

# Ecological site EX043B15Z955

## Montane Subirrigated Meadow Cryic Northern Rocky Mountain Front

Last updated: 3/04/2024  
Accessed: 04/19/2024

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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.

### MLRA notes

Major Land Resource Area (MLRA): 043B–Central Rocky Mountains

This ecological site currently resides in the Major Land Resource Area (MLRA) 43B Central Rocky Mountains. The area of MLRA 43B is expansive and is further divided into Land Resource Units (LRU). A detailed description of MLRA 43B can be found at: [https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2\\_053624](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624)  
This ecological site resides within the eastern portion of Glacier National Park which resides in MLRA 43B and LRU A – Northern Rocky Mountain Front.

### LRU notes

This ecological site resides within the eastern portion of Glacier National Park which resides in MLRA 43B and LRU A – Northern Rocky Mountain Front.

The landscape is mountains and the landforms include scarp slopes, dip slopes, mountain slopes, drainageways, bog, cirque, U-shaped valley and associated moraine and outwash features. Elevations range 1,000-3,175 meters (3,300-10,500 feet) (mean elevation is 1,900 m. or 6,200 ft.). The climate is cold and wet with mean annual precipitation of 1,050 mm (41 in.) and mean annual air temperature of 3 degrees C. (37 degrees F.) with a soil temperature regime of cryic and soil moisture regime of udic or ustic. The geology of the area is dominated by Appenkunny and Grinnell argillite, Kootenai formation, Tertiary sedimentary rocks, Missoula group quartzite, glacial drift alluvium, Siyeh limestone and undifferentiated rock. The soils are dominantly moderately deep to very deep that formed from a variety of sedimentary rock parent materials on moderately steep to very steep mountain slopes. Soils fall into three soil orders: Inceptisols, Mollisols, and Alfisols. Most soils are loamy-skeletal and many, especially in the eastern part, contain significant amounts of calcium carbonate influencing both physical and chemical soil characteristics (horizons of calcium carbonate accumulation and corresponding alkaline pH values). Rock outcrop, rubble land, and surface rock fragments are common. There are few lakes but has numerous major drainages including Dearborn, Sun, Teton, Birch, Badger, Two Medicine, St. Maries, South and Middle Fork Flathead headwaters, Blackfoot headwaters. This is a snow dominated system. Wind is a major force shaping climatic patterns and vegetation structure. This area includes forested areas dominated by either Douglas fir, subalpine fir or white bark pine, and range areas dominated by rough fescue, Richardson's needlegrass and bluebunch wheatgrass and assorted forbs.

This is related to the EPA land classification framework of: Level 3- 41 Canadian Rockies. Specifically, it includes Level 4-41a Northern Front.

This area is related predominantly to the USFS Provinces M333Cf Northern Rocky Mountain Front.

### Ecological site concept

This ecological site is found in the montane, at elevations ranging 1500-1600m, 4921 - 5249 ft, on toeslope or backslope positions of ground moraines or alluvial fans. The climate has a total precipitation range of 24 to 25 inches and a frost-free period of 44 days. This ecological site is found in the cryic soil temperature regime and the udic soil moisture regime. This site relates to the Cowardin System as Palustrine N/A Emergent.

The soils associated with this ecological site are mollisols that can range from very poorly drained to moderately

well drained. These are very deep soils, the texture is fine or fine-silty and the parent material is alluvium. There are no redoximorphic features noted probably due to the dark colors of the mollic layer masking them, no ash present, no organic layer, and the argillic layer is 16-90 cm thick, and the mollic layer is 0-10 cm thick. The water table is 20-40 inches from the surface. These soils can be seasonally moist to saturated in the spring, but dry out later in the growing season.

