USDA Natural Resources Conservation Service

Ecological site R043BP807MT
Saline Sodic Grassland Group

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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

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 does not receive any additional water
• Soils are
o Saline or Sodic (EC>7 or SAR>12 with surface 18cm)
o Typically less than 5% stone and boulder cover (<15% max)
• Soil surface texture variable with ranges from sandy loam to clay loam in surface mineral 4”
• Area of rugged mountain, hills, plateaus, and valleys of the Central Rocky Mountains in Southwest Montana.
• Moisture Regime: ustic
• Temperature Regime: frigid
• Dominant Cover: rangeland (grass dominated)
• Elevation Range: 3900-6700ft
• Slope range: 1-15%

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 through the quality control and quality assurance review process it has not been certified for use in conservation planning.

Associated sites

R043BP808MT	**Saline Sodic Sagebrush Shrubland Group** The Saline Sagebrush Shrubland occupies the same landscape position as the Saline Sodic Grassland. They share similar plant community species and have similar state and transition models.

Similar sites

R043BP808MT	**Saline Sodic Sagebrush Shrubland Group** The Saline Sagebrush Shrubland shares similar plant community species and has similar state and transition models. The Saline Sagebrush Shrubland will express higher amounts of Basin and/or Wyoming big sagebrush.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus*
Herbaceous	(1) *Leymus cinereus* (2) *Elymus lanceolatus*

Physiographic features

The Saline-Sodic Grassland ecological site primarily exists at the toe slope position on fan remnants, hillslopes, and stream terrace risers. Slopes are variable between nearly level and 15 percent.

Local vernacular describes the site as a "bathtub ring" of the hills as the soil may appear slightly white. Though the Saline -Sodic Grassland ecological site is not associated with ground water, capillary fringe from soil moisture flow through pulls salts to the soil surface making bare ground white at the discharge.

Table 2. Representative physiographic features

Hillslope profile	(1) Toeslope
Landforms	(1) Intermontane basin > Fan remnant (2) Intermontane basin > Eroded fan remnant (3) Intermontane basin > Stream terrace
Runoff class	Low to medium
Flooding frequency	None to rare
Elevation	1,189–2,042 m
Slope	0–15%
Water table depth	254 cm
Aspect	Aspect is not a significant factor

Climatic features

This site tends to exist on the lower end of the precipitation gradient of MLRA 43B; receiving 10 to16 inches of Relative Effective Annual Precipitation. It has a frigid soil temperature regime; receiving 70 to 100 frost-free days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	40-90 days
Freeze-free period (characteristic range)	93-120 days
Precipitation total (characteristic range)	254-330 mm
Frost-free period (actual range)	31-98 days
Freeze-free period (actual range)	77-131 days
Precipitation total (actual range)	254-356 mm
Frost-free period (average)	63 days
Freeze-free period (average)	107 days
Precipitation total (average)	279 mm

