# Ecological site R052XN170MT
# Saline Upland (SU)
# 10-14" p.z.

Last updated: 4/14/2025
Accessed: 09/23/2026

## 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): 052X–Brown Glaciated Plains

The Brown Glaciated Plains, MLRA 52, is an expansive, agriculturally and ecologically significant area. It consists of approximately 14.5 million acres and stretches across 350 miles from east to west, encompassing portions of 15 counties in north-central Montana. This region represents the southwestern limit of the Laurentide Ice Sheet and is considered to be the driest and westernmost area within the vast network of glacially derived prairie pothole landforms of the northern Great Plains. Elevation ranges from 2,000 feet (610 meters) to 4,600 feet (1,400 meters). Soils are primarily Mollisols, but Entisols, Inceptisols, Alfisols, and Vertisols are also common. Till from continental glaciation is the predominant parent material, but alluvium and bedrock are also common. Till deposits are typically less than 50 feet thick, and in some areas glacially deformed bedrock occurs at or near the soil surface (Soller, 2001). Underlying sedimentary bedrock largely consisting of Cretaceous shale, sandstone, and mudstone (Vuke et al., 2007) is commonly exposed on hillslopes, particularly along drainageways. Significant alluvial deposits occur along glacial outwash channels and major drainages, including portions of the Missouri, Teton, Marias, Milk, and Frenchman Rivers. Large glacial lakes, particularly in the western half of the MLRA, deposited clayey and silty lacustrine sediments (Fullerton et al., 2013). Much of the western portion of this MLRA was glaciated towards the end of the Wisconsin age, with the maximum glacial extent occurring approximately 20,000 years ago (Fullerton et al., 2004). The result is a geologically young landscape that is predominantly a level till plain interspersed with lake plains and dominated by soils in the Mollisol and Vertisol orders. These soils are very productive and generally are well suited to dryland farming. Much of this area is aridic-ustic. Crop-fallow dryland wheat farming is the predominant land use. Areas of rangeland typically are on steep hillslopes along drainages. The rangeland, much of which is native mixedgrass prairie, increases in abundance in the eastern half of the MLRA. The Wisconsin-age till in the north-central part of this area typically formed large disintegration moraines with steep slopes and numerous poorly drained potholes. A large portion of Wisconsin-age till occurring on level terrain that would typically be optimal for farming has large amounts of less-suitable sodium-affected Natrustalfs. Significant portions of Blaine, Phillips, and Valley Counties were glaciated approximately 150,000 years ago during the Illinoisan age. Due to erosion and dissection of the landscape, many of these areas have steeper slopes and more exposed bedrock than areas glaciated during the Wisconsin age (Fullerton and Colton, 1986). While much of the rangeland in the aridic-ustic portion of MLRA 52 is classified as belonging to the “dry grassland” climatic zone, sites in portions of southern MLRA 52 may belong to the “dry shrubland” climatic zone. The dry shrubland zone represents the northernmost extent of the big sagebrush (Artemisia tridentata) steppe on the Great Plains. Because similar soils occur in both southern and northern portions of the MLRA, it is currently hypothesized that climate is the primary driving factor affecting big sagebrush distribution in this area. However, the precise factors are not yet fully understood. Sizeable tracts of largely unbroken rangeland in the eastern half of the MLRA and adjacent southern Saskatchewan are home to the northern Montana population of greater sage grouse (Centrocercus urophasianus), and large portions of this area are considered to be a Priority Area for Conservation (PAC) by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service, 2013). This population is unique among sage grouse populations in the fact that many individuals overwinter in the big sagebrush steppe (dry shrubland) in the southern portion of the MLRA and then migrate to the northern portion of the MLRA, which lacks big sagebrush (dry grassland), to live the rest of the year (Smith, 2013). Areas of the till plain near the Bearpaw and Highwood Mountains as well as the Sweetgrass Hills and Rocky Mountain foothills are at higher elevations, receive higher amounts of precipitation, and have a typic-ustic moisture regime. These areas have significantly more rangeland production than the drier aridic-ustic portions of the MLRA and have enough moisture to produce crops annually rather than just bi-annually, as in the drier areas. Ecological sites in this higher precipitation area are classified as the moist grassland climatic zone.

