

Ecological site R048BY265CO Salt Meadow

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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): 048B–Southern Rocky Mountain Parks and Valleys

This area is in Colorado (96 percent) and Wyoming (4 percent). It makes up about 2,325 square miles (6,020 square kilometers). The town of Walden, in the northern part of this MLRA, is in a wide valley locally known as North Park. The town of Kremmling is in a valley locally known as Middle Park. The town of Hartsel, in the center of the southern part of the MLRA, is in a broad intermontane basin locally known as South Park. The northern part is bordered by the Medicine Bow, Routt, and Arapaho National Forests, and the southern part is bordered by the San Isabel and Pike National Forests. The Arapaho National Wildlife Refuge is directly south of the town of Walden.

This area is within the Southern Rocky Mountains Province of the Rocky Mountain System. It consists of nearly level to rolling mountain parks and valleys and a few narrow mountain ridges. It occurs as two separate parts in the center of the Southern Rockies. The southern half of the northern part is on the west side of the Continental Divide, and the rest of the MLRA is on the east side of the divide. Elevation ranges from 7,850 to 10,850 feet (2,395 to 3,310 meters). The head waters of North Platte River leaves Colorado and enters Wyoming in the northern half of the northern part of the MLRA (North Park). The headwaters of Colorado River is in the southern half of the northern part of the MLRA (Middle Park). The headwaters of South Platte River is in the southern part of the MLRA (South Park).

The mountain valleys and parks that are characteristic of this MLRA are surrounded by high mountain peaks of the adjacent Southern Rocky Mountains MLRA (48A). Steep slopes give rise to steep-gradient streams that can move cobbles and gravel from the mountain slopes down into the valleys. The coarse textured sediments on the surface of this area were deposited by either glacial meltwater or present-day rivers. Buried deep beneath the sediments is a complex of sedimentary and igneous rocks. Residuum from sedimentary rocks is on the steeper slopes that were not covered by alluvium and glacial outwash.

The average annual precipitation is mainly 10 to 16 inches (255 to 405 millimeters), but it is as high as 28 inches (710 millimeters) at the higher elevations that border the Southern Rocky Mountains MLRA. Precipitation generally increases with elevation. Rainfall occurs as high-intensity, convective thunderstorms during the growing season. About half of the annual precipitation falls as snow. Soil moisture is unevenly distributed within short distances because of snowdrifts. The amount of precipitation is highly influenced by rain shadows. The surrounding peaks receive most of the precipitation as storm systems traverse the area. The average annual temperature is 35 to 42 degrees F (1 to 6 degrees C). The freeze-free period averages 95 days and ranges from 70 to 120 days, decreasing in length with elevation.

The dominant soil order in this MLRA is Mollisols. Alfisols are of lesser extent. The soils are very shallow to deep, generally well drained, and loamy or clayey and have mixed or smectitic mineralogy. The soil temperature regime is dominantly cryic, but it is frigid in some small areas, primarily on south- or west-facing slopes. The soil moisture regime is mainly ustic, but a marginal aridic regime has been identified in areas where the average annual precipitation is less than about 12 inches (305 millimeters). The most extensive great group is Argicryolls (Hodden, Lucky, Parlin, Tiagos, and Cabin series), which commonly formed in outwash and slope alluvium on outwash

terraces, fan remnants, hills, and mountain slopes. Haplocryolls (Redcloud and Tealson series) formed in outwash and slope alluvium on outwash terraces, valley side slopes, hills, and ridges. Haplocryalfs (Gebson and Harsha series) formed in slope alluvium and outwash on outwash terraces, fan remnants, hills, ridges, and mountain slopes. Cryaquolls (Dobrow and Randman series) formed in alluvium on stream terraces and flood plains.

Classification relationships

NRCS:

Major Land Resource Area 48B, Southern Rocky Mountain Parks (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:

M331I – North Parks and Ranges Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

EPA:

21i – Sagebrush Parks and 21j – Grassland Parks < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains North American Deserts (Griffith, 2006).

