USDA Natural Resources
Conservation Service

Ecological site R046XC512MT
Subirrigated (Sb) RRU 46-C 13-19 PZ

Last updated: 7/19/2023
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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.

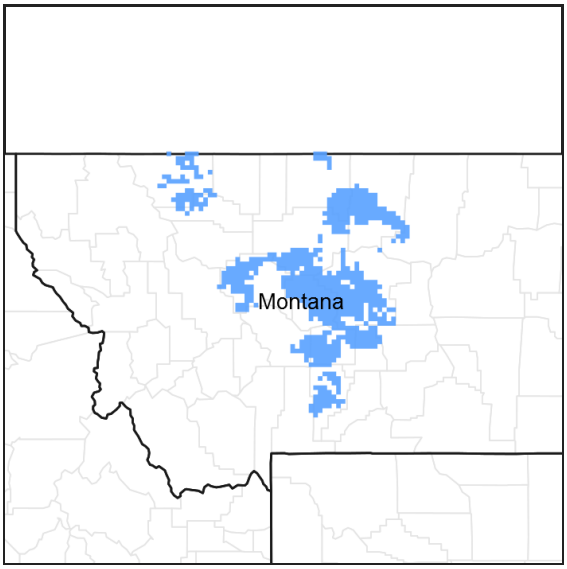

Figure 1. Mapped extent

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

R046XC504MT	**Overflow (Ov) RRU 46-C 13-19 PZ**
R046XC508MT	**Silty (Si) RRU 46-C 13-19 PZ**
R046XC516MT	**Silty Steep (SiStp) RRU 46-C 13-19 PZ**
R046XC518MT	**Wet Meadow (WM) RRU 46-C 15-19 PZ**

Similar sites

R046XC518MT	**Wet Meadow (WM) RRU 46-C 15-19 PZ** The Wet Meadow site differs mainly by being wet to at or near the surface for most of the growing season.
R046XC504MT	**Overflow (Ov) RRU 46-C 13-19 PZ** The Overflow site differs mainly by being associated with ephemeral streams and having no permanent water table.
R046XC520MT	**Riparian Subirrigated (RSb) RRU 46-C 13-19 PZ** The Riparian Subirrigated site differs mainly by being adjacent to perennial or intermittent streams, being frequently flooded, and having a significant component of woody (willow) species.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs on terraces and high floodplain steppes, near springs or seeps, or other areas having a permanent water table close enough to the surface (typically within 3 feet) to influence plant composition and production. Slope is 0–2%, except can be greater when this site occurs on hillslope near a spring/seep. These areas are rarely or non-flooded. Rare flooding indicates that flooding is unlikely, but possible under unusual weather conditions (0–5% chance in any year). These are also considered to be “lentic” (standing water) riparian/wetland areas.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Hill (3) Flood-plain step
Flooding frequency	None to rare
Ponding frequency	None
Slope	0–2%
Water table depth	36 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)	67-87 days
Freeze-free period (characteristic range)	111-124 days
Precipitation total (characteristic range)	15-17 in
Frost-free period (actual range)	53-88 days
Freeze-free period (actual range)	104-126 days
Precipitation total (actual range)	14-19 in
Frost-free period (average)	76 days
Freeze-free period (average)	116 days
Precipitation total (average)	17 in

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

Wetland Description (Cowardin System):

Soil features

These soils are non-hydric. The soils associated with this ecological site are mainly deep to very deep with a permanent water table within about three feet of the surface. They are generally in the aquic moisture regime or aquic intergrade. Free water occurs within about 36" of the surface.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Sandy loam (3) Clay loam
Drainage class	Somewhat poorly drained
Permeability class	Moderate
Soil depth	40 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). This community is described as a reference to understand the original potential of this site, and is not always considered to be the management goal for every acre of rangeland. The following descriptions should enable the landowner or manager to better understand which plant communities occupy their land, and assist with setting goals for vegetation management. It can also be useful to understand the environmental and economic values of each plant community.

