

Ecological site R046XC516MT Silty Steep (SiStp) 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.

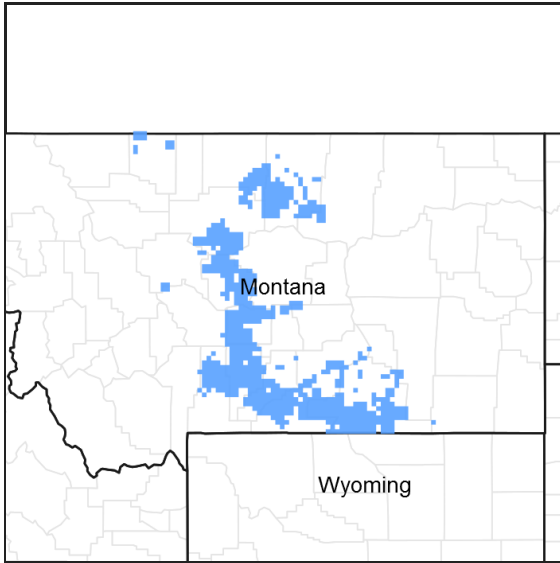


Figure 1. Mapped extent

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

R046XC514MT	Gravelly (Gr) RRU 46-C 13-19 PZ
R046XC598MT	Shallow Clay (SwC) RRU 46-C 13-19 PZ
R046XC505MT	Sandy (Sy) RRU 46-C 13-19 PZ
R046XC506MT	Shallow (Sw) RRU 46-C 13-19 PZ
R046XC507MT	Shallow to Gravel (SwGr) RRU 46-C 13-19 PZ
R046XC508MT	Silty (Si) RRU 46-C 13-19 PZ

Similar sites

R046XC505MT	Sandy (Sy) RRU 46-C 13-19 PZ The Sandy site differs by being mainly on slopes less than 15%.
R046XC508MT	Silty (Si) RRU 46-C 13-19 PZ The Silty site differs by being mainly on slopes less than 15%.
R046XC507MT	Shallow to Gravel (SwGr) RRU 46-C 13-19 PZ The Shallow-to Gravel site may have similar textures, but will be shallow (20 inches or less) to bedrock, semi-consolidated sedimentary beds, or sand and gravel.

R046XC506MT	Shallow (Sw) RRU 46-C 13-19 PZ The Shallow site may have similar textures, but will be shallow (20 inches or less) to bedrock, semi-consolidated sedimentary beds, or sand and gravel.
R046XC598MT	Shallow Clay (SwC) RRU 46-C 13-19 PZ The Shallow Clay site differs mainly by being 20 inches or less to shale or other root limiting material.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Schizachyrium scoparium</i>

Physiographic features

This ecological site occurs on moderately steep to steep plains, hills, and hill slopes. This site occurs on all aspect. Aspect can be significant.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plain (3) Ridge
Flooding frequency	None
Ponding frequency	None
Slope	15–45%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

See Climatic Data Sheet for more details (Section II of the Field Office Technical Guide) or reference the following climatic web site: <http://www.wrcc.sage.dri.edu/> .

Table 3. Representative climatic features

Frost-free period (characteristic range)	67-87 days
Freeze-free period (characteristic range)	111-124 days
Precipitation total (characteristic range)	381-432 mm
Frost-free period (actual range)	53-88 days
Freeze-free period (actual range)	104-126 days
Precipitation total (actual range)	356-483 mm
Frost-free period (average)	76 days
Freeze-free period (average)	116 days
Precipitation total (average)	432 mm