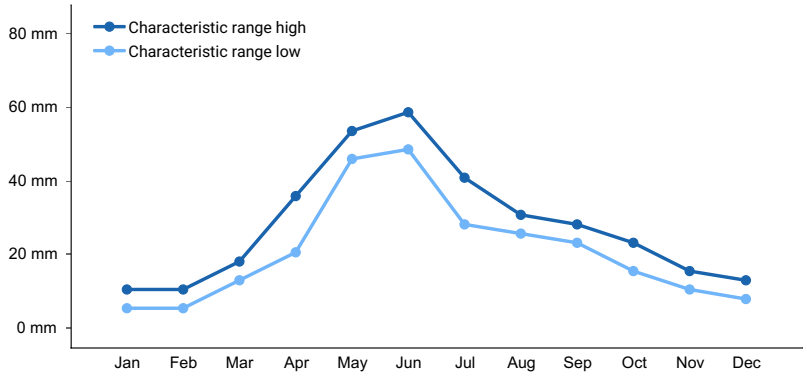


Figure 1. Monthly precipitation range

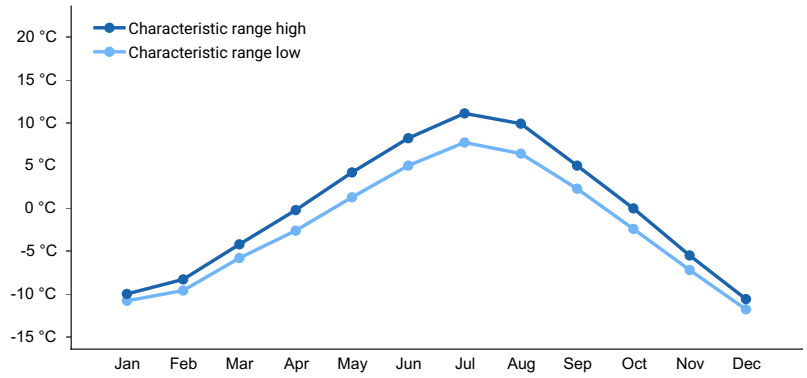


Figure 2. Monthly minimum temperature range

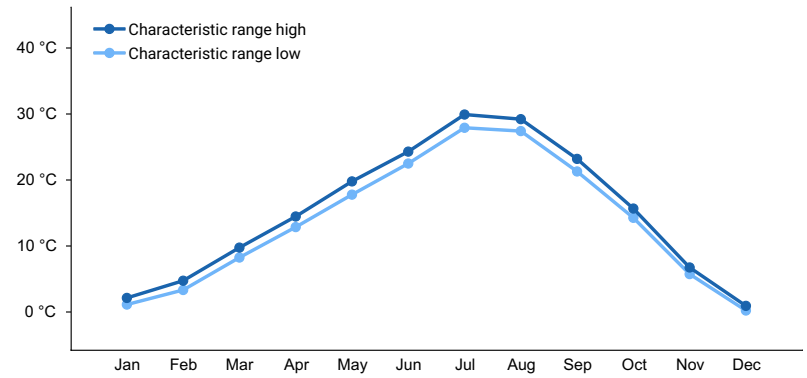


Figure 3. Monthly maximum temperature range

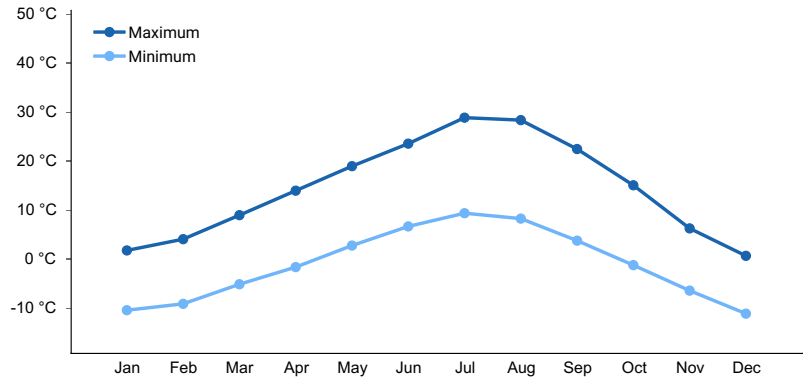


Figure 4. Monthly average minimum and maximum temperature

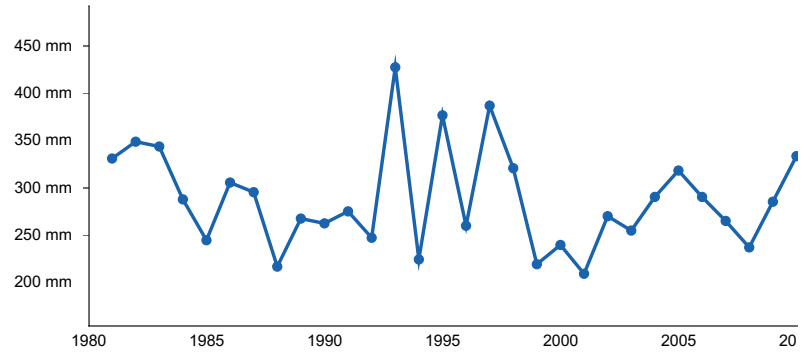


Figure 5. Annual precipitation pattern

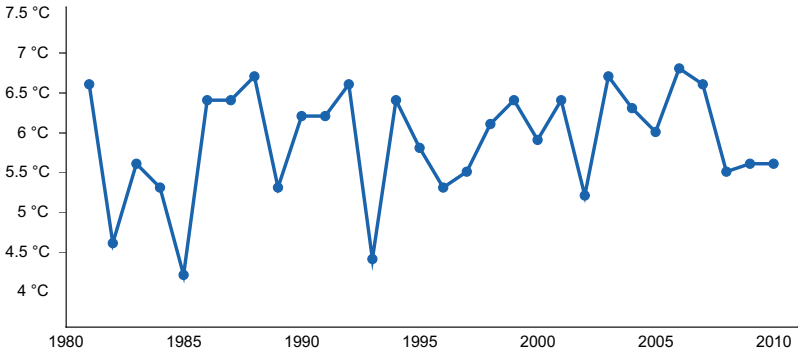


Figure 6. Annual average temperature pattern

Climate stations used

- (1) DEER LODGE 3 W [USC00242275], Deer Lodge, MT
- (2) DILLION U OF MONTANA WESTERN [USC00242409], Dillon, MT
- (3) GLEN 2 E [USC00243570], Dillon, MT
- (4) ENNIS [USC00242793], Ennis, MT
- (5) BOULDER [USC00241008], Boulder, MT
- (6) GARDINER [USC00243378], Gardiner, MT
- (7) TOWNSEND [USC00248324], Townsend, MT
- (8) TRIDENT [USC00248363], Three Forks, MT
- (9) TWIN BRIDGES [USC00248430], Sheridan, MT
- (10) WHITE SULPHUR SPRNGS 2 [USC00248930], White Sulphur Springs, MT
- (11) DILLON AP [USW00024138], Dillon, MT
- (12) HELENA RGNL AP [USW00024144], Helena, MT

Influencing water features

Though the Saline -Sodic Grassland ecological site is not associated with ground water, capillary fringe from soil moisture flow-through pulls salts to the soil surface making bare ground white at the discharge.

Wetland description

n/a

Soil features

Soils for this site are moderately deep to deep with texture varying from sandy loam to clay loam. These soils have a electrical conductivity (EC) greater than 7 or a Sodium Absorption Ratio (SAR) greater than 12 in the mineral soil surface 4 inches. Soils are formed by alluvium or colluvium.