This site is considered resilient to disturbance as it has essentially no limitations for plant growth, except for the growing season. Changes may occur to the Historic Climax Plant Community due to management actions and/or climatic conditions, such as a drop in water table level due to prolonged drought conditions. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments, this site can readily return to the Historic Climax Plant Community (HCPC).

Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller, more palatable species such as basin wildrye, prairie cordgrass, bearded/slender wheatgrass, tufted hairgrass, bluejoint and slimstem reedgrass, and Nebraska sedge will occur. These plants will be replaced by a mixture of medium and short grasses, sedges, and rushes including western wheatgrass, meadow barley, mat muhly, clustered field sedge, and Baltic rush as well as several species of non-palatable forbs. Shrubs such as shrubby cinquefoil, snowberry, or rose will also increase.

Continued deterioration results in an abundance of short grasses and short sedges, non-native grasses and forbs, and annuals. A lowering of the water table can also cause a significant change in the plant community. Plants that are not a part of the Historic Climax Plant Community that are most likely to invade are Kentucky, fowl, and Canada bluegrasses, timothy, quackgrass, smooth brome, redtop, Canada thistle, dandelion, leafy spurge, sulfur cinquefoil, annuals, and other weedy species. Purple loosestrife is potentially a serious invader on this site.

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

State and transition model

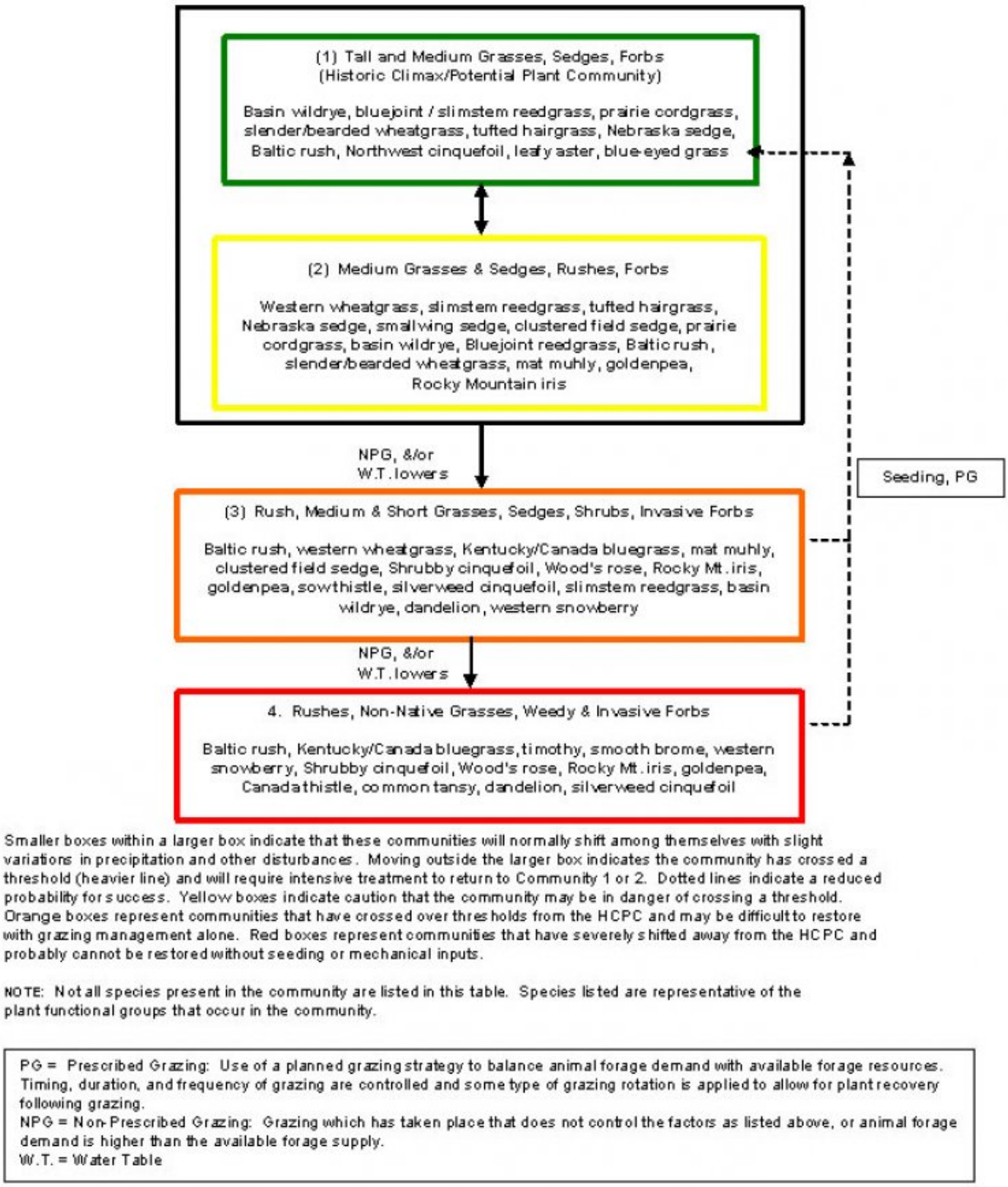

Figure 8. State and Transition Model

State 1
Tall and Medium Grasses, Sedges, Forbs

Community 1.1
Tall and Medium Grasses, Sedges, Forbs

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. The major species include basin wildrye, bluejoint and slimstem reedgrass, prairie cordgrass, slender and