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

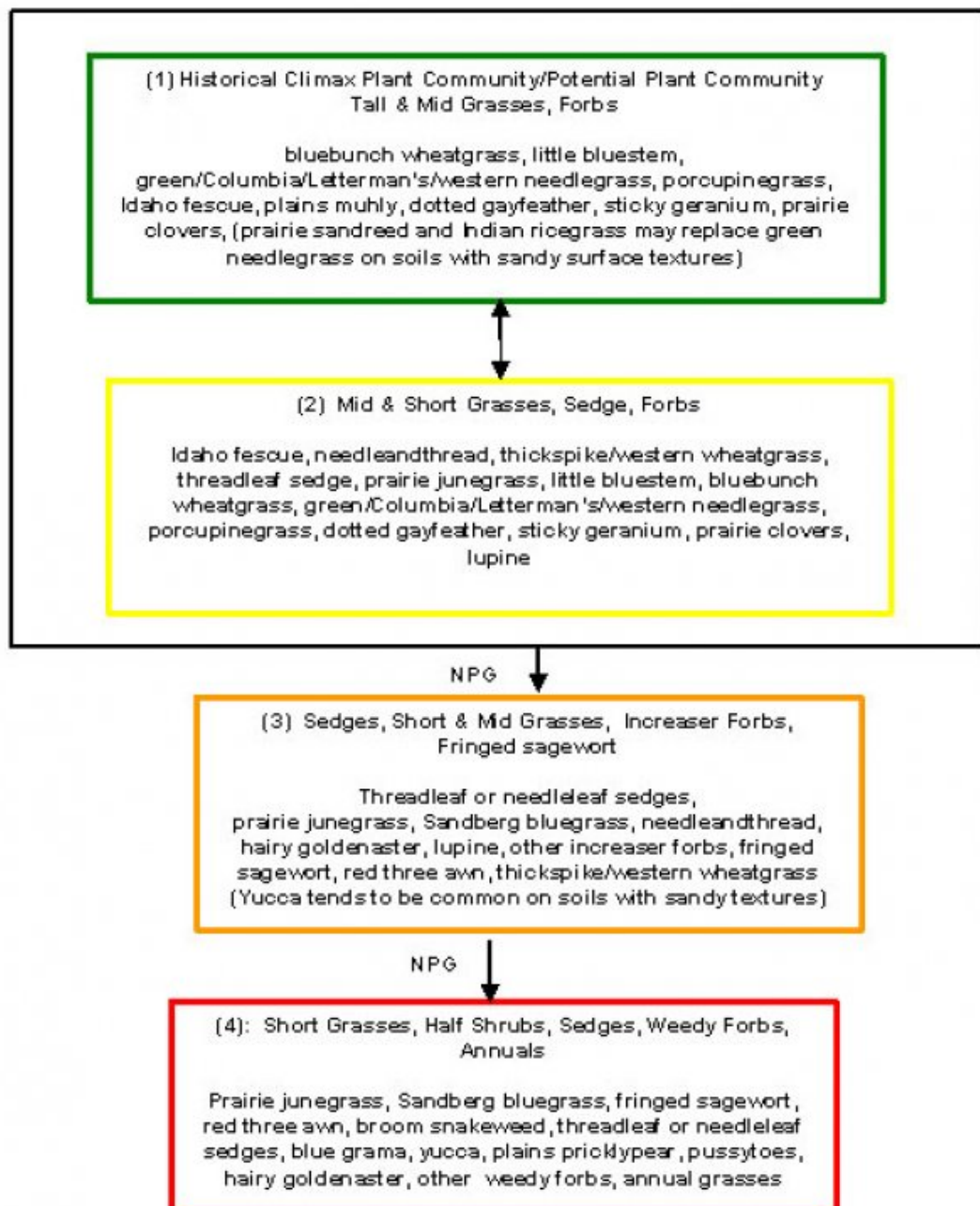
These soils are moderately deep to very deep loamy soils on steep or hilly landscapes. These soils mainly occur on medium textured materials from tertiary deposits, dissected more recent alluvium or colluvium, or dissected sedimentary uplands. Permeability is mostly moderate with some being moderately slow, and effective rooting depth is greater than 20 inches. The major limitation to plant growth is the reduced effective moisture due to slope and the potential for runoff.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Very fine sandy loam
Drainage class	Well drained
Permeability class	Moderate to moderately slow
Soil depth	51 cm
Available water capacity (0-101.6cm)	12.7–20.32 cm
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–5%

Ecological dynamics

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.

Because of the hilly landscape associated with this ecological site, there are often included areas that receive additional moisture from snow drifts, etc. where shrubs such as snowberry will be abundant.

State 1 Tall and Medium Grasses/Forbs

Community 1.1

Tall and Medium Grasses/Forbs

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. This plant community contains a high diversity of tall and medium height, cool and warm season grasses (bluebunch wheatgrass, little bluestem, tall needlegrasses, porcupine grass, Idaho fescue, plains muhly), and short grasses and sedges (Cusick bluegrass, Parry danthonia, spike oatgrass, Sandberg bluegrass, prairie junegrass, threadleaf sedge). Prairie sandreed and Indian ricegrass may replace green needlegrass or some other species on soils with sandy surfaces. There are abundant forbs (sticky geranium, mountain dandelion, prairie clovers, dotted gayfeather) which occur in smaller percentages. Shrubs such as mountain big sagebrush, mountain silver sagebrush, shrubby cinquefoil and snowberry can be common, especially in locations having more favorable moisture. This plant community is well adapted to the Northern Rocky Mountain foothills climatic conditions. The diversity in plant species allows for drought tolerance. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation, and temperature). This plant community is well suited to managed livestock grazing and provides diverse habitat for many wildlife species. Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable moisture conditions. This plant community provides for soil stability and a 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 very favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1093	1345	1597
Forb	73	179	319
Shrub/Vine	73	135	213
Total	1239	1659	2129

