

Ecological site R046XC517MT

Very Shallow (VSw)

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
R046XC508MT	Silty (Si) RRU 46-C 13-19 PZ
R046XC516MT	Silty Steep (SiStp) RRU 46-C 13-19 PZ
R046XC598MT	Shallow Clay (SwC) RRU 46-C 13-19 PZ

Similar sites

R046XC514MT	Gravelly (Gr) RRU 46-C 13-19 PZ The Gravel site differs mainly in depth or texture.
R046XC506MT	Shallow (Sw) RRU 46-C 13-19 PZ The Shallow site differs by having a deeper soil profile over the root restricting layer, and having significantly more production.

Table 1. Dominant plant species

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

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	0 – 70 %
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
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- (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

These soils form in alluvium, residuum, and colluvium. They are typically less than 10 inches deep to hard rock or soft beds of decomposed siltstone, sandstone, or shale. Soil texture can be loam, sandy loam, silt loam, and clay loam. Surface texture modifier can be channery, very channery, gravelly, or very gravelly. Soils that characterize this ecological site can include deep fragmental soils. Few roots penetrate deeper than 10 inches. 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	30 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	5.08 cm
Electrical conductivity (0-101.6cm)	Not specified

Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	20 – 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 bluebunch wheatgrass, little bluestem, 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

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			45-113	
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	0-56	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-56	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	0-56	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	0-56	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-56	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-56	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-1	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-1	–
Grass/Grasslike					
0	Grasses and Sedges			664-850	

	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	443-792	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0-170	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0-113	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-113	–
	little bluestem	SCSCD	<i>Schizachyrium scoparium var. divergens</i>	0-113	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0-56	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	45-56	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	45-56	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0-56	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	0-56	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0-56	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	45-56	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-56	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0-28	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-28	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0-1	–
	Fendler's threeawn	ARPUF	<i>Aristida purpurea var. fendleriana</i>	0-1	–
Forb					
0	Forbs			45-170	
	beardtongue	PENST	<i>Penstemon</i>	0-56	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-56	–
	scurfpea	PSORA2	<i>Psoralegium</i>	0-56	–
	stonecrop	SEDUM	<i>Sedum</i>	0-56	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-56	–
	pussytoes	ANTEN	<i>Antennaria</i>	0-56	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	9-56	–
	Hooker's sandwort	ARHOH3	<i>Arenaria hookeri ssp. hookeri</i>	9-56	–
	aster	ASTER	<i>Aster</i>	0-56	–
	miner's candle	CRVI4	<i>Cryptantha virgata</i>	9-56	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0-56	–
	haplopappus	HAPLO11	<i>Haplopappus</i>	0-56	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-56	–
	rubberweed	HYMEN7	<i>Hymenoxys</i>	0-56	–
	bitter root	LERE7	<i>Lewisia rediviva</i>	9-56	–
	leafy wildparsley	MUDI	<i>Musineon divaricatum</i>	0-56	–
	locoweed	OXYTR	<i>Oxytropis</i>	0-1	–
	larkspur	DELPH	<i>Delphinium</i>	0-1	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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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/PPC. 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. 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: $AUM/AC = [(2200-500)(0.25)]/915 \text{ lbs/month for one AU} = 0.46$ AUM/AC $AC/AUM = (1.0 \text{ AU})/(0.46 AUM/AC) = 2.2$ $AC/AUM > 30\%$ slopes: $AUM/AC = [(2200-800)(0.25)]/915 \text{ lbs/month for one AU} = 0.38$ AUM/AC $AC/AUM = (1.0 \text{ AU})/(0.38 \text{ AU! M/AC}) = 2.6$ 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

Matt Ricketts

Robert L. Ross

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

Approval

Kirt Walstad, 7/19/2023

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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

Indicators

1. **Number and extent of rills:** Rills are rarely present in the reference condition, if present will be short and inconspicuous on the steeper, South facing slopes.

2. **Presence of water flow patterns:** Water flow patterns are not present in the reference condition. but may be present on the steeper, south facing slopes when runoff exceeds infiltration. These patterns will be short and infrequent across gentle slopes and increasingly more common on steeper slopes.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rarely evident in the reference condition, if present will be on slopes greater than 25% and associated with waterflow patterns.

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground): Bare ground is less than 20%. It consists of small, randomly scattered patches.

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

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

7. Amount of litter movement (describe size and distance expected to travel): Litter movement is not evident in the reference condition.

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 4-6 under plant canopies and 4-5 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 typically weak medium subangular blocky to weak fine granular. A Horizon should be 1-3 inches thick with color, when wet, typically ranging in Value of 4 or less and Chroma of 3 or less. Local geology may affect color, it is important to reference the Official Series Description (OSD) for characteristic range. <https://soilseries.sc.egov.usda.gov/osdname.aspx>

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Infiltration of the Very Shallow ecological site is moderate. The site is well drained. An even distribution of mid stature grasses (75-80%), cool season bunchgrasses (10-15%) along with rhizomatous grass (<5%), forbs (5-10%), and shrubs (0-3%)

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

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant: Mid-statured, perennial bunchgrasses (Primarily bluebunch wheatgrass, limited little bluestem)

Sub-dominant: shortgrass grasses/grasslikes (needleanthread, Junegrass) > forbs > rhizomatous grasses ? Shrubs

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):
Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers is 3% or less.
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14. Average percent litter cover (%) and depth (in): Total litter cover ranges from 25-35%. 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 841. Low: 672 High 1011. 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) salsify, whitetop, Canada thistle, annual brome spp., spotted knapweed, leafy spurge, crested wheatgrass, and dandelion Native species such as Rocky Mountain juniper, ponderosa pine, Douglas fir, lupine, 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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