

Ecological site R046XN248MT **Overflow (Ov) 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.

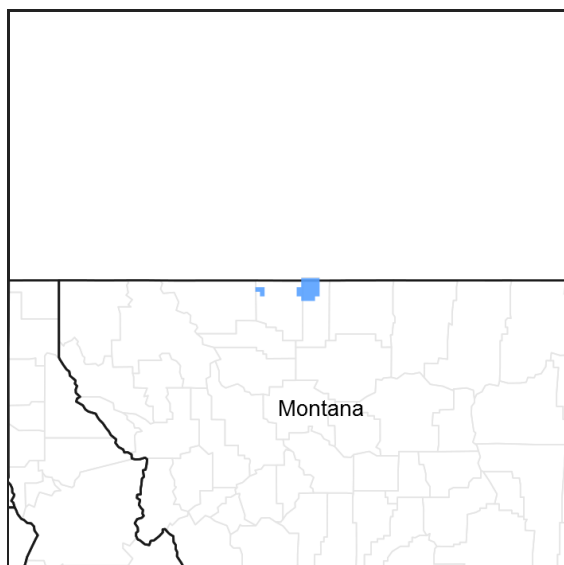


Figure 1. Mapped extent

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
R046XN249MT	Sandy (Sy) RRU 46-N 13-19 PZ
R046XN252MT	Silty (Si) RRU 46-N 13-19 PZ
R046XN256MT	Subirrigated (Sb) RRU 46-N 13-19 PZ
R046XN262MT	Wet Meadow (WM) RRU 46-N 15-19 PZ
R046XN594MT	Silty Steep (SiStp) RRU 46-N 13-19 PZ

Similar sites

R046XN262MT	Wet Meadow (WM) RRU 46-N 15-19 PZ The Wet Meadow site differs mainly by being wet to at or near the surface for most of the growing season.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	(1) <i>Leymus cinereus</i> (2) <i>Pascopyrum smithii</i>
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Physiographic features

This ecological site occurs in swales and narrow drainages where it receives more than normal moisture because of run-in from adjacent areas. It is associated mainly with ephemeral streams (those that flow only in direct response to a precipitation event or snow melt, and the water table is lower than the channel bottom).

Table 2. Representative physiographic features

Landforms	(1) Swale (2) Drainageway
Flooding frequency	None to rare
Ponding frequency	None
Slope	0–4%
Water table depth	60 in
Aspect	Aspect is not a significant factor

Climatic features

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	57-84 days
Freeze-free period (characteristic range)	109-120 days
Precipitation total (characteristic range)	15-17 in
Frost-free period (actual range)	37-90 days
Freeze-free period (actual range)	101-122 days
Precipitation total (actual range)	14-17 in
Frost-free period (average)	69 days
Freeze-free period (average)	114 days
Precipitation total (average)	16 in

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

Stream Type: ephemeral, flowing only in direct response to snow melt or precipitation events. Ephemeral streams typically flow less than 30 consecutive days at a time. The bottom of the channel is above the water table at all times. The Rosgen system of classification does not apply to ephemeral systems.

Non-Stream Characteristics: N/A

Soil features

These soils are non-hydric. The soils associated with this ecological site are moderately deep to very deep. Textures will vary since these are alluvial soils, having been deposited by flowing water. Surfaces are often dark due to the supplemental moisture they receive. Available water holding capacity is high. Permeability varies because of the various textures and materials and the depositional patterns.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Sandy loam (3) Clay loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	40 in
Available water capacity (0-40in)	6 in
Electrical conductivity (0-40in)	0 mmhos/cm
Soil reaction (1:1 water) (0-40in)	6.6–8.4

Ecological dynamics

This site developed under Northern Rocky Mountain foothills climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC) or Potential Plant Community. This community is given 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 highly resilient to disturbance as it has essentially no limitations for plant growth, except for growing season. Changes may occur to the Historic Climax Plant Community (HCPC) due to management actions and/or climatic conditions, such as prolonged drought. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments the site can readily return to the Historic Climax Plant Community.