This vegetation community is medium statured, generally less than 25 inches tall and includes a diverse assemblage of grass and forb species. The reference community includes: ebony sedge (*Carex ebenea*), fowl mannagrass (*Glyceria striata*), Nebraska sedge (*Carex nebrascensis*), shortawn foxtail (*Alopecurus aequalis*), mountain rush (*Juncus arcticus* ssp. *Littoralis*), clustered field sedge (*Carex praegracilis*), reed canarygrass (*Phalaris arundinacea*), small camas (*Camassia quamash*) and Lyall's angelica (*Angelica arguta*). Plant species are equally split between those that have a wetland affinity (designated Obligate (always occurs in wetlands) or FACW (usually occur in wetlands)) and those that have an upland affinity (designated FAC (occur in wetlands and non-wetlands) or FACU (usually occur in non-wetlands)). These wet meadows are subirrigated and have a water table between 20-40 inches below the surface. In spring, these areas may be saturated or flooded. Species are adapted to these wet conditions in the early growing season, which dry later in the growing season. The natural disturbances include fire and wildlife grazing. It is tolerant to moderate intensity ground fires and late-season livestock grazing. Intensive grazing can lead to invasion by non-native species including: Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), timothy (*Phleum pratense*), and common dandelion (*Taraxacum officinale*). This degraded state can lead to noxious species occurring which are highly invasive and pose a real threat to the structure and diversity of this meadow.

### Associated sites

EX043B15I954	<p><b>Montane Very Deep Meadow 20-24" PZ Cryic Northern Rocky Mountain Front</b></p> <p>These sites are associated in that they both reside on the ground moraines and alluvial fans east of the Continental Divide within Glacier National Park. The 43B MONTANE VERY DEEP MEADOW is in areas with drier, loamy soils and the 43B MONTANE SUBIRRIGATED MEADOW is in lower areas with subirrigated water, seasonally moist to saturated in the spring, but dry out later in the growing season.</p>
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Carex ebenea</i> (2) <i>Carex nebrascensis</i>

### Legacy ID

R043BX955MT

### Physiographic features

This ecological site is found in the montane, at elevations ranging 1500-1600m, 4921 - 5249 ft, on toeslope or backslope positions of ground moraines or alluvial fans.



Figure 1.

Table 2. Representative physiographic features

Landforms	(1) Valley > Ground moraine (2) Valley > Alluvial fan
Flooding frequency	None to rare
Elevation	4,921–5,249 ft
Slope	0–5%
Water table depth	20–40 in
Aspect	W, NW, N, NE, E, SE, S, SW

### Climatic features

This ecological site is found in the cryic soil temperature regime and the udic soil moisture regime. Cryic soils have average annual temperature less than 8 degrees C, with less than 5 degrees C difference from winter to summer. Udic soil moisture regime denotes that the rooting zone is usually moist throughout the winter and the majority of summer.

#### SUMMARY ST. MARY CLIMATE STATION:

Mean Average Precipitation 31-63 inches

Mean Average Annual Temperature 34-43 degrees

Frost free days: 30-70

Relative Effective Annual Precipitation: 30-65 inches

Table 3. Representative climatic features

Frost-free period (characteristic range)	44 days
Freeze-free period (characteristic range)	96 days
Precipitation total (characteristic range)	24-25 in
Frost-free period (actual range)	44 days
Freeze-free period (actual range)	96 days
Precipitation total (actual range)	24-25 in
Frost-free period (average)	44 days
Freeze-free period (average)	96 days
Precipitation total (average)	25 in

