USDA Natural Resources Conservation Service

Ecological site R046XN262MT
Wet Meadow (WM) RRU 46-N 15-19 PZ

Last updated: 7/19/2023
Accessed: 04/27/2024

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.

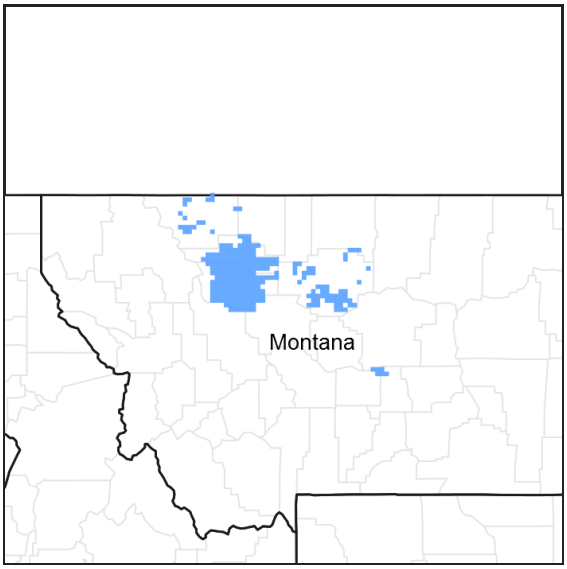


Figure 1. Mapped extent

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

R046XN248MT	**Overflow (Ov) RRU 46-N 13-19 PZ**
R046XN256MT	**Subirrigated (Sb) RRU 46-N 13-19 PZ**

Similar sites

R046XN256MT	**Subirrigated (Sb) RRU 46-N 13-19 PZ** The water table of a Subirrigated site will be deeper, and the water is very seldom at or near the surface. If there is surface water, it will be present for only a short time. The plant community composition will tend to have more grasses and fewer sedges.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex rostrata* (2) *Carex aquatilis var. aquatilis*

Physiographic features

This ecological site typically occurs on nearly level to slightly concave areas that have free water at or near the surface throughout the growing season. It can also occur around the margins of ponds. This site is too wet and poorly aerated (anaerobic) for most plants and cultivated crops, but not wet enough for true aquatics such as cattails. These sites are also called “Lentic” (standing water) wetland/riparian areas.

Table 2. Representative physiographic features

Landforms	(1) Fen (2) Marsh (3) Bog
Flooding duration	Long (7 to 30 days)
Flooding frequency	Rare
Ponding frequency	Occasional to frequent
Slope	1%
Ponding depth	1–4 in
Water table depth	0–24 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

Non-Stream Characteristics (Cowardin System):
No Stream-CHaracteristics.

Soil features

These are deep soils that often have organic (Histic) surfaces or organic profiles. They typically will have free water

within 2 feet of the surface keeping the upper part of the soil very moist or saturated for most of the growing season. These soils are non-saline and non-sodic, but may be calcareous or acidic. These soils are hydric. Surface texture is variable, mainly loamy, sometimes clayey.

Table 4. Representative soil features

Surface texture	(1) Mucky loam (2) Peaty clay
Drainage class	Poorly drained
Permeability class	Moderate to moderately slow
Soil depth	40 in