USGS: Southern Rocky Mountain Province

Ecological site concept

R048BY265CO Salt Meadow occurs on swales, drainageways. Flood plains, and valley floor. Slopes is between level and five percent. Soils are very deep (60 inches or greater). Soils are derived from alluvium. Soil surface texture is clay loam or silty clay loam with fine textured subsurface. It is a western wheatgrass – saltgrass community. It has an ustic aridic moisture regime. The effective precipitation ranges from 9 to 12 inches.

Associated sites

R048BY261CO	<p>Salt Flats</p> <p>R048BY261CO Salt Flats occurs on drainageways and stream terraces in Middle and North Park. Slopes is between 0 to 5%. Soils are very deep (60+ inches). Soils are derived from alluvium from sedimentary rock (Coalmont Formation). Soil surface texture is usually sandy loam with fine textured subsurface. Soils have a natric horizon and are strongly alkali and saline. It is a big sagebrush – greasewood – western wheatgrass – saltgrass community.</p>
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Similar sites

R048BY224CO	<p>Dry Salt Playa</p> <p>R048BY224CO Dry Salt Playa occurs drainageways, alluvial flats and playas. Slopes is between 0 to 5%. Soils are deep to very deep (40 to 80 inches). Soils are derived from alluvium. Soil surface texture is usually coarse sandy loam with fine textured subsurface. This soil has gypsum and salt accumulations. It is a seepweed – alkali cordgrass – saltgrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.</p>
R048BY268CO	<p>Dry Flood Plain Step</p> <p>R048BY268CO Dry Flood-Plain Step occurs on flood plain steps in South Park. Slopes is between 0 to 5%. Soils are very deep (60+ inches). Soils are derived from alluvium. Soil surface texture is usually loam or clay loam with fine-loamy over sandy or sandy-skeletal textured subsurface. This site has a strongly contrasting textural stratification at 20 to approximately 30 inches. It is a tufted hairgrass – Nebraska sedge community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.</p>
R048BY241CO	<p>Mountain Meadow</p> <p>R048BY241CO Mountain Meadow occurs on flood plains, stream terraces, drainageways and alluvial flats. Slopes is between 0 to 5%. Soils are moderately deep to very deep (25 to 100 inches). Soils are derived from alluvium from igneous and metamorphic rock. Soil surface texture is usually loam, fine sandy loam, silty clay loam or sandy clay loam with fine-loamy, fine-loamy over sandy-skeletal or coarse-loamy textured subsurface. It is a tufted hairgrass – Nebraska sedge community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Distichlis spicata</i>

Physiographic features

This site occupies the flat to gently sloping swales and drainageways of Middle Park. The slope varies from level to five percent. The direction of slope is not of great importance. Elevation ranges from 7300 feet to 8300 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Swale (2) Drainageway (3) Flood plain (4) Valley floor
Runoff class	Medium to high
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Elevation	7,300–8,300 ft
Slope	0–5%
Water table depth	20–60 in
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is about 9 to 12 inches. Of this, approximately 50 to 60 percent falls as snow, and 40 to 50 percent falls as rain between middle of June and the end of September. Summer moisture is mostly from thundershowers in June thru September. November thru March is the driest period of the year with the driest month being January and February. July and August are the wettest months.

The average annual total snowfall is 57.4 inches. The snow depth usually ranges from 1 to 8.5 inches during September thru May. The highest winter snowfall record in this area is 104.9 inches which occurred in 1985-1986. The lowest snowfall record is 23.5 inches during the 1962-1963 winter.

The frost-free period typically ranges from 15 to 60 days. The last spring frost is typically the third week of June to the middle of July. The first fall frost is usually the first part of August to the end of August.