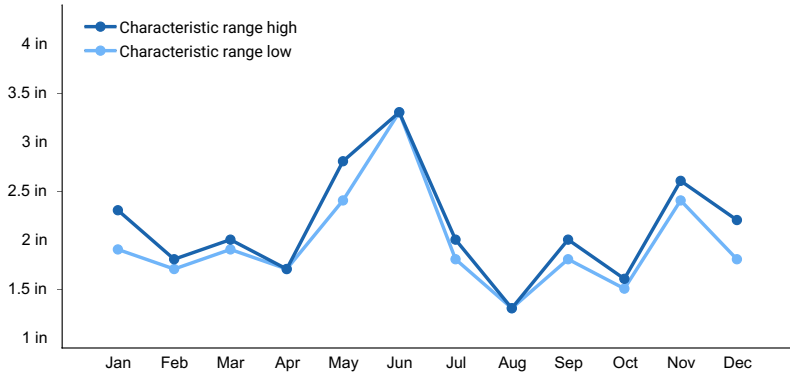


Figure 2. Monthly precipitation range

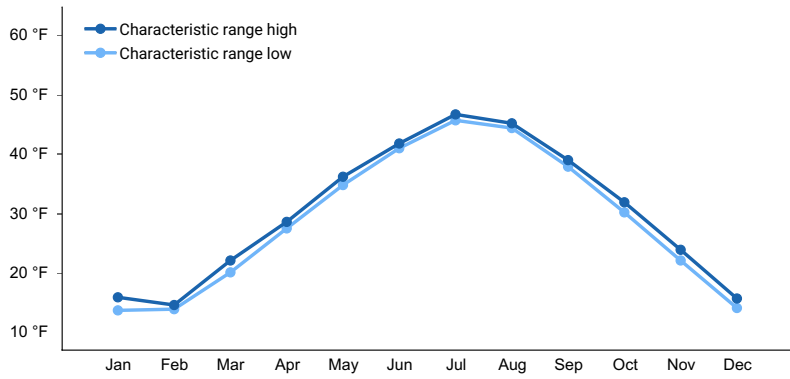


Figure 3. Monthly minimum temperature range

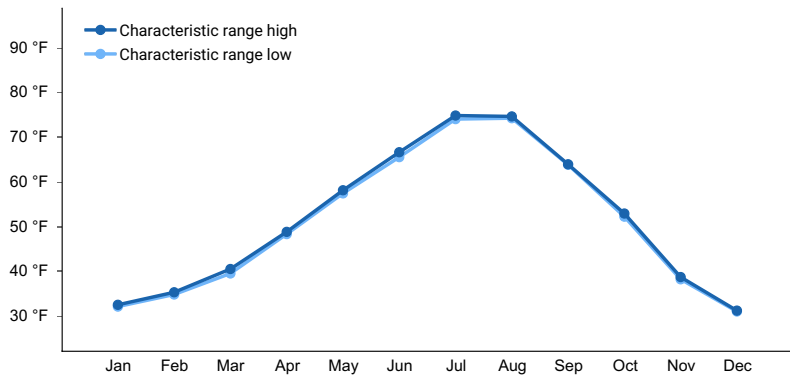


Figure 4. Monthly maximum temperature range

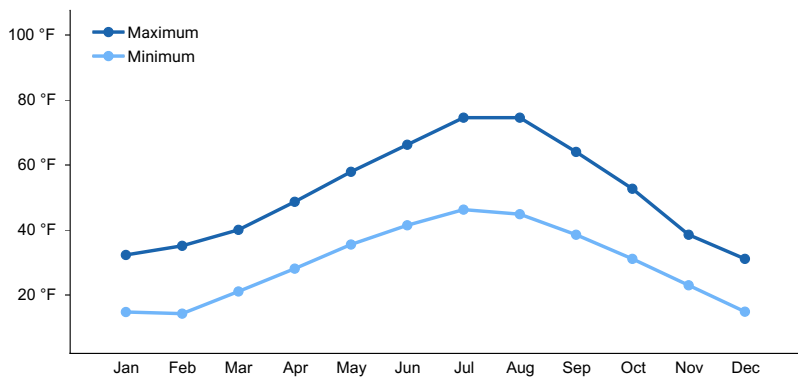
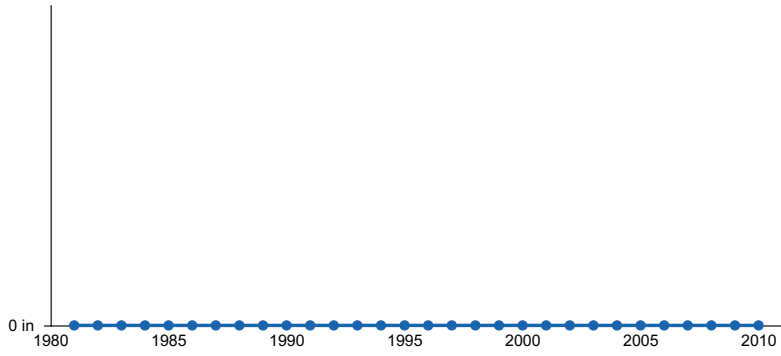
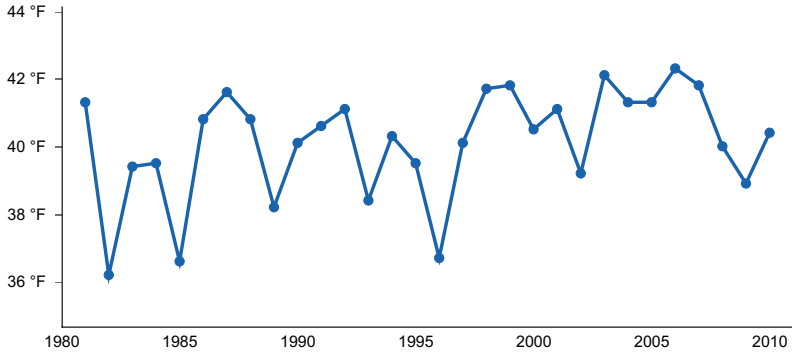