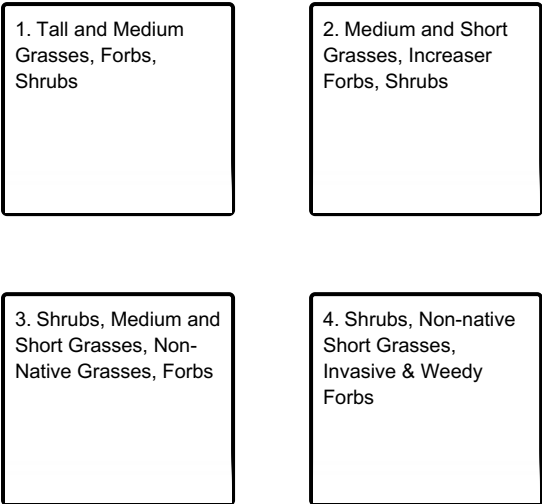
Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller, more palatable species such as basin wildrye, the tall needlegrass species, and bearded/slender wheatgrass. Nebraska or other sedge species may be common in some locations, depending on the site's hydrology. Prairie sandreed can be common on sites that are predominately sandy textured. These plants will be replaced by a mixture of medium (western wheatgrass, needleandthread) and short grasses (prairie junegrass, Sandberg bluegrass) as well as several species of non-palatable forbs. Baltic rush, if present will increase in abundance. Several less desirable forbs, including cudweed sagewort, American licorice, Rocky Mountain iris, goldenrods, and western yarrow. Shrubs such as Wood's rose and snowberry also increase.

Continued deterioration results in an abundance of short grasses, weedy forbs, shrubs, and annuals. Plants that are not a part of the Historic Climax Plant Community that are most likely to invade include quackgrass, Kentucky and Canada bluegrass, timothy, foxtail barley, annual bromes, houndstongue, curlycup gumweed, cocklebur, thistles, dandelion, annual forbs, and other weedy species. Canada thistle, spotted knapweed, sulphur cinquefoil, and dalmation toadflax are potential noxious weed invaders.

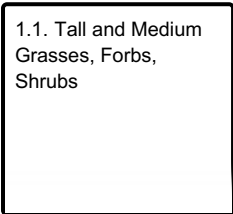
Long-term non-use (>3 years) combined with the absence of fire will result in excessive litter and decadent plants, plus an increase in the amount of shrubs.

State and transition model

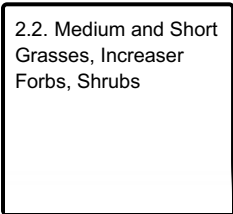
Ecosystem states



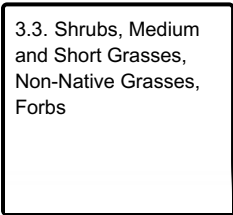
State 1 submodel, plant communities



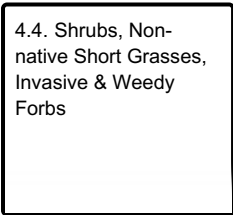
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Tall and Medium Grasses, Forbs, Shrubs

Community 1.1
Tall and Medium Grasses, Forbs, Shrubs

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 diversity of tall and medium height, cool season grasses (basin wildrye, green needlegrass, and slender and bearded wheatgrass). Warm season grasses (prairie cordgrass) may also occasionally be present. Prairie sandreed tends to occur where the soil surfaces are sandy. Sedges (i.e., Nebraska) and rushes (i.e., Baltic) will occur in more favorable sites. There are numerous forbs (geranium, American vetch) that occur in smaller percentages. Shrubs such as western or common snowberry, Wood's rose and occasionally chokecherry, golden currant, Douglas hawthorne, or American plum can be common. 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. The location of this site in the landscape plus the influence of extra water in the early part of the growing season provides a very favorable soil-water-plant relationship. 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. Maintaining good plant cover is necessary for successful management and production and to avoid excessive erosion during runoff events.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1730	2198	2655
Shrub/Vine	530	708	885
Forb	135	235	355
Total	2395	3141	3895

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	14-20%
Grass/grasslike foliar cover	75-85%
Forb foliar cover	1-5%
Non-vascular plants	0-1%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	8-10%
Grass/grasslike basal cover	26-30%
Forb basal cover	2-4%
Non-vascular plants	0-1%
Biological crusts	0%
Litter	55-65%
Surface fragments >0.25" and <=3"	0%

Surface fragments >3"	5-15%
Bedrock	0%
Water	0%
Bare ground	10-20%

Figure 9. Plant community growth curve (percent production by month). MT0815, Cool & warm season grasses on overflow areas. Includes all overflow sites dominated by cool season grass with warm season grasses also present..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	40	20	10	5	0	0	0