Mean daily annual air temperature ranges from about 21.6 degrees F to 52.6 degrees F, averaging about 17.8 degrees F for the winter and 56.6°F in the summer. Summer high temperatures of low-70 degrees F to high-70 degrees F are not unusual. The coldest winter temperature recorded was -49 degrees F on February 1, 1951 and the warmest winter temperature recorded was 58 degrees F on December 10, 1939. The coldest summer temperature recorded was 17 degrees F on June 4, 1898 and the warmest was 96 degrees F on August 4, 1973.

Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2018) for Walden, Colorado Climate Station.

This zone in MLRA 48B will need to be broken up into at least two or three land resources zones in future projects based on current knowledge of precipitation and temperature patterns based on North Park-Middle Park and South Park. All the parks are Cryic. Antero Reservoir is in South Park. Gore Pass Ranch and Kremmling are in Middle Park. Walden is in North Park.

North Park (Walden) is used in the write-up above. Climatic graphs and tables following this were developed using the full range of climate data for all zones within the MLRA. The graphics will show a greater range of variability than expressed in the write ups.

Middle Park (Gore Pass Ranch and Kremmling) has growing season of 50-90 days; August is the wettest month; and the driest months is December thru February.

South Park (Antero Reservoir) has a growing season of 30 to 70 days with August being the wettest months and November thru January is the driest months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	21-47 days
Freeze-free period (characteristic range)	70-83 days
Precipitation total (characteristic range)	12 in
Frost-free period (actual range)	15-53 days
Freeze-free period (actual range)	60-86 days
Precipitation total (actual range)	9-12 in
Frost-free period (average)	34 days
Freeze-free period (average)	77 days
Precipitation total (average)	12 in