## Classification relationships

NRCS Soil Geography Hierarchy • Land Resource Region: Northern Great Plains • Major Land Resource Area (MLRA): 052 Brown Glaciated Plains • Climate Zone: Dry Shrubland National Hierarchical Framework of Ecological Units (Cleland et al., 1997; McNab et al., 2007) • Domain: Dry • Division: Temperate Steppe • Province: Great Plains-Palouse Dry Steppe Province 331 • Section: Northwestern Glaciated Plains 331D • Subsection: Montana Glaciated Plains 331Dh • Landtype Association/Landtype Phase: N/A National Vegetation Classification Standard (Federal Geographic Data Committee, 2008) • Class: Xeromorphic Woodland, Scrub and Herb Vegetation Class

(3) • Subclass: Cool Semi-Desert Scrub and Grassland Subclass (3.B) • Formation: Cool Semi-Desert Scrub and Grassland Formation (3.B.1) • Division: Cool Semi-Desert Scrub and Grassland Division (3.B.1.Ne) • Macrogroup: Artemisia tridentata - Artemisia tripartita ssp. tripartita - Purshia tridentata Steppe and Shrubland Macrogroup (3.B.1.Ne.3) • Group: Artemisia tridentata ssp. wyomingensis - Artemisia tridentata ssp. tridentata Steppe and Shrubland Group (3.B.1.Ne.3.a) • Alliance: Artemisia tridentata ssp. wyomingensis Dry Steppe and Shrubland Alliance • Association: No existing correlation EPA Ecoregions • Level 1: Great Plains (9) • Level 2: West-Central Semi-Arid Prairies (9.3) • Level 3: Northwestern Glaciated Plains (42) • Level 4: North-Central Brown Glaciated Plains (42o) and Glaciated Northern Grasslands (42j)

## Ecological site concept

This provisional ecological site occurs on fans, fan aprons, and terraces where salts have accumulated. The distinguishing characteristic of this site is that soils contain less than 35 percent clay in the upper 4 inches and that saline, sodic, or saline-sodic conditions are evident in the upper 20 inches of soil. Soils for this ecological site are typically very deep (more than 60 inches) and derived from fine-loamy alluvium or outwash deposits. Soil textures in the upper 4 inches are typically loam, clay loam, silt loam, or silty clay loam. Soils typically have an ochric epipedon. Characteristic vegetation is western wheatgrass (Pascopyrum smithii), alkali sacaton (Sporobolus airoides), and Nuttall's saltbush (Atriplex nuttallii).

## Associated sites

| | |
|---|---|
| **R052XN162MT** | **Clayey (Cy) 10-14" p.z.**<br>soils >20 inches in depth, higher production, and no hardpan, different species composition |
| **R052XN176MT** | **Shallow to Gravel (SwGr) 10-14" p.z.**<br>similar position in landscape, soils with depth restriction that limits available moisture, soils 10-20” deep to sands or loamy sands |
| **R052XN179MT** | **Shallow Clay (SwC) 10-14" p.z.**<br>soils 10-20” deep to bedrock’ soils are clayey over clayey shale |
| **R052XN086MT** | **Claypan (Cp) 10-14" p.z.**<br>has 2-8” of soil over the hard argillic layer, less bare ground, and higher production |
| **R052XN172MT** | **Dense Clay (DC) 10-14" p.z.**<br>has a hard restrictive layer in the soil at or near the surface, salt tolerant plants may be present but are rarely dominant |

## Similar sites

| | |
|---|---|
| **R052XC210MT** | **Saline Upland (SU) 10-14" p.z.**<br>Same concept change in species in a different LRU. |
| **R053AE071MT** | **Saline Upland (SU) (Legacy) RRU 53AE**<br>Same concept change in species in a different MLRA. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Atriplex nuttallii*<br>(2) *Sarcobatus vermiculatus* |
| Herbaceous | (1) *Pascopyrum smithii*<br>(2) *Sporobolus airoides* |

### Physiographic features

This ecological site occurs on nearly level to moderately sloping fans and terraces in the uplands. It is associated with shale beds and soils have a clay loam to clay surface layer, subsoil, and underlying material. Soils contain salt and/or alkali accumulations and salt-tolerant species dominate the plant community. Slopes are usually less than 8%. Elevations normally vary from 2200 to 4000 feet.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Terrace<br>(2) Fan<br>(3) Fan apron |
| Runoff class | Medium to very high |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 670 – 1,220 m |
| Slope | 0 – 10 % |
| Aspect | W, NW, N, NE, E, SE, S, SW |