State 2

Medium and Short Grasses, Increaser Forbs, Shrubs

Community 2.1

Medium and Short Grasses, Increaser Forbs, Shrubs

Early stages of degradation to the Historic Climax Plant Community, including a beginning response to non-prescribed grazing, will tend to change it to a community represented by an increase in western wheatgrass and western snowberry and other grasses such as needleandthread, Sandberg bluegrass, prairie junegrass, and plains reedgrass. The medium and tall grasses such as basin wildrye, tall needlegrass, bearded/slender wheatgrass will still be present, sometimes in relatively large amounts. Nebraska sedge, if present in Community 1, will tend to decrease. Baltic rush if present initially, will tend to become more abundant. There may be an increase in some non-palatable increaser forbs such as American licorice, horsemint, goldenrods, and cudweed sagewort. Some non-native grasses such as Kentucky or Canada bluegrass, smooth brome, or quackgrass may become present. Biomass production and litter become reduced on the site with as the taller grasses become replaced by shorter ones, especially the non-native grasses. Evapotranspiration tends to increase, moisture retention is reduced, and soil surface temperatures increase. Some natural ecological processes will be altered. This plant community provide for moderate soil stability, increasing the potential for erosion during runoff events. Increased amounts of bare ground can result in undesirable species invading. Common invaders can include Canada thistle, spotted knapweed, dalmation toadflax, sulphur cinquefoil, and leafy spurge. This plant community will readily respond to improved grazing management, but a significant amount of time can be necessary to move it toward a higher successional stage and a more productive plant community similar to community 1.

State 3

Shrubs, Medium and Short Grasses, Non-Native Grasses, Forbs

Community 3.1

Shrubs, Medium and Short Grasses, Non-Native Grasses, Forbs

With continued heavy disturbance, the site will become dominated by western or common snowberry or rose. Western wheatgrass, needleandthread, Sandberg bluegrass and prairie junegrass become more prevalent. Baltic rush will continue to be more abundant. The taller grasses (basin wildrye, tall needlegrass, bearded, and slender wheatgrass) will still be present, but in much smaller amounts. Non-native grasses (Kentucky and Canada bluegrass) can be common. Palatable forbs will be mostly absent, having been replaced by species such as cudweed sagewort, American licorice, goldenrods, Rocky Mountain iris, and western yarrow. Weedy species such as houndstongue, cocklebur, dandelion and Canada thistle become more 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

Shrubs, Non-native Short Grasses, Invasive & Weedy Forbs

Community 4.1

Shrubs, Non-native Short Grasses, Invasive & Weedy Forbs

Further deterioration of community 3 results in a plant community dominated by undesirable plants such as shrubs (snowberry, rose) and non-native short and mid grasses (Kentucky/Canada bluegrass, timothy). Native short grasses such as Sandberg bluegrass will be abundant, as will Baltic rush. Western wheatgrass and needleandthread may still be present. The taller grasses will occur only rarely, often underneath the shrub canopy. Weedy forbs including houndstongue, cocklebur, iris, and goldenrods will be abundant. Invasive forbs (e.g., thistles, leafy spurge, dandelion) are likely to be common. Plant communities 3 and 4 produce less usable forage for wildlife and livestock than the other two described. The continuation of the downward trend and degradation of this site has resulted in higher soil surface temperatures, reduced water infiltration, and higher evapotranspiration. This has resulted in plant species that are more adapted to drier conditions, such as Kentucky or Canada bluegrass. Most of the attributes of a healthy rangeland, including good infiltration, nutrient cycling and energy flow, have been lost. It is critical at this point to implement a grazing strategy that will restore the stability, health, and hydrology of the site. Communities 3 and 4 can respond positively to improved grazing management. However, grazing management alone typically will not be enough to restore the site to one that resembles the HCPC because of the higher percentage of aggressive, less desirable species that can be present. Additional rest, usually for a number of years, can sometimes help with re-establishment of the desired species, depending on the species composition at the time. Kentucky and Canada bluegrass can be very difficult to eliminate once established. It generally takes additional inputs, such as seeding and/or brush management, to move it towards communities similar in production and composition to the HCPC. Because of the potential hazard of accelerated water erosion when the soil surface is not protected by plant cover during an overflow event, the use of seeding will depend on the specific site location and setting.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	Shrubs and Half-shrubs			530–885	
	American plum	PRAM	<i>Prunus americana</i>	0–175	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–175	–
	common snowberry	SYAL	<i>Symphoricarpos albus</i>	0–175	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–175	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	0–1	–
	currant	RIBES	<i>Ribes</i>	0–1	–
	Woods' rose	ROWO	<i>Rosa woodsii</i>	0–1	–
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	0–1	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–1	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–1	–
	Dodge's hawthorn	CRDO3	<i>Crataegus dodgei</i>	0–1	–
Grass/Grasslike					
0	Grasses, Sedges, Rushes			1730–2655	
	basin wildrye	LECI4	<i>Leymus cinereus</i>	530–1415	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	135–530	–
	rough fescue	FECA4	<i>Festuca campestris</i>	0–530	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–355	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–355	–

