USDA Natural Resources
Conservation Service

Ecological site R046XN594MT
Silty Steep (SiStp) RRU 46-N 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.

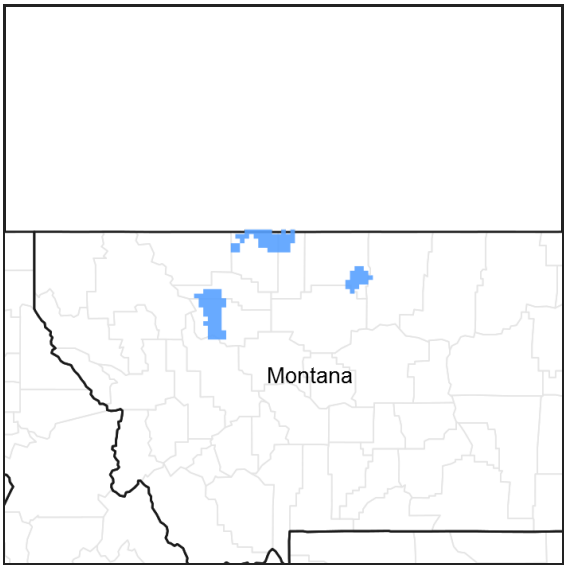


Figure 1. Mapped extent

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

R046XN247MT	**Clayey (Cy) RRU 46-N 13-19 PZ** The Silty-Steep site often occurs as a transition between them
R046XN249MT	**Sandy (Sy) RRU 46-N 13-19 PZ** The Silty-Steep site often occurs as a transition between them
R046XN250MT	**Shallow (Sw) RRU 46-N 13-19 PZ** The Silty-Steep site often occurs as a transition between them
R046XN252MT	**Silty (Si) RRU 46-N 13-19 PZ** The Silty-Steep site often occurs as a transition between them
R046XN589MT	**Shallow Clay (SwC) RRU 46-N 13-16 PZ**
R046XN601MT	**Gravelly (Gr) RRU 46-N 13-19 PZ**

Similar sites

R046XN247MT	**Clayey (Cy) RRU 46-N 13-19 PZ** The Clayey site differs by being mainly on slopes less than 15%.
R046XN252MT	**Silty (Si) RRU 46-N 13-19 PZ** The Silty site differs by being mainly on slopes less than 15%.

R046XN589MT	**Shallow Clay (SwC) RRU 46-N 13-16 PZ** The Shallow Clay site differs mainly by being 20 inches or less to shale or other root limiting material.
R046XN250MT	**Shallow (Sw) RRU 46-N 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.
R046XN249MT	**Sandy (Sy) RRU 46-N 13-19 PZ** The Sandy site differs by being mainly on slopes less than 15%.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Festuca campestris*

Physiographic features

This ecological site occurs on moderately steep to steep plains, hills, and hill slopes. 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)	57-84 days
Freeze-free period (characteristic range)	109-120 days
Precipitation total (characteristic range)	381-432 mm
Frost-free period (actual range)	37-90 days
Freeze-free period (actual range)	101-122 days
Precipitation total (actual range)	356-432 mm
Frost-free period (average)	69 days
Freeze-free period (average)	114 days
Precipitation total (average)	406 mm

Climate stations used

- (1) BABB 6 NE [USC00240392], Babb, MT
- (2) AUGUSTA [USC00240364], Augusta, MT

- (3) CASCADE 5 S [USC00241552], Cascade, MT
- (4) ROGERS PASS 9 NNE [USC00247159], Wolf Creek, MT

Influencing water features

No influencing water features.