Figure 5. Monthly average minimum and maximum temperature



**Figure 6. Annual precipitation pattern**



**Figure 7. Annual average temperature pattern**

**Climate stations used**

- (1) ST. MARY 1 SSW [USW00004130], Babb, MT
- (2) EAST GLACIER [USC00242629], East Glacier Park, MT

**Influencing water features**

Water Table at 20 to 40 inches

**Wetland description**

(Cowardin System) Palustrine N/A Emergent



**Figure 8.**

**Soil features**

The soils associated with this ecological site are mollisols that can range from very poorly drained to moderately well drained. These are very deep soils, the texture is fine or fine-silty and the parent material is alluvium. There are no redoximorphic features noted probably due to the dark colors of the mollic layer masking them, no ash present, no organic layer, and the argillic layer is 16-90 cm thick, and the mollic layer is 0-10 cm thick. The water table is 20-40 inches from the surface. These soils can be seasonally moist to saturated in the spring, but dry out later in the growing season.



Figure 9.



Figure 10.



Figure 11.



Figure 12.

Table 4. Representative soil features

Parent material	(1) Alluvium–metasedimentary rock
Surface texture	(1) Silty clay loam (2) Clay loam
Drainage class	Very poorly drained to moderately well drained
Permeability class	Moderate
Soil depth	60–100 in
Soil reaction (1:1 water) (6.2-7.2in)	Not specified

## Ecological dynamics

This vegetation community is medium statured, generally less than 25 inches tall and includes a diverse assemblage of grass and forb species. Plant species are equally split between those that have a wetland affinity (designated Obligate (always occurs in wetlands) or FACW (usually occur in wetlands)) and those that have an upland affinity (designated FAC (occur in wetlands and non-wetlands) or FACU (usually occur in non-wetlands)). These wet meadows are subirrigated and have a water table between 20-40 inches below the surface. In spring, these areas may be saturated or flooded. Species are adapted to these wet conditions in the early growing season, which dry later in the growing season. The natural disturbances include fire and wildlife grazing. It is tolerant to moderate intensity ground fires and late-season livestock grazing. Intensive grazing can lead to invasion by non-native species including: Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), timothy (*Phleum pratense*), and common dandelion (*Taraxacum officinale*). This degraded state can lead to noxious species occurring which are highly invasive and pose a real threat to the structure and diversity of this meadow.

NATIVE SPECIES PRESENT: ebony sedge (*Carex ebenea*)-fowl mannagrass (*Glyceria striata*)-Nebraska sedge (*Carex nebrascensis*)-shortawn foxtail (*Alopecurus aequalis*)-mountain rush (*Juncus arcticus* ssp. littoralis) - clustered field sedge (*Carex praegracilis*) - reed canarygrass (*Phalaris arundinacea*) small camas (*Camassia quamash*) - Lyall's angelica (*Angelica arguta*).

WEEDY SPECIES PRESENT: Timothy (*Phleum pratense*)-(Kentucky bluegrass (*Poa pratensis*)/common dandelion (*Taraxacum officinale*)-Clover (Trifolium species)-common tansy (*Tanacetum vulgare*)-Queen Anne's lace (*Daucus carota*)-smooth brome (*Bromus inermis*)-intermediate wheatgrass (*Thinopyrum intermedium*)).

