USDA Natural Resources
Conservation Service

Ecological site R043BP816MT
Subirrigated Sagebrush Shrubland Group

Last updated: 3/01/2024
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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

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The Central Rocky Mountains (MLRA 43B) of Montana occupy some 28,850 square miles and exist primarily in Central and SW portions of the state. The climate is extremely variable with precipitation lows of 9 to 100 inches per year and frost free days of less than 30 to over 110 days. The geology of the region is also highly variable. The combination of variable climate and geology create a complex relationship of plant communities. MLRA 43B elevations typically exist between 6000 and 12,799ft at Granite Peak (the highest point in Montana).

The Continental Divide runs through this MLRA effectively splitting its watershed to contribute to either the Missouri River to the East and the Columbia River to the West.

Ecological site concept

• Site receives additional water
• This site occurs on low terraces adjacent to flood plains of perennial or intermittent streams (though not in the floodplain), near springs and seeps, or other areas having a permanent or perched water table.
• Moisture Regime: ustic
• Temperature Regime: frigid to cryic, warm
• Dominant Cover: Shrubland (defined by presence of sagebrush)
• Elevation Range: 5300-7610ft
• Soils are
o Not saline or saline-sodic
o Moderately deep, deep, or very deep
o Typically less than 5% stone and boulder cover (<10% max)
• Seasonal high water table within 40” (approx. 100cm) of soil surface often closer when willows are present
• Area of rugged mountain, hills, plateaus, and valleys of the Central Rocky Mountains in Southwest Montana.
• Slope: 0-5%

Site Development and Testing Plan
This Provisional Ecological Site Description was developed to meet the criteria as defined in Soil Survey National Instruction part 306 (430-306-NI, April 2015) as interpreted by Regional Ecological Site Specialist. Information in this description are first approximations based on broad groupings of soil properties and vegetation characteristics associated with those groupings. Although this description has been thru the quality control and quality assurance review process it has not been certified for use in conservation planning.

Associated sites

R043BP801MT	**Bottomland Group** Bottomland site is often a neighboring site which is closest to a stream or river. The Subirrigated Sagebrush Shrubland will be the slightly drier site however still have a water table.
R043BP815MT	**Subirrigated Grassland Group** Subirrigated Grassland is a neighboring site and occupies the same landscape position. These two sites are often intermixed in a complex that can be hard to map separately.

Similar sites

R043BP801MT	**Bottomland Group** Bottomland site is often a neighboring site which is closest to a stream or river. The Subirrigated Grassland will be the slightly drier site however still have a water table. The Bottomland site will express a canopy of deciduous trees and will have less soil development
R043BP815MT	**Subirrigated Grassland Group** Subirrigated Grassland is a neighboring site and occupies the same landscape position. These two sites are often intermixed in a complex that can be hard to map separately. The Subirrigated Sagebrush Shrubland expresses a sagebrush component that the Subirrigated Grassland does not.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata* (2) *Salix*
Herbaceous	(1) *Leymus cinereus* (2) *Pseudoroegneria spicata*

Physiographic features

This site occurs on low terraces adjacent to flood plains of perennial or intermittent streams (though not in the floodplain), near springs and seeps, or other areas having a permanent or perched water table.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Terrace
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None to very rare
Elevation	1,615–2,320 m
Slope	0–5%
Water table depth	102 cm
Aspect	Aspect is not a significant factor

Climatic features

This site has a variable climate that encompasses both ustic and udic soil moisture regimes as well as frigid to cryic soil temperature regimes. Relative Effective Annual Precipitation (REAP) is 10 to 40 inches with 20 to 90 frost-free days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	31-88 days
Freeze-free period (characteristic range)	74-124 days
Precipitation total (characteristic range)	457-508 mm
Frost-free period (actual range)	26-109 days

Freeze-free period (actual range)	48-137 days
Precipitation total (actual range)	432-660 mm
Frost-free period (average)	61 days
Freeze-free period (average)	98 days
Precipitation total (average)	508 mm