bearded wheatgrass, tufted hairgrass, Nebraska sedge, and various rush species. There are several forbs that will occur in small amounts, including Northwest cinquefoil, leafy aster, and blue-eyed grass. This plant community is well adapted to the Northern Rocky Mountain foothills climatic conditions as well as the presence of a permanent water table. 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, depth to the water table, and temperature). Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable moisture conditions. 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 presence of available water throughout the growing season provides a very favorable soil-water-plant relationship. This plant community provides for soil stability and a properly functioning hydrologic cycle.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3424	4103	4680
Shrub/Vine	0	240	520
Forb	43	288	260
Total	**3467**	**4631**	**5460**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	85-95%
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	0-5%
Grass/grasslike basal cover	36-41%
Forb basal cover	0-2%
Non-vascular plants	0-1%
Biological crusts	0%
Litter	50-60%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-1%
Bedrock	0%
Water	0%
Bare ground	0-1%

Figure 10. Plant community growth curve (percent production by month). MT0816, Permanent water table. All sites with a permanent water table..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	20	20	10	0	0	0

State 2
Medium Grasses and Sedges, Rush, Forbs

Community 2.1
Medium Grasses and Sedges, Rush, Forbs

Early stages of degradation, including non-prescribed grazing, will tend to change the HCPC to a community dominated by medium height grasses (western wheatgrass, slimstem reedgrass, tufted hairgrass) and sedges (smallwing sedge, clustered field sedge). Most of the taller, more palatable grasses and sedges (basin wildrye, bluejoint reedgrass, prairie cordgrass, Nebraska sedge) will still be common, but in smaller percentages. Desirable and nutritious forbs will be replaced by less desirable and more aggressive species (Rocky Mountain iris, goldenpea). Short grasses and grasslikes such as Baltic rush, clustered field sedge, slender beaked sedge, meadow barley and mat muhly will become more common. Biomass production and litter become reduced on the site with as the taller grasses and sedges 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 spotted knapweed, dalmation toadflax, sulphur cinquefoil, and leafy spurge. A key objective at this point is to implement a grazing strategy that prevents further degradation. 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 the HCPC.