**Table 3. Representative physiographic features (actual ranges)**

| | |
|---|---|
| Runoff class | Not specified |
| Flooding frequency | Not specified |
| Ponding frequency | Not specified |
| Elevation | 570 – 1,370 m |

| | |
|---|---|
| Slope | Not specified |

### Climatic features

A semi-arid, temperate climate characterizes the Glaciated Plains. The predominance of cool season species has evolved to take advantage of the precipitation regime that peaks in late spring-early summer (June). Seventy-five percent of the annual precipitation usually falls as steady, soaking, frontal system rains. Summer rains usually come with thunderstorms. Precipitation is the most important factor influencing production (Heitschmidt et al 2005). Severe drought occurs on average in two out of every ten years (Cooper, et al., 2001).

**Table 4 Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 90-120 days |
| Freeze-free period (characteristic range) | 120-140 days |
| Precipitation total (characteristic range) | 250-360 mm |
| Frost-free period (average) | 90 days |
| Freeze-free period (average) | 130 days |
| Precipitation total (average) | 310 mm |

- (1) CHESTER [USC00241692], Chester, MT
- (2) GLASGOW [USW00094008], Glasgow, MT
- (3) HAVRE CITY CO AP [USW00094012], Havre, MT
- (4) SHELBY [USC00247500], Shelby, MT

### Influencing water features

This site is not influenced by water from streams.

### Wetland description

This site is not influenced by water from wetlands.

### Soil features

These deep, well drained soils formed in alluvium and glacial till. The soils usually contain a 2-3-inch surface layer, a 2-3 inch clay subsoil, and a strongly saline underlying material to a depth of > 60 inches. The surface texture is clay loam or silty clay; subsoil textures are usually clay or silty clay. Permeability is very slow. Salt tolerant plants dominate the site. Soil ph varies from 6.6 – 9.0. This site is characterized by the following taxonomic units: Benz and Nobe.

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium<br>(2) Glaciofluvial deposits − shale |

| | |
|---|---|
| Surface texture | (1) Clay loam<br>(2) Silty clay<br>(3) Loam |
| Family particle size | (1) Fine |
| Drainage class | Well drained |
| Permeability class | Very slow |
| Soil depth | 50 – 200 cm |
| Surface fragment cover <=3" | Not specified |
| Surface fragment cover >3" | Not specified |
| Available water capacity<br>(Depth not specified) | 7.62 – 12.7 cm |
| Calcium carbonate equivalent<br>(Depth not specified) | 0 – 10 % |
| Electrical conductivity<br>(Depth not specified) | 0 – 20 mmhos/cm |
| Sodium adsorption ratio<br>(Depth not specified) | 10 – 70 |
| Soil reaction (1:1 water)<br>(Depth not specified) | 6.6 – 9.6 |
| Subsurface fragment volume <=3"<br>(Depth not specified) | Not specified |

| | |
|---|---|
| Subsurface fragment volume >3"<br>(Depth not specified) | Not specified |

## Ecological dynamics

This site developed through time under the influence of climate, geological materials, fire, plants and animals. Research on upland ecological sites consistently shows that precipitation is the principal factor altering productivity (Heitschmidt et al. 2005). The same authors concluded that grazing reduces herbage standing crop, whereas its effects on aboveground net primary production vary with timing of grazing and precipitation events, along with the functional and structural composition of the plant community. Some ecologists believe that these lands may have burned on a natural interval of 10-12 years (Frost 1998). However, environmental characteristics of this site limit herbage production and subsequent fuel accumulation. Therefore, in comparison to normal upland range sites, the role of natural fire is probably less significant in the development of this site. The resultant historic climax plant community (HCPC) is the basis for plant community interpretations. The HCPC has been determined by evaluating rangeland relic areas, and other areas protected from excessive disturbance.

The HCPC is comprised of a mixture of cool and warm season grasses and shrubs. About 70% of the annual production is from grasses and sedges, most of which is produced during the cool season. Forbs and shrubs contribute 5% and 25%, respectively, to total annual production. Total vegetative production averages 500 lbs/ac in normal years, 350 lbs/ac in “unfavorable” years, and 600 lbs/ac in “favorable” years.