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0-10%
Grass/grasslike foliar cover	65-90%
Forb foliar cover	1-10%
Non-vascular plants	0-5%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0-3%
Grass/grasslike basal cover	20-23%
Forb basal cover	2-4%
Non-vascular plants	0-2%
Biological crusts	0%
Litter	50-60%

Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	0-10%

State 2

Medium and Short Grasses, Sedge, and Increaser Forbs

Community 2.1

Medium and Short Grasses, Sedge, and Increaser Forbs

Slight degradation in the historical climax plant community results in a plant community dominated by medium and short grasses such as Idaho fescue, needleandthread, thickspike/western wheatgrass, threadleaf sedge, Cusick bluegrass, Parry danthonia, Sandberg bluegrass, and prairie junegrass,. Most of the taller and more palatable grasses (bluebunch wheatgrass, little bluestem, tall needlegrasses, porcupinegrass, plains muhly) will still be present but in smaller amounts. There may be an increase in the amount of some of the shrub species. Palatable and nutritious forbs will begin to be replaced by less desirable and more aggressive species such as lupine. Biomass production and litter become reduced on the site as the taller grasses disappear, increasing evapotranspiration and reducing moisture retention. Additional open space in this community can result in undesirable invader species. This plant community provides for moderate soil stability. This community will readily respond to improved grazing management, but time is usually required to move this plant community toward a higher successional stage and a more productive plant community similar to community 1.

State 3

Sedges, Short & Medium Increaser Grasses, Increaser Forbs, Fringed Sagewort

Community 3.1

Sedges, Short & Medium Increaser Grasses, Increaser Forbs, Fringed Sagewort

With continued heavy disturbance on community 2, the site will become dominated by species such as threadleaf or needleleaf sedge, prairie junegrass, Sandberg bluegrass, needleandthread, increaser forbs such as lupine and hairy goldenaster, and fringed sagewort,. The taller grasses will occur only occasionally. Idaho fescue and thickspike/western wheatgrass will still be common. Palatable forbs will be mostly absent. Aggressive, invader species such as red threeawn will tend to become abundant. 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.

State 4

Short Grasses & Sedges, Half Shrubs, Weedy Forbs, and Annuals

Community 4.1

Short Grasses & Sedges, Half Shrubs, Weedy Forbs, and Annuals

Further deterioration of community 3 due to non-prescribed grazing or other disturbance leads to a plant community dominated by less desirable plants such as prairie junegrass, Sandberg bluegrass, threadleaf or needleleaf sedge, yucca, and undesirable plants including fringed sagewort, red threeawn, broom snakeweed, weedy forbs (e.g., thistles, pussytoes, hairy goldenaster), annuals such as cheatgrass and Japanese bromes and sixweeks fescue, and pricklypear cactus. These last 2 plant communities are less productive than Plant Communities #1 or #2. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high

evapotranspiration, thus eventually favoring species that are more adapted to drier conditions. These communities have lost many of the attributes of a healthy rangeland, including good infiltration, minimal erosion and runoff, nutrient cycling and energy flow. This community can respond positively to improved grazing management but it will take additional inputs to move it towards a community similar in production and composition to that of Plant Community #1 or #2. However, because of the hilly topography and steeper slopes associated with this ecological site, mechanical treatment or seeding are generally not feasible nor recommended.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	Shrubs and Half-shrubs			73–213	
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	0–106	–
	silver sagebrush	ARCAV2	<i>Artemisia cana ssp. viscidula</i>	0–106	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–106	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	0–106	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–106	–
	common snowberry	SYAL	<i>Symphoricarpos albus</i>	0–106	–
Grass/Grasslike					
0	Grasses and Sedges			1093–1597	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	510–1491	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–1278	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	146–319	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–213	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–213	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–168	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	73–106	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	73–106	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–106	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	73–106	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	73–106	–
	mountain brome	BRMA4	<i>Bromus marginatus</i>	0–106	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	73–106	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	73–106	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	73–106	–
	Parry's oatgrass	DAPA2	<i>Danthonia parryi</i>	0–106	–
	poverty oatgrass	DASP2	<i>Danthonia spicata</i>	73–106	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	37–95	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	37–95	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	18–54	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	18–54	–
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	18–54	–
	western needlegrass	ACOCO	<i>Achnatherum occidentale ssp. occidentale</i>	18–54	–