State 3
Rush, Medium and Short Grasses and Sedges, Shrubs, Invasive Forbs

Community 3.1
Rush, Medium and Short Grasses and Sedges, Shrubs, Invasive Forbs

As disturbance to the site increases, the community will tend to become dominated by Baltic rush and western wheatgrass, meadow barley, mat muhly, clustered field sedge and other small sedges. Reed canarygrass often moves in and, if present, tends to form a monoculture. The taller grasses and sedges may still be present, but in much smaller amounts. Forbs such as Rocky Mountain iris, goldenpea, sow thistle, and silverweed cinquefoil become abundant. Shrubby cinquefoil, Wood’s rose and western snowberry also become more abundant. Non-native grasses (Kentucky or Canada bluegrass, timothy, redtop) and invasive forbs such as Canada thistle, common tansy, and dandelion often become more common. The non-native species will be benefitted, giving them a competitive advantage if the water table lowers, such as during a prolonged drought. This plant community is the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing, or sometimes a lowering of the water table. 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 has lost many of the attributes of a healthy rangeland. The loss of deep perennial root systems reduces total available moisture for plant growth. Invasive species are often aggressive and competitive with seedlings of native plants. This community can respond positively to improved grazing management but it usually requires additional time and inputs to move it towards a higher successional stage and a more productive plant community.

State 4
Rush, Non-Native Grasses, Invasive Forbs

Community 4.1
Rush, Non-Native Grasses, Invasive Forbs

Further deterioration results in a plant community dominated by Baltic rush. Non-native grasses and forbs (Kentucky/Canada bluegrass, redtop, smooth brome, Canada thistle, and dandelion) will become dominant especially if the water table has lowered. Reed canarygrass can create a monoculture if present. There may still be small, remnant amounts of the taller grasses and sedges present. Nebraska sedge can often be persistent because of its extensive system of roots and rhizomes. Shrubby cinquefoil, Wood's rose and western snowberry will continue to be abundant. Plant community 4 produces less usable forage for wildlife and livestock. 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 and redtop. Most of the attributes of a healthy rangeland, including good infiltration, nutrient cycling and energy flow, have been lost. The objective at this point is 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. 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. Additional rest can sometimes help with re-establishment of the desired species, depending on the species composition at the time. It generally takes additional inputs, such as seeding, to move it towards communities similar in production and composition to the HCPC. This site is often seeded to introduced species for hay or pasture because of its productivity potential and level landscape. Reed canarygrass and "Garrison" creeping foxtail, often along with a legume such as clover or alfalfa, are common components. This plant community is often as productive as the HCPC but is no longer managed as rangeland. Once converted to introduced species, this community will take additional inputs (reseeding) to restore a community similar in composition to that of Plant Community 1 or 2.

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**			0–520	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–260	–
	American plum	PRAM	*Prunus americana*	0–260	–
	chokecherry	PRVI	*Prunus virginiana*	0–260	–
	golden currant	RIAU	*Ribes aureum*	0–260	–
	currant	RIBES	*Ribes*	0–260	–
	Woods' rose	ROWO	*Rosa woodsii*	0–260	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–260	–
	snowberry	SYMPH	*Symphoricarpos*	0–260	–
Grass/Grasslike					
0	**Grass and Grasslikes**			3424–4680	
	basin wildrye	LECI4	*Leymus cinereus*	855–1820	–
	slimstem reedgrass	CAST36	*Calamagrostis stricta*	320–780	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–780	–
	bluejoint	CACA4	*Calamagrostis canadensis*	320–780	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	43–520	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	215–520	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	215–520	–
	meadow barley	HOBR2	*Hordeum brachyantherum*	0–260	–
	clustered field sedge	CAPR5	*Carex praegracilis*	0–260	–
	Grass-like (not a true	2GL	*Grass-like (not a true grass)*	0–260	–