	porcupinegrass	NEO11	<i>Hesperostipa spartea</i>	0–300	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	66–221	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	66–221	–
	Columbia needlegrass	ACNEN2	<i>Achnatherum nelsonii</i> ssp. <i>nelsonii</i>	66–221	–
	western needlegrass	ACOCO	<i>Achnatherum occidentale</i> ssp. <i>occidentale</i>	66–221	–
	slender wheatgrass	ELTRS	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	68–178	–
	slender wheatgrass	ELTRT	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	68–178	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–175	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–175	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–175	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–175	–
	big quakinggrass	BRMA	<i>Briza maxima</i>	0–175	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0–175	–
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	0–175	–
	clustered field sedge	CAPR5	<i>Carex praeegracilis</i>	0–175	–
Forb					
0	Forbs			135–355	
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–175	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–175	–
	goldenrod	SOLID	<i>Solidago</i>	0–175	–
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	0–175	–
	American vetch	VIAM	<i>Vicia americana</i>	0–175	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–175	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	0–175	–
	silverweed cinquefoil	ARAN7	<i>Argentina anserina</i>	0–175	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–175	–
	aster	ASTER	<i>Aster</i>	0–175	–
	sticky purple geranium	GEVI2	<i>Geranium viscosissimum</i>	27–175	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–175	–
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	0–175	–
	lupine	LUPIN	<i>Lupinus</i>	0–1	–
	larkspur	DELPH	<i>Delphinium</i>	0–1	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–1	–

Animal community

Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce an abundance of high quality forage. This is often a preferred site for grazing by livestock due to the succulent forage, and animals tend to congregate in these areas. In order to maintain the productivity of the Overflow site, grazing on adjoining sites with less production 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 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 is 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 other practices (e.g., seeding), 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, brush management, and/or mechanical treatment on this site should be done in such a way to minimize the potential for water erosion since this site occurs in a swale/waterway.

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

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

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

Wildlife Interpretations: This ecological site is a “hotspot” of biodiversity as a result of extra moisture availability in ephemeral drainageways. The run-in moisture provides more wildlife habitat complexity because of greater plant species and structural diversity compared to surrounding semi-arid uplands. The linear, meandering drainage pattern common to this site connects a wide variety of upland types and provides secure travel corridors for big game and many other wildlife species as they move between required seasonal habitats. Moisture availability and resulting habitat structural diversity provide for the food, cover and nesting needs of resident and transitory neotropical migratory birds. Invasive plant species are common on this site under non-use as well as season-long livestock and big game grazing. Canada thistle, leafy spurge, houndstongue and burdock are often found here. Prescribed grazing strategies can keep native vegetation more competitive with these invasive weeds. Wildlife habitat diversity is often degraded on this site under season-long grazing strategies because livestock are attracted to the green forage, particularly during the dry season. Seeps and springs common in association with this site provide drinking water for many wildlife species as well as habitat for less common invertebrates, reptiles and amphibians, birds and small mammals.

Hydrological functions

The runoff potential for this site is moderate. Runoff curve numbers generally range from 64 to 89. The soils associated with this ecological site are generally in Hydrologic Soil Group B or C. The infiltration rates for these soils will typically be moderate.

Good hydrologic conditions exist on rangelands if plant cover (grass, forb, and shrub, and litter) 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 and 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 and 4) are generally considered to be in poor hydrologic condition and are susceptible to excessive erosion from stream overflow.

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

Because of the biodiversity, varied structure and other features noted in the wildlife section, this site should provide some outstanding opportunities for recreation, such as bird watching. This site provides 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 runoff and other 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
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- Number and extent of rills:** Slopes on this site are between 0 – 2% and with 99 - 100% of the soil surface well-covered there are no rills even with the most extreme convection storms.

- Presence of water flow patterns:** Due to the soil surface being well covered and minimal slope there is no evidence of past or current soil deposition or erosion for this site.

- Number and height of erosional pedestals or terracettes:** Wind and water erosion will not be evident on this site, so pedestals and terracettes will not be present.

- Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground should be less than 1% on this site.

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

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

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 and rhizomatous grasses, 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 6; rare areas of bare soil on this site may have values less than 5 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 5 – 12”.
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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 bunchgrasses (basin wildrye, rough fescue)
- Sub-dominant: cool season mid grasses (Needlegrass spp.) > cool season rhizomatous grasses (western wheatgrass) = shrubs > perennial forbs = sedge spp.
- 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):** Litter cover will be 60 to 65%; often in low depths that may be hard to quantify
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2650 - 3500 #/acre. This would be the expected production for the reference state during adequate

moisture years. 3300 pounds would be the expected production in a 17 inch precipitation zone.

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: Kentucky bluegrass, Canada bluegrass, snowberry, wild rose, cudweed sagewort, pussytoes, a variety of annual or biennial weedy forbs, fringed sagewort, broom snakeweed, clubmoss, japanese brome, cheatgrass, leafy spurge, houndstongue, thistle spp.
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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.
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