STATE 1: Historic reference state which is defined by the species with wetland affinity, to some degree, that have been found at current times.

STATE 2: Current reference state with very low cover of weedy species present. This state is defined by the native species with some wetland affinity (designated Obligate, FACW, and FAC) that occur at sites in State 3.

STATE 3: Current state in which defining species are present, but the high cover of weedy species precludes adding this community to STATE 2.

COMMUNITY PHASE 1.1:

DOMINATED BY: Timothy (*Phleum pratense*)-(Kentucky bluegrass (*Poa pratensis*)/common dandelion (*Taraxacum officinale*)-Clover (*Trifolium* species)-common tansy (*Tanacetum vulgare*)-Queen Anne’s lace (*Daucus carota*)-smooth brome (*Bromus inermis*)-intermediate wheatgrass (*Thinopyrum intermedium*)).

NATIVE SPECIES: ebony sedge (*Carex ebenea*)-fowl mannagrass(*Glyceria striata*)-Nebraska sedge (*Carex nebrascensis*)-shortawn foxtail (*Alopecurus aequalis*)-mountain rush (*Juncus arcticus* ssp. littoralis)- clustered field sedge (*Carex praegracilis*)- reed canarygrass (*Phalaris arundinacea*) small camas (*Camassia quamash*)- --Lyll’s angelica (*Angelica arguta*)-SOLIDAGO-twin arnica (*Arnica sororia*)-slender cinquefoil (*Potentilla gracilis*)-common yarrow (*Achillea millefolia*)-northern bedstraw (*Galium boreale*)-vicia –Virginia strawberry (*Fragaria virginiana*)-SENECIO.

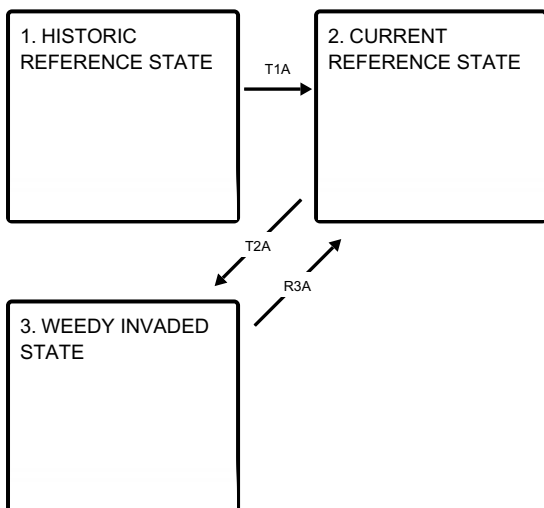
This vegetation community has a variety of grass and forb species with wetland affinities with designations of Obligate or FACW. These are indicative of the moist nature of these meadows. These are subirrigated ecological sites with water table ranging 20-40 inches from the surface. Species designated as OBLIGATE to wetlands include: fowl mannagrass, Nebraska sedge, and shortawn foxtail. Species designated as having a wetland affinity but can survive outside of wetlands are FACW and include: small camas, Lyall’s angelica, mountain rush and clustered field sedge. Other species that are typical of montane meadows and are more upland species (designated FAC, FACU) include: twin arnica, slender cinquefoil, common yarrow, northern bedstraw, Virginia strawberry and solidago, senecio and vicia species.

This vegetation community is generally medium statured with all plants under 25 inches in height. There are two layers of grass and forbs species. The taller layer ranges 10-25 inches tall and can include: shortawn foxtail, ebony sedge, mountain rush, Lyall’s angelica, fowl mannagrass, Nebraska sedge, clustered field sedge, reed canarygrass, common yarrow, small camas, solidago species and slender cinquefoil. The shorter layer is 10 inches and lower and can include: Lyall’s penstemon (*Penstemon lyallii*), Starry false lily of the valley (*Maianthemum stellatum*), northern bedstraw, twin arnica, senecio species and vicia species.