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock (2) Colluvium–sedimentary rock
Surface texture	(1) Sandy loam (2) Loam (3) Clay loam
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	51–254 cm
Soil depth	51–254 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	9.14–11.94 cm
Sodium adsorption ratio (0-30.5cm)	12
Soil reaction (1:1 water) (0-25.4cm)	8.2–9.5
Subsurface fragment volume <=3" (25.4-50.8cm)	0–22%
Subsurface fragment volume >3" (25.4-50.8cm)	0–5%

Ecological dynamics

1.1 Basin wildrye, western wheatgrass, and alkali sacaton dominant plants. Inland saltgrass and blue grama present as subordinate plants. Scarlet globemallow, hoods phlox, and chenopods common forbs. Greasewood and Big sagebrush present though in small amounts. Bare ground is typically naturally high.

1.1a extended drought, improper grazing, climate change

1.2 Basin wildrye is rare. Western wheatgrass and Alkali sacaton remain dominant. Saltgrass and other short-stature grasses increasing. Large shrub production remains similar to 1.1; however, subshrubs like broom snakeweed and fringed sagewort increase. Bare ground remains high

1.2a proper grazing management, favorable growing conditions, time
T1A poor grazing, drought with improper grazing, multiple spring grazing events,
T1B introduction of invasive plants, multiple or frequent overgrazing events, drought
R1A proper grazing management, favorable growing conditions, time, tree/shrub establishment