	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0-1	-
Forb					
0	Forbs			73-319	
	leafy wildparsley	MUDI	<i>Musineon divaricatum</i>	0-106	-
	beardtongue	PENST	<i>Penstemon</i>	0-106	-
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-106	-
	scurfpea	PSORA2	<i>Psoralegium</i>	0-106	-
	cutleaf anemone	PUPAM	<i>Pulsatilla patens ssp. multifida</i>	0-106	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-106	-
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	0-106	-
	American vetch	VIAM	<i>Vicia americana</i>	0-106	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-106	-
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	0-106	-
	onion	ALLIU	<i>Allium</i>	0-106	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-106	-
	aster	ASTER	<i>Aster</i>	0-106	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-106	-
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	0-106	-
	prairie clover	DALEA	<i>Dalea</i>	15-106	-
	Bonneville shootingstar	DOCO	<i>Dodecatheon conjugens</i>	0-106	-
	yellow fritillary	FRPU2	<i>Fritillaria pudica</i>	0-106	-
	blanketflower	GAAR	<i>Gaillardia aristata</i>	0-106	-
	old man's whiskers	GETR	<i>Geum triflorum</i>	0-106	-
	sticky purple geranium	GEVI2	<i>Geranium viscosissimum</i>	15-106	-
	dotted blazing star	LIPU	<i>Liatis punctata</i>	15-106	-
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	0-106	-
	desertparsley	LOMAT	<i>Lomatium</i>	0-106	-
	lupine	LUPIN	<i>Lupinus</i>	0-1	-
	little larkspur	DEBIC	<i>Delphinium bicolor ssp. calcicola</i>	0-1	-
	deathcamas	ZIGAD	<i>Zigadenus</i>	0-1	-
	locoweed	OXYTR	<i>Oxytropis</i>	0-1	-

Animal community

Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce a moderate amount of high quality forage. This can be a preferred site for grazing by livestock, depending on amount of slope and proximity to water. In order to maintain the productivity of this site, grazing must be managed carefully to be sure utilization on this site is not excessive. Management objectives should include maintenance or improvement of the plant community.

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, resulting in plant communities that resemble numbers 3 and 4. 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. These communities are still stable, productive, and healthy provided they receive proper management. These will respond fairly quickly to improved grazing management, including increased growing season rest of key forage plants. Grazing management alone can usually move these back towards the potential / historic climax community,.

Plant Community 3 has 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. To restore the stability and health of the site, additional growing season rest is often necessary for re-establishment of the desired species.

Plant community 4 has a high percentage of non desirable forage species and an extremely limited production of usable forage (< 600 pounds per acre). Because of the hilly topography and steeper slopes associated with this ecological site, mechanical treatments or seeding are generally not feasible, leaving grazing management as the only practical alternative available.

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
 $AC/AUM = (1.0 AU)/(0.38 AU/AC) = 2.6 AC/AUM$

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 runoff potential for this site is low to moderate, depending on slope and ground cover/health. Runoff curve numbers generally range from 78 to 90. The soils associated with this ecological site are generally in Hydrologic Soil Group C. Soils have a slow infiltration rate when thoroughly wetted and consist chiefly of soils with moderately fine to fine textures.

Good hydrologic conditions exist on rangelands if plant 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 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. The deep root systems of the potential vegetation help maintain or increase infiltration rates and reduce runoff.

Sites in low similarity (Plant Communities 3 & 4) are generally considered to be in poor hydrologic condition as the majority of plant cover is from shallow-rooted species such as blue grama and annual grasses. 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. Plant cover and litter helps retain soil moisture for use by the plants. Maintaining a healthy stand of perennial vegetation will optimize the amount of precipitation that is received. (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	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not present in the reference condition on slopes less than 15%, if present will be short and inconspicuous on the steepest southerly facing slopes.

2. **Presence of water flow patterns:** Water flow patterns are rare 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 the landscape.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are not evident in the reference condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 0-10%. 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 5-6 under plant canopies and plant interspaces. The A horizon is 4-6 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 strong to medium fine granular. A Horizon should be 4-6 inches thick with color, when wet, typically ranging in Value of 3 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 Silty Steep ecological site is high and is well drained. An even distribution of mid stature grasses (65-75%), cool season bunchgrasses/grasslikes (15-20%) along with rhizomatous

grass (<5%), forbs (10-15%), and shrubs (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 (Primarily bluebunch wheatgrass and green needlegrass with minimal little bluestem possible)

Sub-dominant: shortgrass grasses/grasslikes (needle and thread, prairie Junegrass) ≥ forbs > shrubs > rhizomatous grasses

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 50-60%. 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 1480. Low: 1105 High 1900. 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) sulphur cinquefoil, houndstongue, whitetop, Canada thistle, annual brome spp., spotted knapweed, yellow toadflax, leafy spurge, crested wheatgrass, Kentucky bluegrass, smooth brome 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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