Community Phase Pathway 1.1.A  
Community Phase Pathway 1.1B

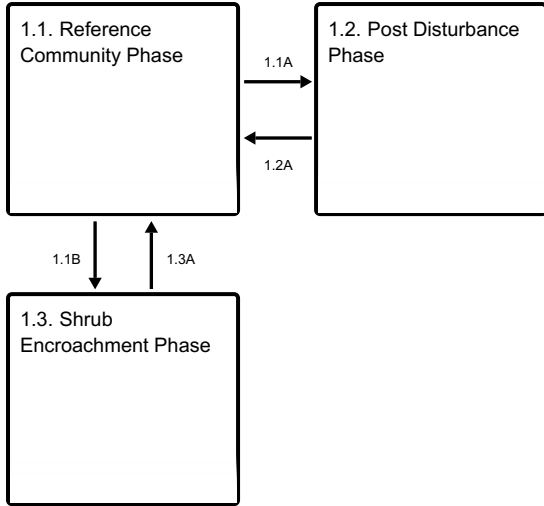
State and transition model

Ecosystem states

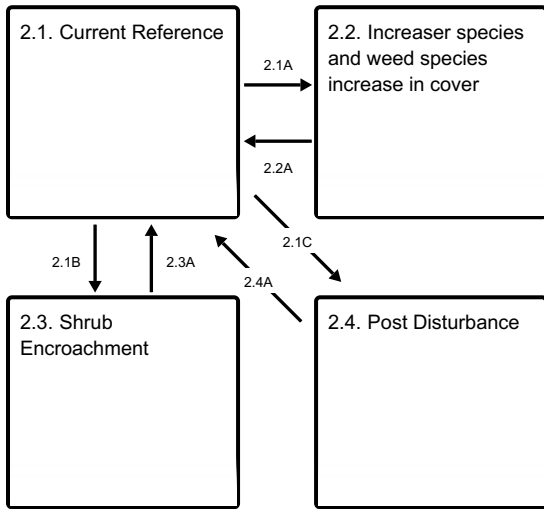




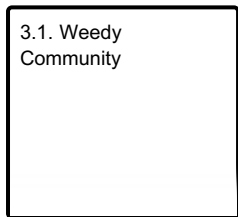
**State 1 submodel, plant communities**



**State 2 submodel, plant communities**



**State 3 submodel, plant communities**



**State 1  
HISTORIC REFERENCE STATE**

STATE 1: Historic reference state which is defined by the species with wetland affinity, to some degree, that have been found at current times.

**Community 1.1  
Reference Community Phase**

NATIVE SPECIES: ebony sedge (*Carex ebenea*)-fowl mannagrass(*Glyceria striata*)-Nebraska sedge (*Carex nebrascensis*)-shortawn foxtail (*Alopecurus aequalis*)-mountain rush (*Juncus arcticus* ssp. littoralis)- clustered field sedge (*Carex praegracilis*)- reed canarygrass (*Phalaris arundinacea*)/ small camas (*Camassia quamash*)- --Lyall's angelica (*Angelica arguta*)-SOLIDAGO-twin arnica (*Arnica sororia*)-slender cinquefoil (*Potentilla gracilis*)-common yarrow (*Achillea millefolia*)-northern bedstraw (*Galium boreale*)-vicia –Virginia strawberry (*Fragaria virginiana*)-  
SENECIO.

## **Community 1.2**

### **Post Disturbance Phase**

After fire, sedges species will resprout as long as the fire did not penetrate into the root layer of the soil severely. Wind blown seed of herbaceous seedlings will establish and many shrubs will resprout.

## **Community 1.3**

### **Shrub Encroachment Phase**

Shrubby cinquefoil and common snowberry and other shrub species encroach from the periphery into the interior of the subirrigated meadow.

## **Pathway 1.1A**

### **Community 1.1 to 1.2**

1.1A - Fire during times of drought during which extended dry conditions cause water tables to lower and vegetation to become extremely dry and flammable.

## **Pathway 1.1B**

### **Community 1.1 to 1.3**

1.1B - During times of drought shrub species may encroach from the periphery to the interior of the subirrigated meadow.