This site is moderately resilient to disturbance because soil characteristics limit plant growth. Departures from the HCPC generally result from management actions, drought, and/or a change in the natural fire regime. The site is considered fragile in the sense that vegetative vigor and composition will rapidly decline with continued adverse impacts. With favorable precipitation and/or prescribed grazing treatments, plant communities that are in the high seral state can return to the HCPC. In contrast, significant succession is unusual within early-seral communities.

State and Transition Diagram

Successional pathways of Saline Upland 10-14” p.z. ecological sites cannot be satisfactorily described using traditional theories of plant succession leading to a single climax community (Briske et al. 2005). As the HCPC regresses to an early seral state, it is theorized that a threshold is crossed somewhere within the mid-seral state. Plant communities occurring below this threshold are in a steady state. Succession back to the HCPC does not occur within a reasonable length of time, and/or without a large input of energy.

Two plant communities and the successional pathways that commonly occur within the Reference State (State 1) are shown in the following diagram. The transitions from State 1 to State 2 (Plant Community B) and State 3 (Plant Community C) are also illustrated. Ecological processes are discussed in the plant community descriptions that follow the diagram.

## State and transition model

## Additional community tables

**Table 6. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |
| 1 | **Rhizomatous Wheatgrasses** | | | 224-336 | |
| | western wheatgrass | PASM | *Pascopyrum smithii* | 224-336 | – |
| 2 | **Warm-season Grasses** | | | 56-196 | |
| | alkali sacaton | SPAI | *Sporobolus airoides* | 56-112 | – |
| | saltgrass | DISP | *Distichlis spicata* | 6-84 | – |
| 3 | **Miscellaneous Grasses** | | | 6-56 | |
| | Sandberg bluegrass | POSE | *Poa secunda* | 56-112 | – |
| | Nuttall's alkaligrass | PUNU2 | *Puccinellia nuttalliana* | 6-28 | – |
| | prairie Junegrass | KOMA | *Koeleria macrantha* | 6-28 | – |
| | Grass, native | 2GN | *Grass, native* | 6-28 | – |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 6-28 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 6-28 | – |
| | plains reedgrass | CAMO | *Calamagrostis montanensis* | 6-28 | – |

| | | | | | |
|---|---|---|---|---|---|
| | threadleaf sedge | CAFI | *Carex filifolia* | 6-28 | – |
| **Forb** | | | | | |
| 4 | **Forbs** | | | 22-34 | |
| | scarlet globemallow | SPCO | *Sphaeralcea coccinea* | 6-28 | – |
| | aster | ASTER | *Aster* | 6-28 | – |
| | povertyweed | IVAX | *Iva axillaris* | 6-28 | – |
| | bastard toadflax | COUM | *Comandra umbellata* | 6-28 | – |
| | milkvetch | ASTRA | *Astragalus* | 6-28 | – |
| | spiny phlox | PHHO | *Phlox hoodii* | 6-28 | – |
| | Forb, native | 2FN | *Forb, native* | 6-28 | – |
| **Shrub/Vine** | | | | | |
| 5 | **Dominant Shrubs** | | | 84-140 | |
| | Nuttall's saltbush | ATNU2 | *Atriplex nuttallii* | 84-140 | – |
| | greasewood | SAVE4 | *Sarcobatus vermiculatus* | 84-140 | – |
| 6 | **Miscellaneous Shrubs** | | | 0-140 | |
| | silver sagebrush | ARCA13 | *Artemisia cana* | 6-28 | – |
| | prairie sagewort | ARFR4 | *Artemisia frigida* | 6-28 | – |
| | Shrub (>.5m) | 2SHRUB | *Shrub (>.5m)* | 0-28 | – |
| | broom snakeweed | GUSA2 | *Gutierrezia sarothrae* | 0-1 | – |
| | plains pricklypear | OPPO | *Opuntia polyacantha* | 0-1 | – |

