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.

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) *Pseudoroegneria spicata* (2) *Achnatherum hymenoides*

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	30 %
Water table depth	150 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)	70-90 days
Freeze-free period (characteristic range)	110-120 days
Precipitation total (characteristic range)	380-430 mm
Frost-free period (actual range)	50-90 days
Freeze-free period (actual range)	100-130 days
Precipitation total (actual range)	360-480 mm
Frost-free period (average)	80 days
Freeze-free period (average)	120 days
Precipitation total (average)	430 mm

- (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	100 cm
Available water capacity (0-101.6cm)	12.7 cm
Soil reaction (1:1 water) (0-101.6cm)	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

Figure 7. State and Transition Model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
0	**Shrubs and Half-shrubs**			84-269	
	skunkbush sumac	RHTR	*Rhus trilobata*	84-269	–
	limber pine	PIFL2	*Pinus flexilis*	0-135	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0-135	–
	prairie rose	ROARS	*Rosa arkansana var. suffulta*	0-67	–
	soapweed yucca	YUGL	*Yucca glauca*	0-67	–
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0-67	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0-67	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0-67	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0-67	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-1	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-1	–
Grass/Grasslike					
0	**Grasses and Sedges**			532-880	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	325-813	–
	little bluestem	SCSCD	*Schizachyrium scoparium var. divergens*	0-342	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	39-202	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0-135	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0-135	–
	green needlegrass	NAVI4	*Nassella viridula*	39-135	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	39-135	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-67	–
	Grass, perennial	2GP	*Grass, perennial*	0-67	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0-67	–
	Sandberg bluegrass	POSE	*Poa secunda*	0-67	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0-67	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0-67	–
	Idaho fescue	FEID	*Festuca idahoensis*	0-67	–
	blue grama	BOGR2	*Bouteloua gracilis*	0-67	–
	threadleaf sedge	CAFI	*Carex filifolia*	0-67	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0-67	–
	purple threeawn	ARPU9	*Aristida purpurea*	0-1	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0-1	–
Forb					
0	**Forbs**			39-67	
	prairie clover	DALEA	*Dalea*	0-40	–
	dotted blazing star	LIPU	*Liatris punctata*	0-40	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	0-27	–
	desertparsley	LOMAT	*Lomatium*	0-27	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0-27	–
	locoweed	OXYTR	*Oxytropis*	0-27	–
	beardtongue	PENST	*Penstemon*	0-27	–
	spiny phlox	PHHO	*Phlox hoodii*	0-27	–
	scurfpea	PSORA2	*Psoralidium*	0-27	–

	Forb, perennial	2FP	*Forb, perennial*	0-27	–
	common yarrow	ACMI2	*Achillea millefolium*	0-27	–
	onion	ALLIU	*Allium*	0-27	–
	pussytoes	ANTEN	*Antennaria*	0-27	–
	aster	ASTER	*Aster*	0-27	–
	milkvetch	ASTRA	*Astragalus*	0-27	–
	balsamroot	BALSA	*Balsamorhiza*	0-27	–
	miner's candle	CRVI4	*Cryptantha virgata*	0-27	–
	Bonneville shootingstar	DOCO	*Dodecatheon conjugens*	0-27	–
	old man's whiskers	GETR	*Geum triflorum*	0-27	–
	little larkspur	DEBIC	*Delphinium bicolor ssp. calcicola*	0-1	–
	deathcamas	ZIGAD	*Zigadenus*	0-1	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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. 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 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/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

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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Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

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%)

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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):** 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.**