Soil features

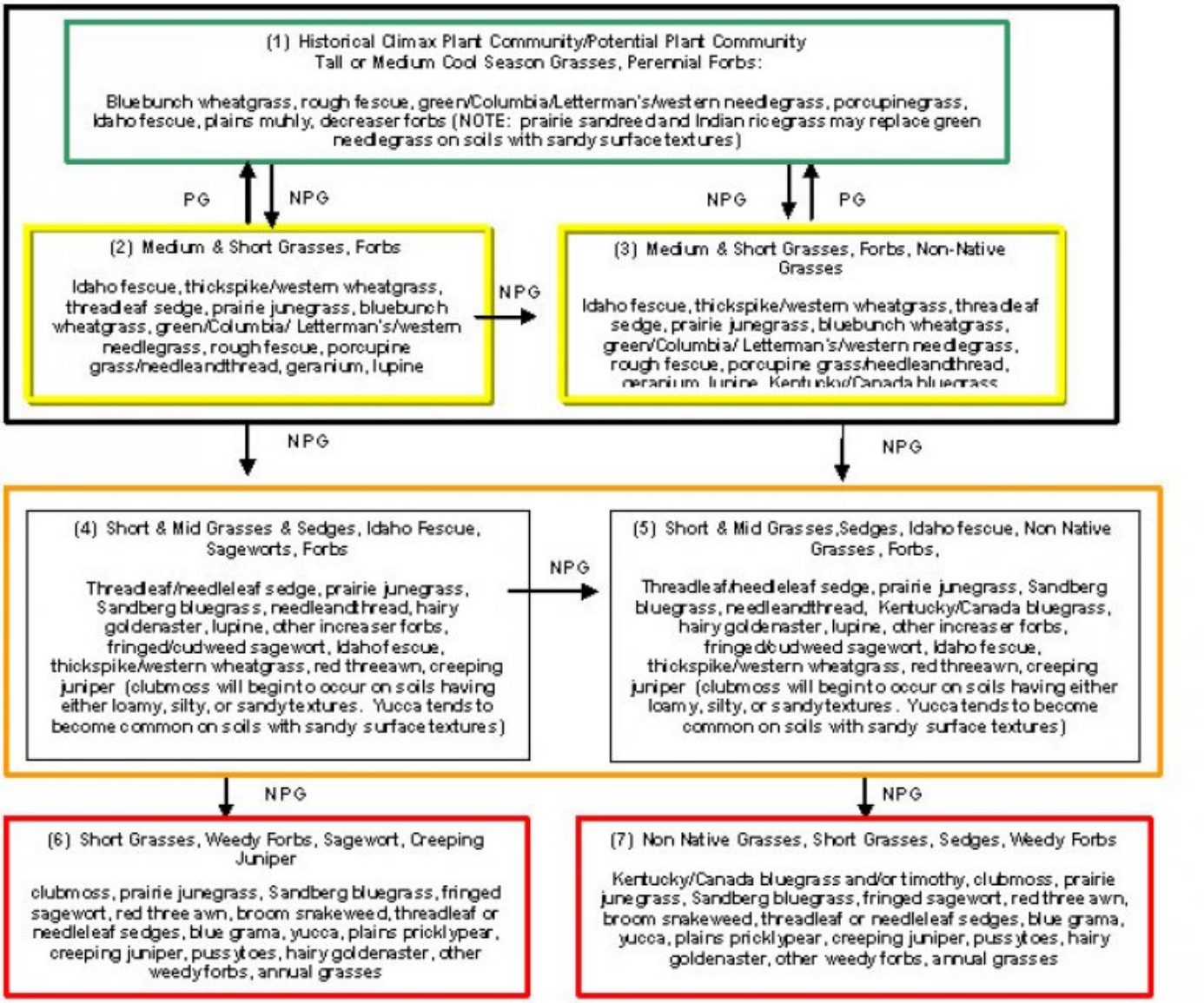
These soils are moderately deep to very deep loamy soils on steep or hilly landscapes. They form on medium textured materials from tertiary deposits, dissected more recent alluvium, or dissected sedimentary uplands. Permeability is mostly moderate with some being moderately slow,- and effective rooting 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: Kentucky and Canada bluegrass and common timothy can become a part of any plant community in this ecological site, depending on factors such as site history, circumstances, and the opportunity for these plants to establish. Generally, the percent composition of these will increase as the ecological condition degrades until they will become dominant.