## **Pathway 1.2A**

### **Community 1.2 to 1.1**

1.2A - Time without disturbance

## **Pathway 1.3A**

### **Community 1.3 to 1.1**

1.3A - Shrub removal or flooding with long enough duration to kill shrubs within the interior of the subirrigated meadow.

## **State 2**

### **CURRENT REFERENCE STATE**

STATE 2: Current reference state with very low cover of weedy species present. This state is defined by the native species with some wetland affinity (designated Obligate, FACW, and FAC) that occur at sites in State 3.

## **Community 2.1**

### **Current Reference**





ebony sedge (*Carex ebenea*)-fowl mannagrass(*Glyceria striata*)-Nebraska sedge (*Carex nebrascensis*)-shortawn foxtail (*Alopecurus aequalis*)-mountain rush (*Juncus arcticus* ssp. littoralis)- clustered field sedge (*Carex praegracilis*)- reed canarygrass (*Phalaris arundinacea*) small camas (*Camassia quamash*)- --Lyll's angelica (*Angelica arguta*)-SOLIDAGO-twin arnica (*Arnica sororia*)-slender cinquefoil (*Potentilla gracilis*)-common yarrow (*Achillea millefolia*)-northern bedstraw (*Galium boreale*)-vicia –Virginia strawberry (*Fragaria virginiana*)- SENECIO. VERY LOW COVER OF WEEDS.

## **Community 2.2**

### **Increaser species and weed species increase in cover**

Increaser species such as foxtail barley, Nebraska sedge, mountain rush increase in cover in response to overgrazing or drought or other disturbance, as well as weed species.

## **Community 2.3**

### **Shrub Encroachment**

Shrubs such as common snowberry and shrubby cinquefoil penetrate from the periphery to the interior of meadows, establish and increase cover.

## **Community 2.4**

### **Post Disturbance**

After fire, sedges species will resprout as long as the fire did not penetrate into the root layer of the soil severely. Wind blown seed of herbaceous seedlings will establish and many shrubs will resprout.

## **Pathway 2.1A**

### **Community 2.1 to 2.2**

Overgrazing and/or drought

## **Pathway 2.1B**

### **Community 2.1 to 2.3**

Lowerin of water tables due drought and encrachment of shrubs from periphery to interior of meadow.

## **Pathway 2.1C**

### **Community 2.1 to 2.4**

fire

## **Pathway 2.2A**

### **Community 2.2 to 2.1**

Prescribed grazing practices and /or cessation of drought and return to normal climatic conditions.

### **Pathway 2.3A** **Community 2.3 to 2.1**

Shrub eradication methods and restoration methods to increase native sedge community.

### **Pathway 2.4A** **Community 2.4 to 2.1**

time without disturbance

## **State 3** **WEEDY INVADED STATE**

STATE 3: Current state in which defining species are present, but the high cover of weedy species precludes adding this community to STATE 2.

### **Community 3.1** **Weedy Community**

Weed species dominate the native plant community and changes in soil chemistry, biotic composition and other attributes may be irreversible. Spotted Knapweed (*Centaurea stoebe*)-Timothy (*Phleum pratense*)-(Kentucky bluegrass (*Poa pratensis*)/common dandelion (*Taraxacum officinale*)-Clover (*Trifolium* species)-common tansy (*Tanacetum vulgare*)-Queen Anne's lace (*Daucus carota*)-smooth brome (*Bromus inermis*)-intermediate wheatgrass (*Thinopyrum intermedium*)

### **Transition T1A** **State 1 to 2**

Weed species propagules are introduced into the historic native vegetation community and establish.

### **Transition T2A** **State 2 to 3**

Weed species are present in high numbers at most sites seen throughout the range of natural variability of this site across the landscape.

### **Restoration pathway R3A** **State 3 to 2**

Extreme weed eradication and restoration with native plant species needed to restore to the native current reference state with very low numbers of weed presence.

## **Additional community tables**

### **Other references**

#### References

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## **Contributors**

Stephanie Shoemaker

## **Approval**

Kirt Walstad, 3/04/2024

## **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.

Author(s)/participant(s)	
Contact for lead author	
Date	04/19/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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):**

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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:

Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth ( in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**

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