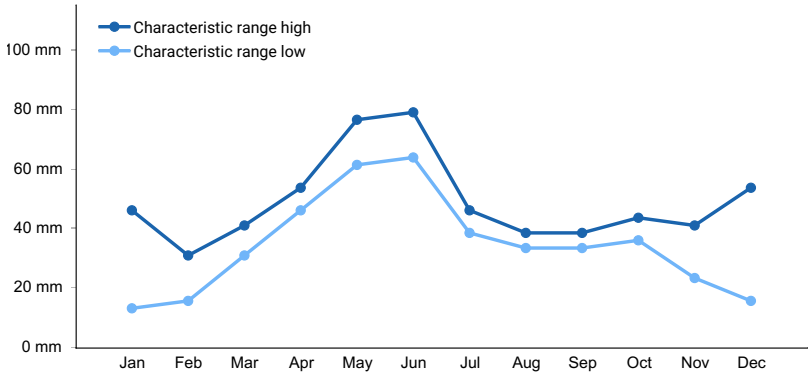


Figure 1. Monthly precipitation range

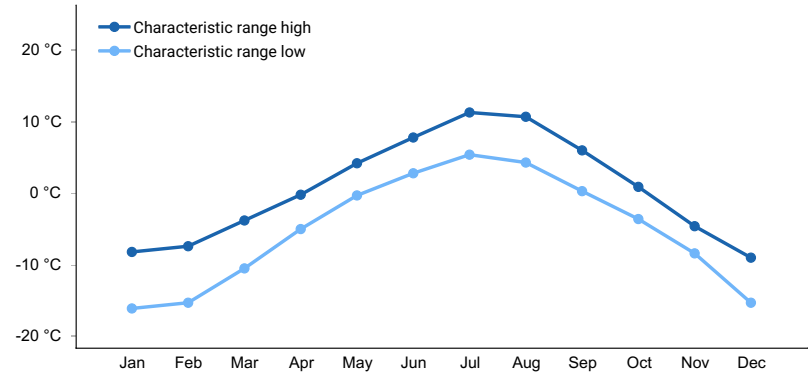


Figure 2. Monthly minimum temperature range

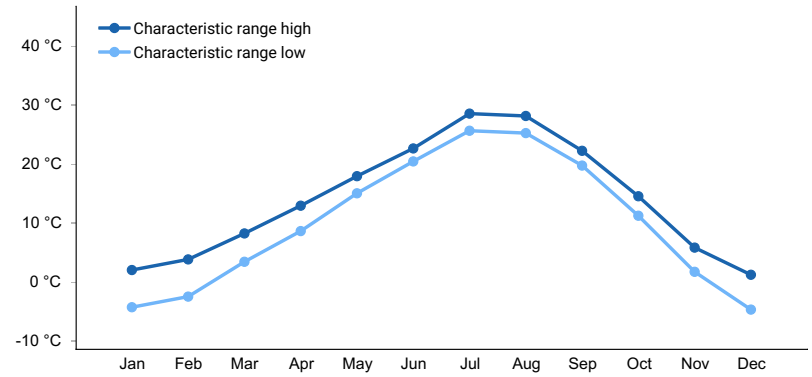


Figure 3. Monthly maximum temperature range

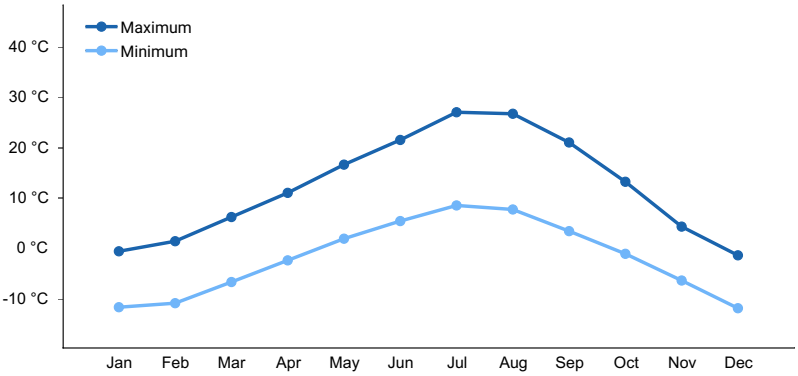


Figure 4. Monthly average minimum and maximum temperature

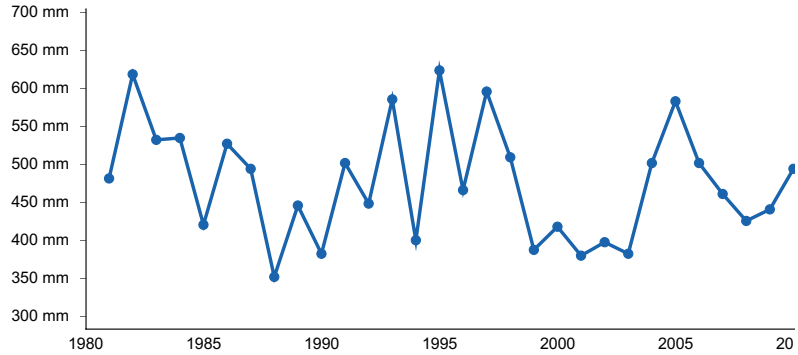


Figure 5. Annual precipitation pattern

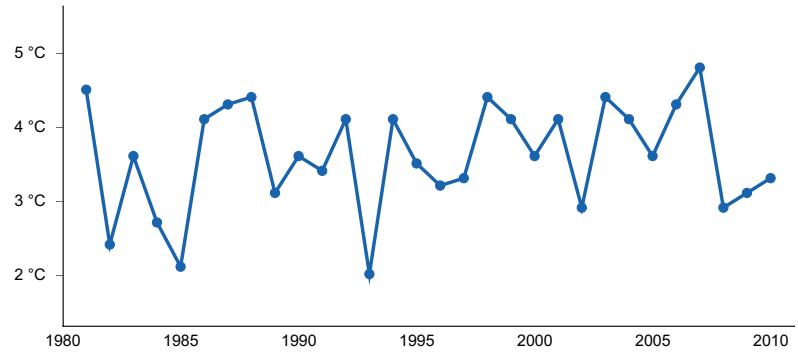


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SULA 14 NE [USC00247967], Sula, MT
- (2) PONY [USC00246655], Cardwell, MT
- (3) NORRIS MADISON PH [USC00246157], Ennis, MT
- (4) HEBGEN DAM [USC00244038], West Yellowstone, MT
- (5) LAKEVIEW [USC00244820], Lima, MT

Influencing water features

Site has water table within 40 inches of soil surface for a short period of the year. Often dry midway through the growing season.

Wetland description

Site may express classic oxidation and reduction associated with periodic water inundation.

Soil features

Soils are recent alluvium. Textures vary based on local geology.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Gravelly, cobbly loam
Drainage class	Excessively drained to poorly drained
Soil depth	254 cm
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	11.43–18.8 cm
Soil reaction (1:1 water) (0-25.4cm)	6.6–7.5
Subsurface fragment volume <=3" (25.4-50.8cm)	0–45%
Subsurface fragment volume >3" (25.4-50.8cm)	0–22%

Ecological dynamics

1 - Reference State
1.1 Mixed Sagebrush/Shrub community. Shrubs and grass share canopy dominance. Mountain Silver sagebrush and Mountain Big sagebrush present. A mixed bunchgrass community of basin wildrye, bluebunch wheatgrass, and sedges (Nebraska, beaked, and water sedge) comprise this site.

1.1a extended drought, improper grazing, untimely fire, climate change

1.2 Grassland/Shrubland Community. Shrubs lose codominance with grasses post-disturbance or increased water availability. Tufted hairgrass and basin wildrye tend to increase slightly.