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/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, rough fescue, tall needlegrasses, plains muhly, Idaho fescue, thickspike or western wheatgrass and, needleandthread), and short grasses and sedges (Cusick bluegrass, Parry danthonia, spike oatgrass, Sandberg bluegrass, prairie junegrass, threadleaf sedge). There are abundant forbs (sticky geranium, mountain dandelion, prairie clovers, dotted gayfeather) which occur in smaller percentages. Shrubs such as snowberry, mountain silver sagebrush, shrubby cinquefoil and creeping juniper 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. These plants have strong, healthy root systems that allow production to increase significantly with favorable growing 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 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

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 Idaho fescue, needleandthread (mainly 15 inches MAP or less), thickspike/western wheatgrass, threadleaf sedge, Cusick bluegrass, Parry danthonia, Sandberg bluegrass, and prairie junegrass,. Most of the taller, more palatable grasses (bluebunch wheatgrass, tall needlegrasses, rough fescue) will still be present but in smaller amounts. There may be an increase in the amount of some shrubs. Palatable and nutritious forbs will be replaced by less desirable and more aggressive species. 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
Medium and Short Grasses, Forbs, Non-Native Grasses

Community 3.1
Medium and Short Grasses, Forbs, Non-Native Grasses

Given the right circumstances and opportunity, non-native grasses such as Kentucky/Canada bluegrass or common timothy will become established on this ecological site. In this situation, slight degradation in the historical climax plant community results in a plant community similar to #2, except that it will also have these non native plants as minor components. If further degradation continues, these species will continue to increase and replace more desirable native species. Biomass production and litter become slightly reduced on the site with Communities 2 and 3, 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 leafy spurge, dalmation toadflax, and sulphur cinquefoil. The following plant communities are the result of long-term, heavy, continuous season long grazing and/or heavy, annual, early spring grazing. Repeated grazing during a grass' critical growth periods depletes stored carbohydrates, resulting in weakening and eventual death of the cool season tall and medium grasses. These plant communities can occur throughout the pasture, on spot grazed areas, and near water sources where season-long grazing patterns occur. It is critical at this point to consider implementing a change in grazing management to prevent further degradation to any of the following plant communities and minimize the increase of less desirable and non native species. Once any of the following communities become established, the potential to return to communities 1, 2, or 3 is reduced and often requires a significant amount of time along with economic inputs.

State 4
Sedges, Mid and Short Increaser Grasses, Increaser Forbs, Fringed Sagewort, Creeping Juniper

Community 4.1
Sedges, Mid and Short Increaser Grasses, Increaser Forbs, Fringed Sagewort, Creeping Juniper

With continued heavy disturbance, the site will become dominated by species such as threadleaf or needleleaf

sedge, Idaho fescue, needleandthread, thickspike or western wheatgrass, green sagewort, and increaser forbs such as scurfpeas. There may still be remnant amounts of some of the late-seral species such as rough fescue, bluebunch wheatgrass and green/Columbia needlegrass present. The taller grasses will occur only occasionally, often within creeping juniper plants. Palatable forbs will be mostly absent. Dense clubmoss will begin to be abundant on soils having either loamy, silty, or sandy textures. Creeping juniper becomes common. Shrubby cinquefoil can become a significant component, particularly in the higher moisture areas (> 17 inches precipitation) of this MLRA/RRU.

State 5
Sedges, Mid and Short Grasses, Increaser Forbs, Non-Native Grasses, Fringed Sagewort

Community 5.1
Sedges, Mid and Short Grasses, Increaser Forbs, Non-Native Grasses, Fringed Sagewort

As heavy disturbance continues, plant community 3 deteriorates to one similar to community number 4, except that non-native bluegrasses (Kentucky/Canada) and/or common timothy become more abundant, often comprising about 25 percent or more of the composition. These last 2 plant communities (4 & 5) are often less productive than Plant Communities 1, 2, or 3. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evapotranspiration rates, 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. Communities 4 and 5 will respond positively to improved grazing management, but significant economic inputs and time will usually also be needed to move them toward a higher successional stage. Once plants such as Kentucky or Canada bluegrass or timothy become established, they are very difficult to remove and replace by grazing management alone. Additionally, the chances for success are significantly reduced.

State 6
Short Grasses, Half Shrubs, Cactus, Annuals, Weedy Forbs, and Shrub

Community 6.1
Short Grasses, Half Shrubs, Cactus, Annuals, Weedy Forbs, and Shrub

Further deterioration of community 3 results in a plant community dominated by undesirable plants such as red threeawn, green sagewort, broom snakeweed, weedy forbs (e.g., thistles), annuals such as cheatgrass and Japanese bromes and sixweeks fescue, pricklypear cactus, threadleaf sedge, and yucca. Dense clubmoss will be common and abundant on medium to lighter textured soils. Creeping juniper can become abundant in the northern part of this MLRU. Frequently, a remnant population of climax species such as rough fescue and bluebunch wheatgrass will occur within the creeping juniper.