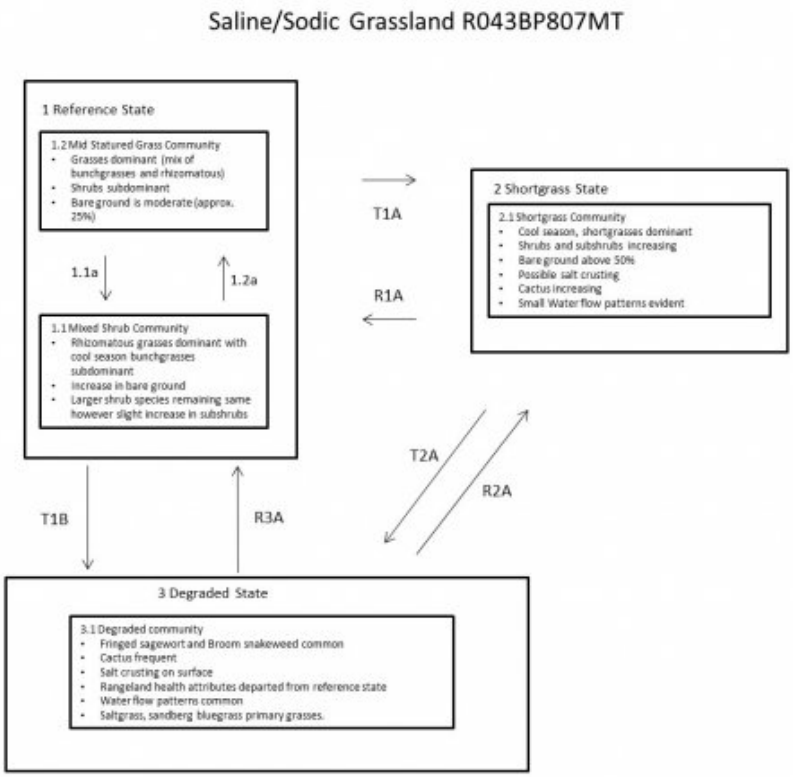
2 - Short-statured Grass State -
2.1 Short-statured grass dominated (saltgrass, alkali (Sandberg) bluegrass). Forbs remain a small component of community. Subshrubs increase, pricklypear cactus common. Bare ground exceeds 50 percent, possible salt-crusting on soil surface. Waterflow patterns and pedestalling frequent.

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

3 - Degraded State
3.1 Subshrubs and short-statured grasses share dominance. Forbs particularly Chenopods (namely sumpweed) common, Cheatgrass invades

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

State and transition model



MLRA 43B Saline/Sodic Grassland R043BP807MT

Legend

- 1.1 Basin wildrye, western wheatgrass, and alkali sacaton dominant plants. Inland saltgrass and blue grama present as subordinate plants. Scarlet globemallow, hoods phlox, and Chenopods common forbs. Greasewood and Big sagebrush present though in small amounts. Bare ground is typically naturally high.
- 1.1a extended drought, improper grazing, climate change
- 1.2 Basin wildrye is rare. Western wheatgrass and Alakali sacaton remain dominant. Saltgrass and other shortgrasses increasing. Large shrub production remains similar to 1.1 however subshrubs like broom snakeweed and fringed sagewort increase. Bare ground remains high
- 1.2a proper grazing management, favorable growing conditions, time

- 2.1 Shortgrass dominated (Saltgrass, Alkali (Sandberg) bluegrass). Forbs remain a small component of community. Subshrubs increase, pricklypear cactus common. Bare ground exceeds 50%, possible salt crusting on soil surface. Waterflow patterns and pedestalling frequent.
- T1A poor grazing, drought with improper grazing, multiple spring grazing events,
- R1A proper grazing management, favorable growing conditions, time, tree/shrub establishment

- 3.1 Subshrubs and shortgrasses share dominance. Forbs particularly Chenopods (namely sumpweed) common, Cheatgrass invades
- T1B introduction of invasive plants, multiple/frequent overgrazing events, drought
- T2A overgrazing, introduction of weeds, drought, heavy human disturbance, conversion to introduced species
- 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

Animal community

The Saline-Sodic Grouping provides for a variety of 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 hiding habitat for larger animals.

Greater Sage Grouse likely utilize most states of this ecological site as there are high amounts of forbs and insects as a result of the favorable soil moisture. Even in the Shortgrass State, sage grouse will utilize the increased forb and shrub cover for both foraging and hiding cover. This site would be considered critical habitat for most lifestages of Greater Sage Grouse.

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 Shortgrass 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/or 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

Inventory data compiled from NRCS field observations, National Resources Inventory (NRI) data, BLM Assess, Inventory, and Monitoring (AIM) data, as well as professional knowledge from agency and partner professionals.

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:**

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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:**
