluestem, 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	145	240
Forb	35	48	60
Total	585	823	1085

Table 6. Ground cover

Tree foliar cover	0-10%
Shrub/vine/liana foliar cover	0-10%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	5-20%
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	0-1%
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, spike fescue) 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 short and medium increaser grasses and sedges (prairie junegrass, threadleaf sedge, Sandberg bluegrass, plains reedgrass, , western or thickspike wheatgrass, and Idaho fescue needleandthread), fringed sagewort, 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 significant 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 and yucca) 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). 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" appearance, 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			75–240	
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	75–240	–
	limber pine	PIFL2	<i>Pinus flexilis</i>	0–120	–
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0–120	–
	prairie rose	ROARS	<i>Rosa arkansana</i> var. <i>suffulta</i>	0–60	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–60	–
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	0–60	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–60	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	0–60	–
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–60	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–1	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–1	–
Grass/Grasslike					
0	Grasses and Sedges			475–785	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	290–725	–
	little bluestem	SCSCD	<i>Schizachyrium scoparium</i> var. <i>divergens</i>	0–305	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	35–180	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–120	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–120	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	35–120	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	35–120	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–60	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–60	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–60	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–60	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0–60	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–60	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0–60	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–60	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0–60	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0–60	–

	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–1	–
	Fendler's threeawn	ARPUF	<i>Aristida purpurea</i> var. <i>fendleriana</i>	0–1	–
Forb					
0	Forbs			35–60	
	prairie clover	DALEA	<i>Dalea</i>	0–36	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–36	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	0–24	–
	desertparsley	LOMAT	<i>Lomatium</i>	0–24	–
	leafy wildparsley	MUDI	<i>Musineon divaricatum</i>	0–24	–
	locoweed	OXYTR	<i>Oxytropis</i>	0–24	–
	beardtongue	PENST	<i>Penstemon</i>	0–24	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–24	–
	scurfpea	PSORA2	<i>Psoralidium</i>	0–24	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–24	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	0–24	–
	onion	ALLIU	<i>Allium</i>	0–24	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–24	–
	aster	ASTER	<i>Aster</i>	0–24	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–24	–
	balsamroot	BALSA	<i>Balsamorhiza</i>	0–24	–
	miner's candle	CRVI4	<i>Cryptantha virgata</i>	0–24	–
	Bonneville shootingstar	DOCO	<i>Dodecatheon conjugens</i>	0–24	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	0–24	–
	little larkspur	DEBIC	<i>Delphinium bicolor</i> ssp. <i>calcicola</i>	0–1	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	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 effects 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.

12a. 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.

The following is an example of how to calculate the recommended stocking rate. This example does not use production estimates from this specific ecological site. You will need to adjust the annual production values and run the calculations using total annual production values from the ecological sites encountered on each individual ranch/pasture. Before making specific recommendations, an on-site evaluation must be made.

Example of total annual production amounts by type of year:

Favorable years = 2200 lbs/acre

Normal years = 1480 lbs/acre

Unfavorable years = 1200 lbs/acre

It is recommended that on slopes of 30% or less, stocking rate should be derived from the total annual production pounds minus 500 pounds for residual dry matter and 25% harvest efficiency. On slopes over 30%, stocking rate is derived from total annual production pounds minus 800 pounds for residual dry matter and 25% harvest efficiency. Refer to the NRCS National Range and Pasture Handbook for a list of Animal Unit Equivalents.

Sample Calculations using Favorable Year production amounts:

< 30% slopes: $AUM/AC = [(2200-500)(0.25)]/915 \text{ lbs/month for one AU} = 0.46 \text{ AUM/AC}$
 $AC/AUM = (1.0 \text{ AU})/(0.46 \text{ AUM/AC}) = 2.2 \text{ AC/AUM}$

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

NOTE: 915 lbs/month for one Animal Unit is used as the baseline for maintenance requirements. This equates to 30 lbs/day of air-dry forage (1200 lb cow at 2.5% of body weight).

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/PPC (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

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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	03/01/2020
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Approval date	

Indicators

1. **Number and extent of rills:** Rills may be frequent in reference especially on slopes exceeding 25%. Rills will be less than 5 feet long

2. **Presence of water flow patterns:** Water flow patterns will be evident on this site on steeper slopes.

3. **Number and height of erosional pedestals or terracettes:** Pedestals, if present, will be less than 0.5 inches tall and directly associated with the waterflow patterns on steep slopes.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 30-60%. Large patches may exist as a result of the steep and shallow nature of the site.

5. **Number of gullies and erosion associated with gullies:** Remnant gullies from extreme weather events may be present however these will show signs of healing (vegetation growing).

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 minimal however on steeper slopes litter movement such as litter dams may be present. Litter tends to move less than 5 feet.

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 2-4 in interspaces. The A horizon is 1-3 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 weak subangular blocky to weak fine granular. A Horizon should be 1-3 inches thick with color, when wet, typically ranging in Value of 5 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 Thin Breaks ecological site is high and is well drained. An even distribution of mid stature grasses (65-75%), cool season shortgrasses (10-15%) along with rhizomatous grass (<5%), forbs (5%), shrubs (10-15%), and trees (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. Soil profile may contain an abrupt transition to an Argillic horizon which can be misinterpreted as compaction, however, the soil structure will be fine to medium subangular blocky, where a compaction layer will be platy or structureless (massive).
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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: Mid-statured, perennial bunchgrasses (bluebunch wheatgrass, little bluestem)
- Sub-dominant: shortgrass grasses/grasslikes (needle and thread, Sandberg bluegrass) > Shrubs ≥ trees ≥ forbs > rhizomatous grasses
- Other:
- Additional:
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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.
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14. **Average percent litter cover (%) and depth (in):** Total litter cover ranges from 30-40%. Most litter is irregularly distributed on the soil surface and is not at a measurable depth
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production is 823. Low: 585 High 1085. Production varies based on effective precipitation and natural variability of soil properties for this ecological site.
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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:** Potential invasive (including noxious) species (native and non-native). Invasive species on this ecological site include (but not limited to): annual brome spp., spotted knapweed, leafy spurge, crested wheatgrass, yellow salsify.
- Native species such as Rocky Mountain juniper, ponderosa pine, prickly pear cactus, broom snakeweed, Sandberg's bluegrass, etc. when their populations are significant enough to affect ecological function, indicate site condition departure.
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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.
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