Ecological dynamics

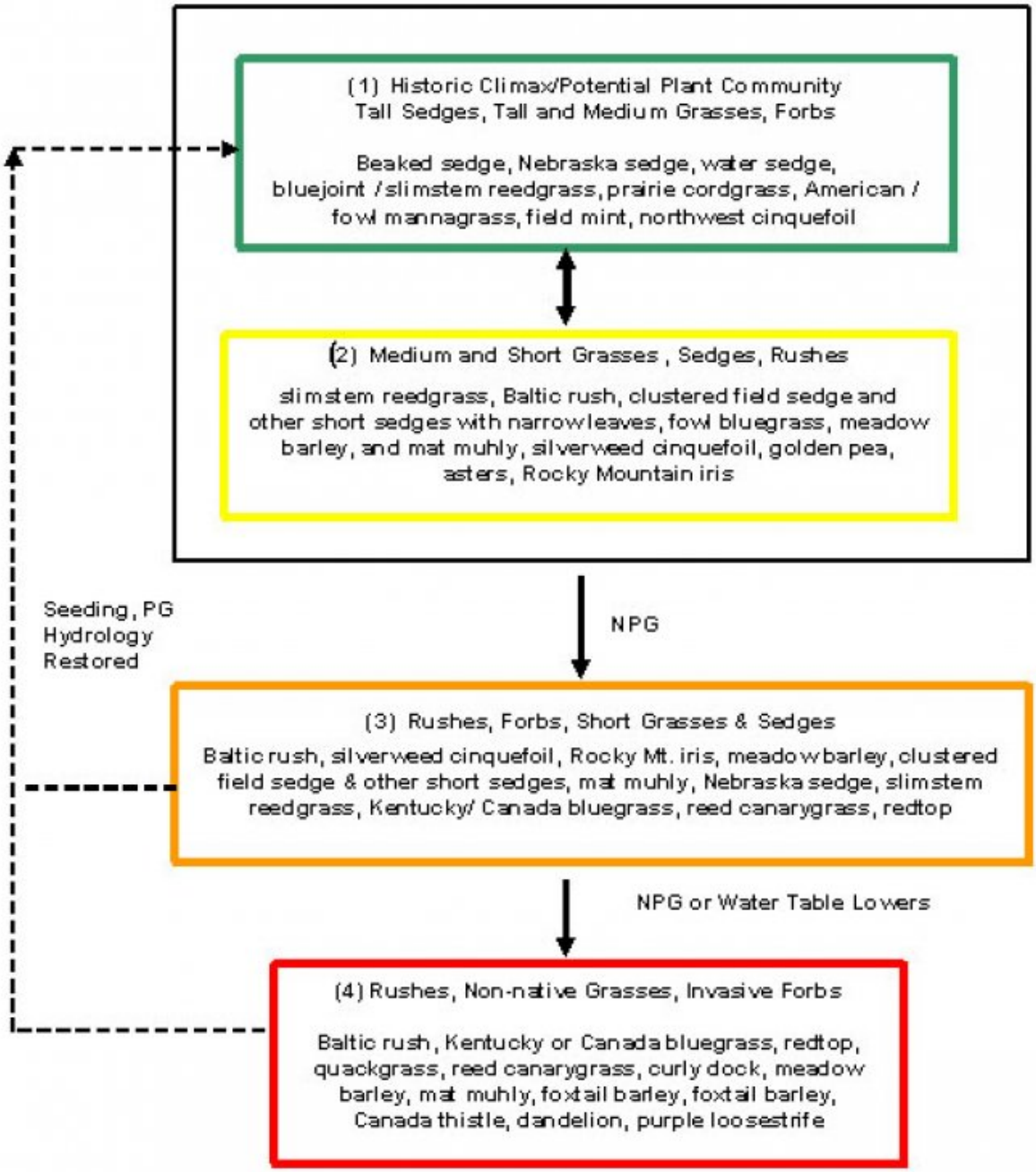
This site developed under Northern Rocky Mountain foothills climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). This community is described 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 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 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, including a change in the hydrology, will result in a departure from the HCPC. A decrease of the tall and medium, palatable species such as beaked, Nebraska, water, and woolly/woolfruit sedges, American and fowl mannagrass, prairie cordgrass, bluejoint and slimstem reedgrass, and tufted hairgrass will occur. These plants will be replaced by a mixture of short sedges, rushes, and grasses, including Baltic rush, western wheatgrass, meadow barley, mat muhly, smallwing, and clustered field sedges as well as several species of non-palatable forbs. Baltic rush often becomes dominant on this site provided that the water table remains at or near its historic levels.

Continued deterioration results in an abundance of short grasses and short sedges, non-native grasses and forbs, and annuals. Plants that are not a part of the Historic Climax Plant Community that are most likely to invade are foxtail barley, Kentucky, Canada, and fowl bluegrass, smooth brome, redtop, Canada thistle, dandelion, curly dock, annuals, and other weedy species. These species often occur when the water table is deeper (lower) than its historic levels. Purple loosestrife, leafy spurge, and sulfur cinquefoil are potentially serious invaders on this site.

State and transition model



Smaller boxes within a larger box indicate that these communities will normally shift among themselves with slight variations in precipitation and other disturbances. Moving outside the larger box indicates the community has crossed a threshold (heavier line) and will require intensive treatment to return to Community 1 or 2. Dotted lines indicate a reduced probability for success. Yellow boxes indicate caution that the community may be in danger of crossing a threshold. Orange boxes represent communities that have crossed over thresholds from the HCPC and may be difficult to restore with grazing management alone. Red boxes represent communities that have severely shifted away from the HCPC and probably cannot be restored without mechanical inputs.