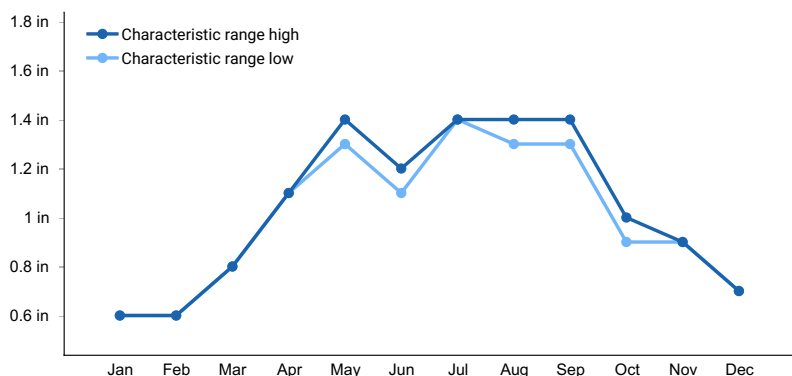


Figure 1. Monthly precipitation range

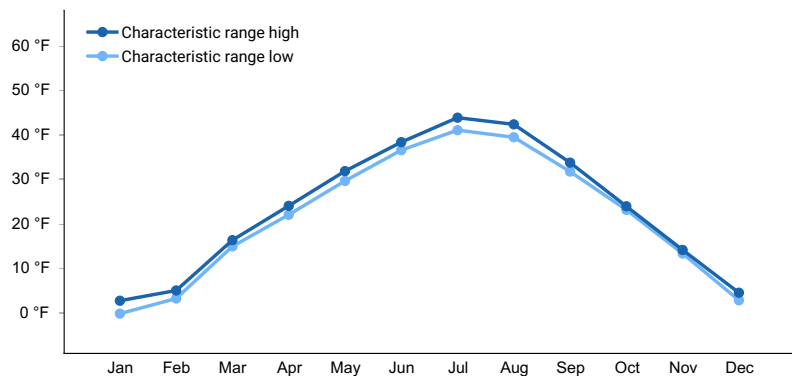


Figure 2. Monthly minimum temperature range

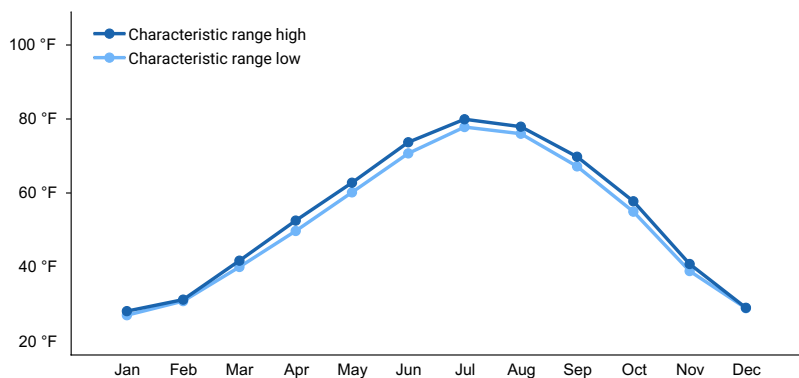


Figure 3. Monthly maximum temperature range

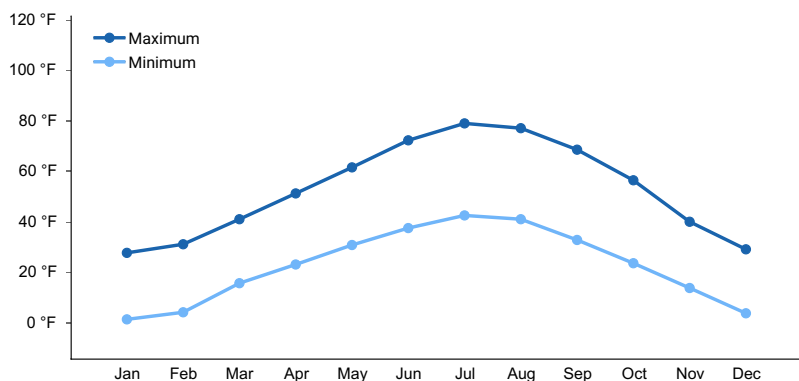


Figure 4. Monthly average minimum and maximum temperature

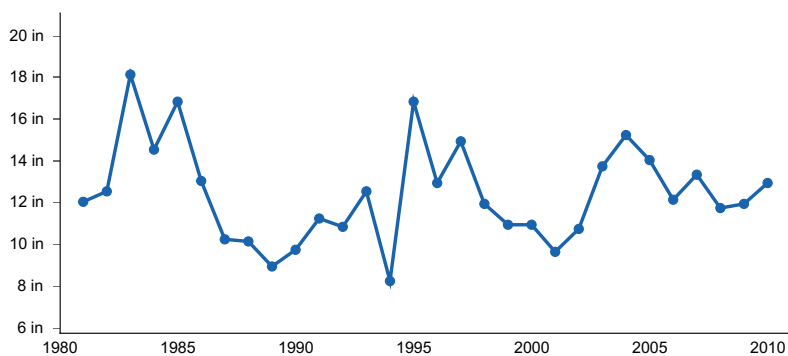


Figure 5. Annual precipitation pattern

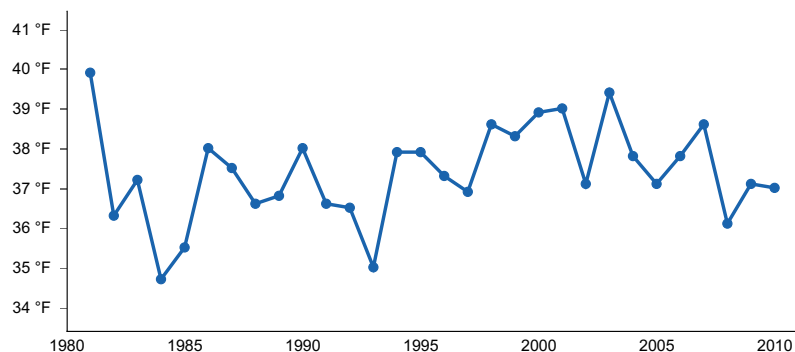


Figure 6. Annual average temperature pattern

Climate stations used

- (1) KREMMLING [USC00054664], Kremmling, CO
- (2) WALDEN [USC00058756], Walden, CO

Influencing water features

This ecological site is located in swales and valleys. It receives extra moisture from surrounding uplands that drain into the area. They have ephemeral streams. The water table is usually greater than 20 to 60 inches. Periodic flooding is very brief (4 to 48 hours) to brief (2 to 7 days) in duration.