State 7
Non-Native Grasses, Weedy Forbs, Clubmoss

Community 7.1
Non-Native Grasses, Weedy Forbs, Clubmoss

Further deterioration of community 5 leads to a plant community dominated by Kentucky/Canada bluegrass and/or common timothy, often comprising 25 to 80 % of the community. Weedy forbs including field chickweed, cudweed sagewort, and pussytoes are abundant and typically comprise the rest of the plant composition. A thick cover of dense clubmoss often completes this community. Occasionally, in places receiving 17 inches or greater precipitation, some short lived native species such as mountain brome can become dominant after major disturbance from grazing or rodent (pocket gopher mainly) activity. Plant communities 6 and 7 have extremely reduced production of desirable native plants. The lack of litter and short plant heights result in higher soil surface temperatures, poor water infiltration rates, and increased evaporation, which gives short grasses, weedy forbs, and invader species a competitive advantage over the cool season tall and medium grasses. These communities have lost most of the attributes of a healthy rangeland, including good infiltration, minimal runoff and erosion, nutrient cycling and energy flow. Inputs such as seeding and/or mechanical treatment practices are generally not recommended as they are generally not practical or feasible because of the steep slopes associated with this

ecological site. Brush management may be used in some, specific situations. Extended rest and prescribed grazing management are the primary practices available to restore these plant communities to a higher successional stage.

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	*Shrub, broadleaf*	0–106	–
	silver sagebrush	ARCAV2	*Artemisia cana ssp. viscidula*	0–106	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–106	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–106	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–106	–
	common snowberry	SYAL	*Symphoricarpos albus*	0–106	–
Grass/Grasslike					
0	**Grasses and Sedges**			1093–1597	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	510–1491	–
	rough fescue	FECA4	*Festuca campestris*	291–1278	–
	Idaho fescue	FEID	*Festuca idahoensis*	146–319	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–213	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–213	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–168	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	73–106	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–106	–
	Sandberg bluegrass	POSE	*Poa secunda*	73–106	–
	blue grama	BOGR2	*Bouteloua gracilis*	73–106	–
	big quakinggrass	BRMA	*Briza maxima*	0–106	–
	needleleaf sedge	CADU6	*Carex duriuscula*	73–106	–
	threadleaf sedge	CAFI	*Carex filifolia*	73–106	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	73–106	–
	Parry's oatgrass	DAPA2	*Danthonia parryi*	0–106	–
	poverty oatgrass	DASP2	*Danthonia spicata*	73–106	–
	tufted wheatgrass	ELMA7	*Elymus macrourus*	37–95	–
	western wheatgrass	PASM	*Pascopyrum smithii*	37–95	–
	Grass, perennial	2GP	*Grass, perennial*	0–73	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	18–54	–
	Columbia needlegrass	ACNEN2	*Achnatherum nelsonii ssp. nelsonii*	18–54	–
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	18–54	–
	green needlegrass	NAVI4	*Nassella viridula*	18–54	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
Forb					
0	**Forbs**			73–319	

	leafy wildparsley	MUDI	*Musineon divaricatum*	0–106	–
	beardtongue	PENST	*Penstemon*	0–106	–
	spiny phlox	PHHO	*Phlox hoodii*	0–106	–
	scurfpea	PSORA2	*Psoralidium*	0–106	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–106	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–106	–
	American vetch	VIAM	*Vicia americana*	0–106	–
	Forb, perennial	2FP	*Forb, perennial*	0–106	–
	common yarrow	ACMI2	*Achillea millefolium*	0–106	–
	pale agoseris	AGGL	*Agoseris glauca*	0–106	–
	onion	ALLIU	*Allium*	0–106	–
	pussytoes	ANTEN	*Antennaria*	0–106	–
	aster	ASTER	*Aster*	0–106	–
	milkvetch	ASTRA	*Astragalus*	0–106	–
	balsamroot	BALSA	*Balsamorhiza*	0–106	–
	prairie clover	DALEA	*Dalea*	15–106	–
	Bonneville shootingstar	DOCO	*Dodecatheon conjugens*	0–106	–
	coneflower	DRACO3	*Dracopis*	0–106	–
	yellow fritillary	FRPU2	*Fritillaria pudica*	0–106	–
	blanketflower	GAAR	*Gaillardia aristata*	0–106	–
	old man's whiskers	GETR	*Geum triflorum*	0–106	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	0–106	–
	dotted blazing star	LIPU	*Liatris punctata*	15–106	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	0–106	–
	desertparsley	LOMAT	*Lomatium*	0–106	–
	lupine	LUPIN	*Lupinus*	0–1	–
	larkspur	DELPH	*Delphinium*	0–1	–
	deathcamas	ZIGAD	*Zigadenus*	0–1	–