	Grass like (not a true grass)	2GL	*Grass like (not a true grass)*	0–260	
	Grass, perennial	2GP	*Grass, perennial*	0–260	–
	shortawn foxtail	ALAE	*Alopecurus aequalis*	0–260	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–260	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–260	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–260	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–5	–
Forb					
0	**Forbs**			43–260	
	Forb, perennial	2FP	*Forb, perennial*	0–260	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–260	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–260	–
	northern bedstraw	GABO2	*Galium boreale*	0–260	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–260	–
	common cowparsnip	HEMA80	*Heracleum maximum*	0–260	–
	Rocky Mountain iris	IRMI	*Iris missouriensis*	0–260	–
	blue lettuce	LATA	*Lactuca tatarica*	0–260	–
	wild mint	MEAR4	*Mentha arvensis*	0–260	–
	wild bergamot	MOFI	*Monarda fistulosa*	0–260	–
	elephanthead lousewort	PEGR2	*Pedicularis groenlandica*	0–260	–
	slender cinquefoil	POGR9	*Potentilla gracilis*	0–260	–
	curly dock	RUCR	*Rumex crispus*	0–260	–
	mountain blue-eyed grass	SISA4	*Sisyrinchium sarmentosum*	0–260	–
	goldenrod	SOLID	*Solidago*	0–260	–
	alpine leafybract aster	SYFOF	*Symphyotrichum foliaceum var. foliaceum*	0–260	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–260	–

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 this site, stocking rates must be managed carefully on adjoining sites with less production to be sure livestock drift onto the Subirrigated 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.

Heavy stocking and season-long use of this site can be detrimental and will alter the plant community composition and production over time. 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 depth to the water table, weather conditions, and fire frequency.

Grazing this site when the upper part of the soil is wet can cause compaction. Hummocking (frost heaving) is sometimes a feature of this site. The hummocking can be exacerbated if grazing impact becomes excessive.

Whenever Plant Community 2 (medium and short grasses and sedges) occurs, grazing management strategies

need to be implemented to avoid further deterioration. This community is still stable, productive, and healthy provided it receives proper management. This community will respond fairly quickly to improved grazing management including increased growing season rest of key forage plants. Grazing management alone can usually move this community back to one more similar to 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.

The management objective 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, fencing), is usually necessary for re-establishment of the desired native species and to restore the stability and health of the site.

Once established, plants such as Kentucky bluegrass, smooth brome, and Canada thistle are stable and very difficult to remove by grazing alone. The potential for using seeding or mechanical treatment to improve site health can be limited, depending on the depth to the water table.

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. At this point, the primary objective should be to implement a grazing strategy that will restore the stability and health of the site. Additional rest is often a necessary component of this strategy. Seeding and/or mechanical treatment may be necessary, particularly since this community is predominantly non-native, highly competetive species.

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. Runoff curve numbers generally range from 61 to 79. The soils associated with this ecological site are generally in Hydrologic Soil Group B. The infiltration rates for these soils will normally be moderate.

A drop in the water table elevation, such as a result of several years of drought conditions will result in a change in the plant community to more drought tolerant species (often non-native).

Good hydrologic conditions exist on rangelands if plant cover (grass, sedge, 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 Community 3 and 4) are generally considered to be in poor hydrologic condition as the majority of plant cover is from shallow-rooted species such as Kentucky bluegrass.

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 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	03/01/2020
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.

2. **Presence of water flow patterns:** Water flow patterns are not present in the reference condition.

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 0-5%. 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 6 under plant canopies and plant interspaces. The A horizon is 15-20 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 15-20 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 Subirrigated ecological site is slow and is somewhat poorly drained. An even distribution of mid stature grasses (70-80%), cool season grasslikes/bunchgrasses (20-25%) along with rhizomatous grass (<5%), forbs (5-10%), and shrubs (3-5%)

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).

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, cool season, perennial bunchgrasses (Primarily basin wildrye, tufted hairgrass, slender wheatgrass, bluejoint)

    Sub-dominant: grasslikes/shortgrasses (Nebraska sedge, mountain rush) >> forbs > rhizomatous grasses ≥ Shrubs

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers is 3% or less.

14. **Average percent litter cover (%) and depth (in):** Total litter cover ranges from 55 to 65%. Most litter is irregularly distributed on the soil surface and is not at a measurable depth.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production is 4631. Low: 3467 High 5460. Production varies based on effective precipitation and natural variability of soil properties for this ecological site.

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, Kentucky bluegrass, Canada bluegrass, Timothy, smooth brome, yellow toadflax, leafy spurge,
Native species such as Rocky Mountain juniper, ponderosa pine, Douglas fir, lupine, 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.