Wetland description

N/A

Soil features

Soils are brown to almost white, strongly saline-alkali, and poorly drained silty clay loam. Soils are deep (60 inches or greater) The entire profile is strongly gleyed and is affected by salt and high water table that is restrictive to plant growth.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Clay loam (2) Silty clay loam
Family particle size	(1) Fine
Drainage class	Poorly drained to moderately well drained
Permeability class	Moderately slow to slow
Soil depth	60 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (Depth not specified)	5–8 in
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0–8 mmhos/cm
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The site has a salt tolerant grassland aspect. Only small amounts of shrubs are native to the site. Western wheat-grass is the dominant plant on the site. Other grasses and grasslike plants are alkali cordgrass, alkali sacaton, tufted hairgrass, alkali grass, saltgrass, squirreltail, sedges, and rushes. Forbs include woody aster and arrowgrass. Greasewood is the only shrub native to the site.

State and transition model

R048BY265CO Salt Meadow

State 1: Reference State

1.1 Grass Meadow

Western wheatgrass, saltgrass, alkaligrass, sedges and rushes.

1.2A

1.2 Saltgrass with Mixed Shrubs (<15%)

Grasses, sedges and rushes with greasewood

1.1A

1.3 Saltgrass with Mixed Shrubs (>15%)

Greasewood with foxtail and saltgrass

1.2B

1.3A

1.3B

T1A

State 2: Current Potential State

2.1 Grass Meadow

Western wheatgrass, saltgrass, alkaligrass, sedges and rushes. Present of introduced grasses and forbs.

2.1A

2.2 Meadow with Shrubs

Grasses, sedges and rushes with greasewood. Present of introduced grasses and forbs.

2.2A

2.3 Greasewood with saltgrass

Greasewood with foxtail and saltgrass. Present of introduced grasses and forbs.

1.2A

1.2A

1.2A

T2A

State 3: Enhanced or Altered State

3.1 Enhanced Grass Dominated

Seeded grass species, other grasses, shrubs and forbs. Present of introduced grasses and forbs.

3.2A

3.1A

3.2 Enhanced with Shrubs

Seeded grass species, shrubs and forbs. Present of introduced grasses and forbs.

Legend

1.1A, 2.1A, 1.3A, 2.3A – wetter climate period, time without disturbance
 1.1B, 2.1B, 1.2B, 2.2B – Fire
 1.2A, 2.2A – Insect and pathogen outbreaks, drought, small scale fires
 T1A – Establishment of non-native invasive plants
 T2A – vegetation manipulation, insect or pathogen outbreaks, drought
 T2B, T3A – Vegetation manipulation
 3.1A – drought, reduced fire return interval
 3.2A – time without disturbance

State 1

Reference State

This site is treeless. Optimum ground cover is 50 percent. Invaders to this site are rabbitbrush, big sagebrush, and foxtail barley.

Community 1.1

Reference State

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1065	1485	1700
Shrub/Vine	100	150	200
Forb	35	65	100
Total	1200	1700	2000