Animal community

Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce a 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 4, 5, 6 and 7. 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 Communities 2 or 3 (Medium and short grasses) occur, 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, particularly if the non native grasses such as Kentucky/Canada bluegrass and/or common timothy, are not significant components.

Plant Communities 4 and 5 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. Reseeding and/or mechanical treatment are sometimes needed along with additional growing season rest for re-establishment of the desired species and to restore the stability and health of the site, especially with Community 5 having a relatively high percentage of non native perennial grasses.

Plant community 6 has a high percentage of non desirable forage species and an extremely limited production of usable forage (< 600 pounds per acre). Community 7 has a high amount of non native perennial grasses that can be good forage, but generally for only a short time during the early part of the grazing season. The bluegrasses and timothy are highly competetive once established. 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! 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 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 & 3) 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 4-7) 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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Date	04/19/2005
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Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slopes most common on this site are between 15–45% and with at least 90% of the soil surface well-covered, rills, if evident will be rare, but may occur in bare areas after extreme convection storms – rills in this case would be narrow and less than 5 feet in length.

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2. **Presence of water flow patterns:** Will be rare, generally, on this site, but with the steeper slopes, and up to 10% bare ground, there may be areas which show accumulations of litter due to water movement, especially after severe storms.

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3. **Number and height of erosional pedestals or terracettes:** Wind and water erosion will be rare on this site, but with the steeper slopes there may be rare plants that could have pedestals which could be 0.5 inch in height.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground should be 10% or less on this site.

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5. **Number of gullies and erosion associated with gullies:** Gully erosion will not be evident on this site.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Appearance or evidence of these erosional features or the landscape would not be present on this site.

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7. **Amount of litter movement (describe size and distance expected to travel):** Because there is little bare ground, litter movement will be minimal at most. Because the site is dominated by the taller bunchgrasses, litter size will reflect the height and diameter of the reproductive culms and leaves of these grasses as well as the lesser dominate mid-size grasses.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Resistance to erosion will be high with soil stability values of 5 or 6 under plant canopies; areas of bare soil on this site may have values between 1 and 4 if not under plant canopy.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is granular; A horizon depth is 2 – 4”.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Dominance of taller, deep rooted bunchgrasses will maximize infiltration and minimize runoff throughout the site.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Will not be present generally, but there may be areas that have “healed” from former bison trails and wallows as well as more current livestock trails which could have a compaction layer below the soil surface.

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

    Dominant: Cool season, taller grasses (bluebunch wheatgrass, rough fescue)

    Sub-dominant: cool season mid-grasses (needle and thread, Idaho fescur) > shrubs > cool season rhizomatous grasses (thickspike wheatgrass) = warm season bunchgrass (plains muhly) > cool season short grasses (Sandberg bluegrass) = perennial forbs > warm season shortgrass (blue grama).

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Will be low for all functional groups in a given year. Prolonged droughts which last more than 3 years may show increases in mortality and decadence for all plant groups.

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14. **Average percent litter cover (%) and depth (in):** This site has thin litter cover of 50 to 60 percent.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1300 - 1900 #/acre. This would be the expected production for the reference state during adequate moisture years. 1700 pounds would be the expected production in a 17 inch precipitation zone.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Dense clubmoss, blue grama, Kentucky bluegrass, Canada bluegrass, red threeawn, field brome, a variety of annual or biennial weedy forbs, fringed sagewort, broom snakeweed, prickly pear cactus, yucca, cheatgrass.

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17. **Perennial plant reproductive capability:** During adequate moisture years bunchgrasses will generally produce seeds, however the cool season rhizomatous grasses may not necessarily produce seed even with adequate moisture.