NOTE: Not all species present in the community are listed in this table. Species listed are representative of the plant functional groups that occur in the community.

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 Sedges, Tall and Medium Grasses, Forbs

Community 1.1
Tall Sedges, 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 diversity of tall sedges (beaked, Nebraska, and water) and tall and medium height grasses (bluejoint / slimstem reedgrass, prairie cordgrass, American & fowl mannagrass, bearded/ slender wheatgrass). There are a variety of forbs that occur in smaller percentages, such as willow herbs, goldenpea, field mint and northwest cinquefoil. Because of the anaerobic conditions associated with this site, very few woody species will occur. There may be an incidental willow, or possibly others such as bog birch or silver buffaloberry, usually in slightly drier areas that have more favorable oxygen relationships for their roots. Sedges and rushes are more dominant on wetter phases of this site. Once well established, they provide significant competition, often restricting the establishment of other species. 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 soil properties (depth to permanent water table) and growing conditions (timing and amount of precipitation, temperature). This plant community is well suited to managed livestock grazing and provides diverse habitat for many wildlife species. Plants on this site have strong, healthy root systems that allow production to respond with favorable moisture and 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. This site, because of the permanent water table present, provides a very good soil-water-plant relationship. Maintaining good plant cover is necessary for successful management and production.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	4880	5440	6030
Shrub/Vine	0	160	335
Forb	0	160	335
Total	**4880**	**5760**	**6700**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0-1%
Grass/grasslike foliar cover	80-95%
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	0-1%

Grass/grasslike basal cover	15-25%
Forb basal cover	1-5%
Non-vascular plants	1-5%
Biological crusts	0%
Litter	50-80%
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 and Short Grasses and Sedges, Rushes, Forbs

Community 2.1
Medium and Short Grasses and Sedges, Rushes, Forbs

Slight degradation in the Historic Climax Plant Community, including a response to non-prescribed grazing, will tend to change the HCPC to a community represented by an increase in plants such as slimstem reedgrass, Baltic rush, clustered field sedge and other short sedges with narrow leaves, fowl bluegrass, meadow barley, and mat muhly and forbs such as silverweed cinquefoil, golden pea, asters, and Rocky Mountain iris. The tall and medium sedges (beaked, Nebraska, and water) and grasses (bluejoint reedgrass, prairie cordgrass, American & fowl mannagrass, bearded/slender wheatgrass) will still be present, sometimes still in relatively large amounts, depending on water table levels. There may be an increase in some non-native species (Kentucky or Canada bluegrass, redtop, timothy), especially if there has also been a lowering of the water table. Biomass production and litter become reduced on the site with as the taller sedges and grasses become replaced by shorter species, 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 purple loosestrife, leafy spurge, and sulfur cinquefoil. 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, particularly if the water table has been altered.

State 3
Rushes, Forbs, Short Grasses, Sedges

Community 3.1
Rushes, Forbs, Short Grasses, Sedges

With continued heavy disturbance, the site will become dominated by Baltic rush and some forbs, provided the hydrology of the site remains somewhat stable. Short grasses and sedges such as meadow barley, clustered field sedge, and mat muhly can also become common. Some climax species such as Nebraska sedge will still be relatively abundant. The taller grasses (bluejoint/northern reedgrass, bearded/slender wheatgrass, American/fowl mannagrass, and prairie cordgrass) will still be present, but in much smaller amounts. Palatable forbs will be mostly absent. Non-native grasses such as Kentucky or Canada bluegrass, fowl bluegrass, redtop, quackgrass, and reed canarygrass tend to become more common. This plant community is the result of either a lowering of the water

table, 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. These grazing patterns can also exacerbate the presence/abundance of soil hummocks, resulting in a change in the hydrologic cycle and function of this ecological site. 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 signinicant amount of time are usually required to move this plant community toward a higher successional stage and a more productive plant community.