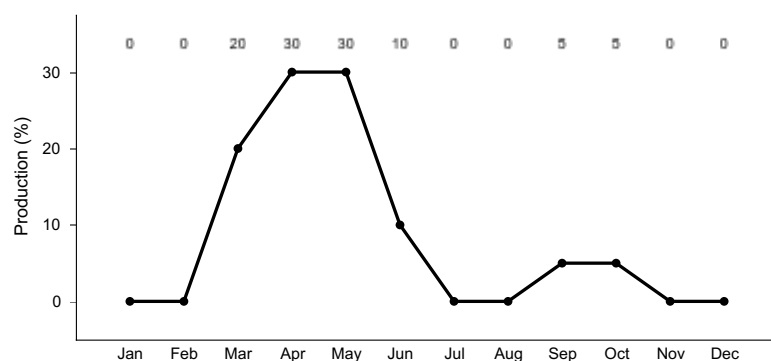


Figure 8. Plant community growth curve (percent production by month). CO0102, Semidesert Sites.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				1200–1600	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	500–750	–
	saltgrass	DISP	<i>Distichlis spicata</i>	350–500	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	100–250	–
	alkaligrass	PUCCI	<i>Puccinellia</i>	100–250	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	50–125	–
	rush	JUNCU	<i>Juncus</i>	50–125	–
	sedge	CAREX	<i>Carex</i>	50–125	–
Forb					
2				25–100	
	Forb, perennial	2FP	<i>Forb, perennial</i>	50–150	–
Shrub/Vine					
3				50–250	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	100–250	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–150	–

Animal community

Grazing:

This site has a high value rating for cattle and horses and a low value rating for sheep.

Wildlife:

This site has a high value rating for cottontail, jackrabbit and upland game birds. It has a medium value rating for antelope and deer. It has a low value rating for elk and waterfowl. This site is not applicable for bison.

Hydrological functions

This site has a low value rating for watershed due to small are and rapid runoff.

Recreational uses

This site has a medium value rating for recreation and natural beauty.

Wood products

N/A

Other information

Rare, Threatened or Endangered Plants and Animals:
None identified at this time.

Location of Typical Example of the Site:
Near Highway 40 overpass, 6 miles east of Kremmling.

Field Offices in Colorado wher the site occurs:
Kremmling
Walden

Other references

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Contributors

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Approval

Kirt Walstad, 9/07/2023

Acknowledgments

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--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 48A must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

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)	C. Holcomb, F. Cummings, S. Jaouen
Contact for lead author	
Date	01/20/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** None

3. **Number and height of erosional pedestals or terracettes:** None to slight

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expect 5-15% bare ground. Extended drought or increased salt concentrations can cause bare ground to increase.

5. **Number of gullies and erosion associated with gullies:** None to rare. Due to off-site influence. If present, edges rounded and vegetated.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

7. **Amount of litter movement (describe size and distance expected to travel):** Typically slight, however during major flooding events this site slows water flow and captures litter and sediment.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class rating anticipated to be 3-5 at soil surface.

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

typically deep and poorly drained with a high water table. Surface texture ranges from loam to fine sandy loam with a moderate medium sub-angular blocky structure. The A-horizon ranges from 0-8 inches in depth. Color varies from light gray to pale brown. Moderate to strongly saline-alkali. Surface salts may be obvious.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass, sedge/rush, shrub and forb functional/structural groups and diverse root structure/patterns reduces raindrop impact slows overland flow providing increased time for infiltration to occur. However, the high water table inherent to this site has more effect on infiltration than does plant community.
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: cool season rhizomatous grass >

Sub-dominant: warm season rhizomatous grass > cool season bunchgrass

Other: shrubs > sedges/rushes forbs

Additional:

- 13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal
- 14. **Average percent litter cover (%) and depth (in):** 30-40% litter cover and ranges from 0.25 to 0.50 inches in depth. Litter cover declines during and following extended drought.
- 15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1200 lbs./ac. low precip years; 1700 lbs./ac. average precip years; 2000 lbs./ac. above average precip years. After extended drought, production may be reduced by 350 – 800 lbs./ac. or more.
- 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:** Big sagebrush, rabbitbrush, foxtail barley, inland saltgrass.
- 17. **Perennial plant reproductive capability:** The only limitations are weather-related, wildfire, natural disease, inter-species competition, wildlife, and insects that may temporarily reduce reproductive capability.