1.2a proper grazing management, favorable growing conditions, time
T1A poor grazing, drought with improper grazing, multiple spring grazing
T1B sod-busting, introduction of tame pasture species and other invasive plants, overgrazing, drought

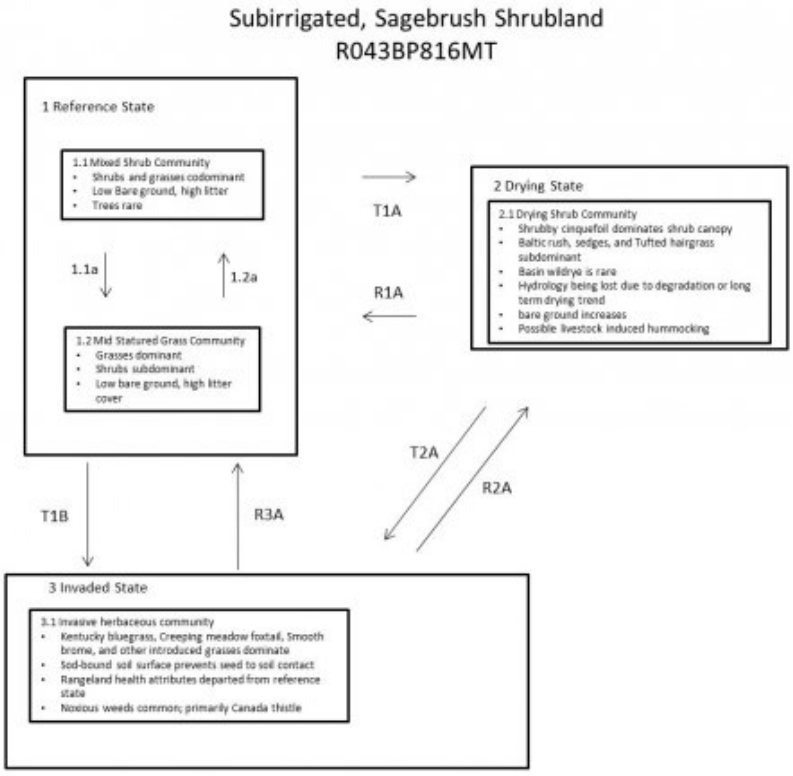
2 - Drying State
2.1 Poor management and a drying climate trend transitions site to a dry shrub community where Wyoming big sagebrush begins to occupy drier site. Shrubby cinquefoil also increases.

T2A overgrazing, introduction of weeds, drought, heavy human disturbance, conversion to introduced species
R1A proper grazing management, favorable growing conditions, time, tree/shrub establishment

3 - Invaded State
3.1 Typically introduced species take over dominance.

R2A fire, range seeding, timely moisture, proper grazing management, IPM
R3A IPM, range seeding, timely moisture, grazing management, brush management, range seeding, tree/shrub establishment

State and transition model



MLRA 43B Subirrigated Shrubland R043BP816MT

Legend

1.1 Mixed Sagebrush/Shrub community. Shrubs and grass share canopy dominance. Mountain Silver sagebrush and Mountain Big sagebrush present. A mixed bunchgrass community of Basin wildrye, Bluebunch wheatgrass, and sedes (Nebraska, beaked, and water sedge) resides on this site.

- 1.1a extended drought, improper grazing, untimely fire, climate change
- 1.2a proper grazing management, favorable growing conditions, time

1.2 Grassland/Shrubland Community. Shrubs lose codominance with grasses post disturbance or increased water availability. Tufted hairgrass and Basin wildrye tend to increase slightly.

- T1A poor grazing, drought with improper grazing, multiple spring grazing
- T1B sodbusting, introduction of tame pasture species and other invasive plants, overgrazing, drought
- R1A proper grazing management, favorable growing conditions, time, tree/shrub establishment

2.1 Drying State. Poor management and/or a drying climate trend transitions site to a dry shrub community where Wyoming big sagebrush begins to occupy drier site. Shrubby cinquefoil also increases.