**Table 7. Community 1.2 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|---|---|---|---|---|---|

**Table 8. Community 2.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|---|---|---|---|---|---|

**Table 9. Community 3.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|---|---|---|---|---|---|

## Animal community

Livestock Management The Saline Upland 10-14” p.z. ecological site is suited for livestock grazing. However, prescribed grazing management is needed. Forage production is limited by soil chemistry. Species composition is susceptible to heavy stocking and season long grazing. The cool season medium height grasses are generally selectively grazed giving the short grasses a competitive advantage. Grazing during early spring may also result in soil compaction. Any additional factor reducing infiltration and increasing runoff on this site is a management concern. Shorter grazing periods developed in conjunction with adequate periods of deferment to facilitate regrowth, replenish carbohydrate pools, and accumulate litter on the soil surface are recommended. The Saline Upland 10-14” p.z. ecological site has a short grass component, as do most other sites in the northern mixed prairie. The short grasses usually increase with grazing and decrease with protection or prescribed grazing. However, succession is not guaranteed in the Northern Great Plains. Sampling four-year old ungrazed exclosures and grazed areas with 35% utilization, Vogel and Van Dyne (1966) found essentially the same basal cover of grasses, sedges, forbs, litter and bare soil on protected and grazed sites. They concluded that four years was too short of a time for cover to change significantly. Hofmann and Ries (1989) observed similar results following a four-year study in North Dakota. Even after 41 years of exclosure, changes in species composition can be relatively small when the site is in the dry, low production portion of northern mixed prairie (Brand and Goetz, 1986). They concluded that site characteristics limited the development of potential vegetation with the exclusion of grazing, but the potential impacts of prescribed grazing on succession were not discussed. This ecological site is not as productive as the sites evaluated by Vogel and Van Dyne, Hofmann and Ries, or by Brand and Goetz. Therefore, range managers should recognize the environmental limitations of this site. While a prescribed grazing system is always a good recommendation, it may not guarantee significant succession. Seeding and/or mechanical treatment are not recommended. This ecological site is suited for prescribed grazing by livestock. Because of the terrain and propensity of shrubs, this site may be more compatible for sheep, rather than cattle grazing. Although poisonous plants are not normally a problem, greasewood can cause some livestock losses. Most of the problems develop when livestock are moved onto this site in late summer or early fall. If the livestock are moved into this site from upland sites where forage is mature and limiting, grazing animals often ingest a high quantity of greasewood leaves. This can be dangerous because plants are high in oxalates and can cause bloat or poisoning. However, greasewood and some of the associated species are

nutritious, and growing livestock can make good weight gains. Wildlife Interpretations The HCPC associated with this ecological site provides diverse and valuable wildlife habitat. This site often occurs as a mosaic with other ecological sites, thus creating “ecotones” that serve as a magnet to attract many species of wildlife. Antelope and mule deer prefer grazing this site because of the Nuttall saltbush and other shrubs. When this site occurs in the landscape as a mosaic with other sites, thermal and escape cover are provided for many species of wildlife. The lack of species diversity limits the value of the site for some species of wildlife. The bare ground and lack of litter also limits the potential of the site for upland birds and for ground-nesting birds. This ecological site becomes less valuable for deer and antelope when plant diversity declines with regression. For example, the disappearance of either the alkali sacaton or western wheatgrass, and the reduction of Nuttall saltbush would shorten the length of the “green forage” season. The increase of blue grama, hoods phlox etc. is associated with the loss of palatable forbs. These changes also adversely impact foraging opportunities for deer, antelope, upland birds, etc. Because of insufficient vegetative structural diversity, residual grass carry-over and litter cover, the value of Communities B and C for wildlife habitat are greatly reduced. Plant Preferences by Animal Kind Refer to NRCS Field Office Technical Guide, Section IIE, General Information, for tables displaying plant preferences by livestock and wildlife.

## Hydrological functions

Water and alkalinity are the main factors limiting vegetative production on this site. Soil components in this ecological site are normally in Hydrologic Group D. These soils have a medium to very high runoff potential, with hydrologic runoff curves of 89 to 80. Field investigations are needed to adjust the runoff curves when plant communities deteriorate from the HCPC. Areas with ground cover less than 50% have the greatest potential for reduced infiltration and higher runoff.

## Recreational uses

This site provides hunting opportunities for upland game species. Outdoor enthusiasts may also appreciate the serenity and openness of is site.

## Wood products

This site has no significant value for wood products.