State 4
Rushes, Non-Native Grasses, Invasive Forbs

Community 4.1
Rushes, Non-Native Grasses, Invasive Forbs

If heavy disturbance continues and the water table lowers, making the site drier, the plant community can deteriorate to one primarily composed of non-native species such as Kentucky/Canada/fowl bluegrass, redtop, quackgrass, reed canarygrass and short grasses (meadow barley and mat muhly) with Baltic rush being the major remaining wetland species. There may be some other plants normally associated with drier conditions, such as pussytoes and cudweed sagewort present. There will be little of some of the more desirable species such as Nebraska sedge present. Foxtail barley, Canada thistle, and dandelion can be common invaders. Purple loosestrife is potentially a serious invader on this site. Hummocking can become more significant with this plant community, and will help maintain this community by providing a drier soil condition on their tops. 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 and redtop. 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. It generally takes additional inputs, such as seeding, to move it towards communities similar in production and composition to the HCPC. In many locations, this ecological site, because of its favorable moisture and topography, has been seeded to introduced species such as reed canarygrass or “Garrison” creeping foxtail for hay and/or pasture. Once these species have been established, they form a stable, long-lived stand that is extremely difficult and often expensive to restore to previous conditions by grazing management alone.

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**			0–335	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–67	–
	bog birch	BEPUG	*Betula pumila var. glandulifera*	0–67	–
	Woods' rose	ROWO	*Rosa woodsii*	0–67	–
	willow	SALIX	*Salix*	0–67	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–67	–
Forb					
0	**Forbs**			0–335	
	Forb, perennial	2FP	*Forb, perennial*	0–335	–
	silverweed cinquefoil	ARAN7	*Argentina anserina*	61–335	–

	white sagebrush	ARLU	*Artemisia ludoviciana*	0–335	–
	aster	ASTER	*Aster*	61–335	–
	willowherb	EPILO	*Epilobium*	61–335	–
	bedstraw	GALIU	*Galium*	61–335	–
	Rocky Mountain iris	IRMI	*Iris missouriensis*	0–335	–
	wild mint	MEAR4	*Mentha arvensis*	61–335	–
	wild bergamot	MOFI	*Monarda fistulosa*	61–335	–
	slender cinquefoil	POGR9	*Potentilla gracilis*	61–335	–
	western dock	RUAQF	*Rumex aquaticus var. fenestratus*	61–335	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–335	–
Grass/Grasslike					
1	**Sedges and Rushes**			2440–3015	
	bluejoint	CACA4	*Calamagrostis canadensis*	610–1340	–
	American mannagrass	GLGR	*Glyceria grandis*	305–1340	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–670	–
	fowl mannagrass	GLST	*Glyceria striata*	305–670	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	305–670	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	0–670	–
	water whorlgrass	CAAQ3	*Catabrosa aquatica*	61–335	–
	meadow barley	HOBR2	*Hordeum brachyantherum*	61–335	–
	Grass, perennial	2GP	*Grass, perennial*	0–335	–
	bearded wheatgrass	ELCA11	*Elymus caninus*	153–335	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	153–335	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–335	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–335	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–1	–
2	**Sedges and Rushes**			2440–3015	
	beaked sedge	CARO6	*Carex rostrata*	1525–2680	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	610–2010	–
	water sedge	CAAQA	*Carex aquatilis var. aquatilis*	615–1675	–
	shortbeak sedge	CABR10	*Carex brevior*	61–335	–
	woollyfruit sedge	CALA11	*Carex lasiocarpa*	153–335	–
	smallwing sedge	CAMI7	*Carex microptera*	61–335	–
	woolly sedge	CAPE42	*Carex pellita*	153–335	–
	clustered field sedge	CAPR5	*Carex praegracilis*	61–335	–
	sedge	CAREX	*Carex*	0–335	–
	rush	JUNCU	*Juncus*	0–335	–
	knotted rush	JUNO2	*Juncus nodosus*	0–335	–
	poverty rush	JUTE	*Juncus tenuis*	0–335	–
	Torrey's rush	JUTO	*Juncus torreyi*	0–335	–

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 can be a preferred site for grazing by livestock, and animals can tend to congregate in these areas. In order to maintain the productivity of the Wet Meadow 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.

Vegetation is important for this site to maintain its function. A good vegetative cover will help maintain water infiltration, thus maintaining the ground water hydrology. Vegetation around the perimeter acts as a filter for sediment and nutrients that may be carried by surface runoff from the surrounding uplands. For sites that may be surrounding an open water area, good vegetative cover reduces erosion of the shorelines.

This site is extremely sensitive to trampling damage. Grazing this site when soils are wet can cause soil compaction, possibly also contributing to excessive hummocking. Grazing should occur after soils have dried, unless the amount of time the livestock spend on this site can be managed. Grazing a pasture early in the season can be accomplished when upland vegetation is green and high quality, and the meadow area is often colder. Shorter grazing periods and allowing adequate re-growth after grazing are recommended for plant recovery and to reduce damage from excess hummocking or soil compaction.