- T2A overgrazing, introduction of weeds, drought, heavy human disturbance, conversion to introduced species
- R2A fire, range seeding, timely moisture, proper grazing management, IPM

3.1 Invaded State. Typically introduced species take over dominance.

- R3A IPM, range seeding, timely moisture, grazing management, brush management, range seeding, tree/shrub establishment

Animal community

The Subirrigated Sagebrush Shrubland ecological site grouping provides wildlife habitat for an array of species. Prior to the settlement of this area, large herds of antelope, elk and bison roamed. Though the bison that once utilized this landscape have been replaced with domestic livestock, wildlife still utilize this largely intact landscape for habitat

The relatively high grass component of the Reference Community provides excellent nesting cover for multiple neotropical migratory birds as well as provide cover for larger animals.

Managed livestock grazing is suitable on this site due to the potential to produce an abundance of high quality forage. This is often a preferred site for grazing by livestock, and animals tend to congregate in these areas. In order to maintain the productivity of this 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 native plant community. Careful management of timing and duration of grazing is important. Shorter grazing periods and adequate deferment during the growing season are recommended for plant maintenance, health, and recovery.

Continual non-prescribed grazing of this site will be injurious, will alter the plant composition and production over time, and will result in transition to the Short-statured Grass State. Transition to other states will depend on duration of poorly managed grazing as well as other circumstances such as weather conditions and fire frequency.

Further degradation will result in transition to the Invaded State. Management should focus on grazing management strategies that will prevent further degradation, such as seasonal grazing deferment or winter grazing where feasible. Communities within this state are still stable and healthy under proper management. Forage quantity and quality may be substantially decreased from the Reference State.

Grazing is possible in the Invaded State. Invasive species are generally less palatable than native grasses. Forage production is typically greatly reduced in this state. Due to the aggressive nature of invasive species, sites in the Invaded State face increased risk for further degradation. Grazing has to be carefully managed to avoid further soil loss and degradation and possible livestock health issues.

Prescriptive grazing can be used to manage invasive species. In some instances, carefully targeted grazing (sometimes in combination with other treatments) can reduce or maintain species composition of invasive species.

Hydrological functions

The hydrologic cycle functions best in the Reference State (1) with good infiltration and deep percolation of rainfall; however, the cycle degrades as the vegetation community declines. Rapid rainfall infiltration, high soil organic matter, good soil structure, and good porosity accompany high bunchgrass canopy cover. High ground cover reduces rain drop impact on the soil surface, which keeps erosion and sedimentation transport low. Water leaving the site will have minimal sediment load, which allows for high water quality in associated streams. High rates of infiltration will allow water to move below the rooting zone during periods of heavy rainfall. The Reference Community (1.1) should have no rills or gullies present and drainage ways should be vegetated and stable. 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 wind or water.

Improper grazing management results in a community shift to the Bunchgrass Community (1.2). This plant community has a similar canopy cover, but only slightly higher bare ground. Therefore, the hydrologic cycle is functioning at a level similar to the water cycle in the Reference Community (1.1).

In the Invaded State (3) canopy and ground cover are greatly reduced compared to the Reference State (1), which impedes the hydrologic cycle. Infiltration will decrease and runoff will increase due to reduced ground cover, presence of shallow-rooted species, rainfall splash, soil capping, reduced organic matter, and poor structure. Sparse ground cover and decreased infiltration can combine to increase frequency and severity of flooding within a watershed. Soil erosion is accelerated, quality of surface runoff is poor, and sedimentation increases.

Recreational uses

This site provides some limited 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.

Wood products

n/a

Inventory data references

Information presented was derived from NRCS inventory data, literature, field observations, and personal contacts with range-trained personnel (i.e., used professional opinion of agency specialists, observations of land managers, and outside scientists).

Other references

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Contributors

Petersen, Grant

Approval

Kirt Walstad, 3/01/2024

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	05/17/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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:

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

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

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

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:**

17. **Perennial plant reproductive capability:**