## Other information

This ecological site is not highly resistant to disturbances. Species diversity is adversely affected by season long continuous grazing and by heavy stocking. Medium height grasses are replaced by short grasses. There is also a shift from predominantly herbaceous plants in State 1 to more woody plants in States 2 and 3. The number of structural/functional groups is reduced with regression from the HCPC. The amount of solar energy that is captured and converted to carbohydrates for plant growth is reduced in States 2 and 3. A reduction in total vegetative growth results in less potential vegetation that can be transformed into litter. Litter reductions result in less infiltration, and more runoff and soil erosion.

## Inventory data references

Data Source Number of Records Sample Period State County SCS-Range-417 ECS-1 Modified Double Sampling Ross, R. L. and H. E. Hunter. 1976. Climax vegetation of Montana. USDA Soil Conservation Service. Bozeman, MT. USDA-SCS-MT 1981 Technical Range Site Description

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## Contributors

Kirt Walstad

## Approval

Kirt Walstad, 4/14/2025

## Acknowledgments

Site Description Revisions The 2005 Saline Upland 10-14” p.z. ecological site description replaces earlier dated versions of the Saline Upland 10-14” p.z. description in Rangeland Resource Unit 52XN. This 2005 revision incorporates the State and Transition Model theory, additional data on site productivity, and an improved understanding of many rangeland health indicators. Site Description Approval This ecological site description is approved with the understanding that it is no more than another step in our continual effort to update the NRCS technical guide. In order to facilitate the process, NRCS field personnel are encouraged to forward existing information and/or new data that can be used to improve the utility of this site description. Please forward the information and data to the State Rangeland Management Specialist. Authors Date Approval Date Dr. John Lacey 02/28/2005 Loretta J. Metz 03/19/2005 Maxine Rasmussen, Area RMS, Glasgow, MT Jon Siddoway, Area RMS, Great Falls, MT Rick Bandy, Area RSS, Great Falls, MT Greg Snell, Area RSS, Glasgow, MT

## 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) | Siddoway/Bandy |
| Contact for lead author | Great Falls Area Office, Great Falls, MT Reference site used? No |
| Date | 04/19/2005 |
| Approved by | |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills: Slopes are between 0 – 8%, generally, and bare ground will be 50-60%, so past and current rill activity is expected on this site after rain storms or following melting of adequate snow depths within a short time period.**

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2. **Presence of water flow patterns:** Because the soil surface is not well covered and slopes greater than zero are common on this site there will be evidence of water flow patterns. Sodium & salt content in these soils restricts water intake into the soil.

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3. **Number and height of erosional pedestals or terracettes:** Where there is adequate slope and unsheltered distance, pedestals and terracettes will be shallower towards the top of the slope and deeper towards the bottom of the slope.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground will be 50 – 60% across this site.

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5. **Number of gullies and erosion associated with gullies:** Past gully erosion may be evident on this site. Active gullies should not be present, but can occur after severe storms.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** These areas will be rare on this site.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement may move over extensive distances relative to other sites due to the presence of larger areas of bare ground. Size of the litter would reflect the more common plant tissue (leaves & reproductive culms) in the reference state – mainly western wheatgrass.

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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):** Areas under plant canopies and areas of bare soil on this site will have values between 1 and 4.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is platy to blocky; A horizon depth is 1 – 3".

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Even with the dominance of taller, deeper-rooted bunchgrasses infiltration on this site is restricted due to the presence of sodium in the soil and the extensive bare ground, so runoff will be more common on this site with more moderate storm events.

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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):** Will not be present generally, but there may be areas that have "healed" from former bison trails and wallows as well as from more current livestock trailing, which will have a compaction layer below the soil surface.

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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: Cool season, rhizomatous grasses (Western wheatgrass) > shrubs >warm season taller bunchgrasses (alkali sacaton) = cool season, taller bunchgrasses (Nuttall alkaligrass) > warm season rhizomatous grasses (inland saltgrass) > perennial forbs.**

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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. Prolonged droughts which last more than 2 years may show increases in mortality and decadence for all plant groups.**

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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): 300 - 700 #/acre. This would be the expected production for the reference state during adequate moisture years. 500 pounds would be the expected production in a 12 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: Foxtail barley, kochia, a variety of annual or biennial weedy forbs.**

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17. **Perennial plant reproductive capability: Due to the soil restrictions on this site, seed production can be unpredictable. Bunchgrasses will generally produce seeds in good moisture years, however the cool & warm season rhizomatous grasses may not necessarily produce seed even with adequate moisture.**

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