Livestock can incur foot problems if they have to spend too much time using a wet site. A mineral supplement containing Iodine has been effective in treating this condition. In addition, providing off-site drinking water will significantly reduce the amount of time spent at this site.

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 3 and 4, depending on how long this type of grazing is used as well as other circumstances such as weather conditions and fire frequency.

Whenever Plant Community 2 (medium and short sedges, grasses, rush) 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 community back towards the potential / historic climax community, unless the water table has been lowered, in which case a strategy for restoring the hydrology is also needed.

Plant community 3 is the result of long-term, heavy, continuous grazing, annual, early season grazing, and/or a significant change in the hydrology of the site (i.e., lowering of the water table). 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 becomes critical at this point to implement a grazing strategy that will restore the stability and health of the site and prevent further degradation. 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. The potential for using seeding or mechanical treatment practices 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. Once established, plants such as Kentucky bluegrass, redtop, reed canarygrass, and Canada thistle are very difficult to remove. Grazing management alone is usually not enough to restore the site to one that resembles the HCPC. Re-seeding typically becomes necessary for re-establishment of the desired species, especially with Community 4 having a sizable component of non native perennial grasses. Prescribed grazing needs to be used after seeding to ensure the success and longevity of the practice.

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 high. Runoff curve numbers generally range from 79 to 88. The soils associated with this ecological site are generally in Hydrologic Soil Group D. 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 dryland species, particularly non-native species such as Kentucky bluegrass, redtop, and Canada thistle.

The hydrologic condition of this site has a significant affect on runoff. The hydrologic condition considers the effects of cover, including litter, and management on infiltration. Good hydrologic condition indicates that the site usually has a lower runoff potential. Plant cover and litter helps retain soil moisture for use by the plants. Maintaining a healthy stand of perennial native vegetation with deep root systems will optimize the amount of precipitation that is received, help maintain or increase infiltration rates and reduce runoff.

For arid and semi-arid rangelands, good hydrologic conditions exist if 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 the HCPC (Plant Communities 1 & 2) generally have enough plant cover and litter to optimize infiltration, minimize runoff and erosion, and have a good hydrologic condition. 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. 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 less than good hydrologic condition as the majority of plant cover is from shallow rooted species such as Kentucky bluegrass and redtop.

(Reference: Engineering Field Manual, Chapter 2 and Montana Supplement 4).

Recreational uses

This site provides some recreational opportunities for bird watching. The forbs have flowers that appeal to photographers. This site provides valuable open space and visual aesthetics. Caution should be used because of the wet soils and standing or open water on this site.

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

1. **Number and extent of rills:** Slopes on this site are between 0 – 1% and with 100% of the soil surface well-covered there are no rills even with the most extreme convection storms.

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2. **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.

3. **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.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** There should be no bare ground on this site.

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

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.

7. **Amount of litter movement (describe size and distance expected to travel):** Because there is no bare ground, litter movement will be minimal at most. Because the site is dominated by taller sedges and rhizomatous grasses , litter size will reflect the height and diameter of the reproductive culms and leaves of these grasses and sedges.

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.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure of the A-horizon is granular; O-horizon thickness is at least 1.0 to 4.0 inches.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Due to the dominance of taller, deep rooted bunchgrasses and sedges and the topographic position of this site on the landscape there will not be any runoff. Because the soil profile is saturated throughout the year, infiltration is not an issue – the site is dominated by hydrophytic vegetation.

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.

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 rhizomatous grasses (reedgrasses, mannagrasses)

    Sub-dominant: cool season sedges (Northwest Territory sedge, water sedge, Nebraska) >> cool season grasses (tufted hairgrass) > rush spp. = small sedges (gray sedge) = shrubs = perennial forbs

    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.

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14. **Average percent litter cover (%) and depth (in):** Litter cover is 40 to 50 percent and can be up to 3 inches deep.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 6100 - 6700 #/acre. This would be the expected production for the reference state during adequate moisture years. 6500 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:** Baltic rush, spikerushes, Potentilla spp., redtop, reed canarygrass, quackgrass, meadow barley, foxtail barley, Kentucky/Canada bluegrass, dandelion, curly dock, purple loosestrife, other weedy grasses and forbs.

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17. **Perennial plant reproductive capability:** During most years bunchgrasses, rhizomatous grasses and sedges will generally produce seeds.
