USDA Natural Resources Conservation Service

Ecological site R051XY267CO
Salt Meadow

Last updated: 9/07/2023
Accessed: 04/24/2024

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): 051X–High Intermountain Valleys

This MLRA encompasses the San Luis Valley in south central Colorado and the Taos Plateau and Taos alluvial fans of north central New Mexico. As part of the northern portion of the Rio Grande Rift, the MLRA consists of large, alluvium filled basins washed down from adjacent mountain ranges. The Rio Grande River flows through this MLRA, continuing its long function of carrying mountain sediment down to the basin. Cenozoic volcanism is an extensive characteristic of the MLRA where large basalt flows with volcanic hills and domes are abundant .Ancient Lake Alamosa is a large feature within the MLRA.

Classification relationships

NRCS:
Major Land Resource Area 51, High Intermountain Valleys (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:
331J – Northern Rio Grande Basin M331Ic > 331Ja - San Luis Valley, 331Jb - San Luis Hills and 331C - Mogotes

EPA:
22 - Arizona/New Mexico Plateau > 22a - San Luis Shrublands and Hills ; 22b -San Luis Alluvial Flats and Wetlands ; 22c - Salt Flats; 22e - Sand Dunes and Sand Sheets and 22f -Taos Plateau (Griffith, 2006).

USGS:
Southern Rocky Mountain Province

Ecological site concept

Salt Meadows are relatively low-lying on ground gently undulating due to located on the floodplains and stream terraces. The water-table is usually within three feet of the surface. Salt and alkali and a high water table are the main factors affecting plant growth. Some areas receive periodic flooding but are not under water for long periods. Salinity and alkalinity are mostly moderate. Surface textures are mostly loams.

Associated sites

R051XY263CO	**Salt Flats** Salt Meadow sites are commonly associated with the Salt Flats site. The Salt Flats occurs on ground slightly higher than the Salt Meadow site. Salt Meadows are influenced by a higher water table. These two sites share a significant overlap in species composition however the meadow site supports much higher plant diversity and productivity.

R051XY315CO	**Wet Meadow 6-10 PZ** Salt Meadow sites are often sandwiched between salt flats and wet meadow sites. Wet Meadow sites are located on ground slightly lower than Salt Meadow therefore are influenced by a higher water table. These two sites share a significant overlap in species composition with the Wet Meadow site supporting higher plant diversity and productivity. These two sites are often found adjacent to river courses, forming the landscape in and around oxbows.
R051XY264CO	**Chico Land** Chico Land sites can be found adjacent to and on slightly higher ground than Salt Meadow sites. Salt Meadows have access to extra water due to higher flooding frequency and higher water table. Salt Meadows are grass dominated while chico land has a strong shrub component.

Similar sites

R051XY263CO	**Salt Flats** The Salt Flats occurs on ground slightly higher than the Salt Meadow site. Salt Meadows are influenced by a higher water table.
R051XY315CO	**Wet Meadow 6-10 PZ** Wet Meadow sites are located on ground slightly lower than Salt Meadow therefore are influenced by a higher water table. These two sites share a significant overlap in species composition with the Wet Meadow site supporting higher plant diversity and productivity. These two sites are often found adjacent to river courses, forming the landscape in and around oxbows. Wet meadow occurs in areas with less salinity and alkalinity than the salt meadow site.

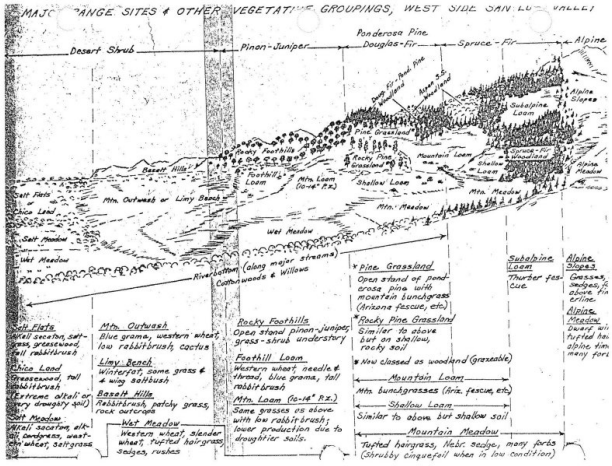


Figure 1.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus* (2) *Ericameria nauseosa*
Herbaceous	(1) *Sporobolus airoides* (2) *Spartina gracilis*

Physiographic features

Salt Meadows are relatively low-lying on ground gently undulating on floodplains and stream terraces. In some places, it forms a band between the Wet Meadow and Salt Flats range sites. Slopes are mostly 0 to 1% and have no significant effect on plant growth.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace

Runoff class	Low to very high
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	7,500–8,500 ft
Slope	0–1%
Water table depth	12–36 in
Aspect	Aspect is not a significant factor

Climatic features

The climate that typifies the High Intermountain Valley, ranges from arid to semi-arid, and is characterized by cold winters, moderate summers, and much sunshine. The San Juan mountain range to the west and the Sangre de Cristo Mountains to the east intercept much of the precipitation causing a two-way rain shadow effect. Average annual precipitation is 6 to 12 inches. of this 55-60% falls between May 1 and September 1, mostly as hard, spotty thundershowers in July and August. May and June are normally dry. Wide seasonal and yearly variations are common. Major native plants make most of their growth between early May and August. Some plants normally complete growth by mid-June and may make late regrowth.

Cold air from the encompassing mountain ranges drain into the valley and settle. This phenomena results in long cold winters and moderate summer temperatures. July is the hottest month and January is the coldest. Mean annual temperature is 41 degrees to 43 degrees F. Average freeze-free period is 95 to 105 days, from late May to early June to September. Summer daytime temperatures are frequently in the low 80's, but rarely exceed 90 degrees F, and nights are cool. Temperatures of -20 degrees to -30 degrees F can be expected each year and are common some winters. Winds that often reach high velocities are common, especially in spring. Relative humidity is usually low. Even so, evaporation rates average lower than those of many dry regions because of the cooler climate. Snow cover is often light and is sometimes lacking through much of the winter. There is usually some snow through, during the coldest weather. Most major plant species initiate growth between mid May and late July, but growth may extend into September. Some cool season plants begin growth earlier and complete growth by mid June.

Table 3. Representative climatic features

Frost-free period (characteristic range)	71-83 days
Freeze-free period (characteristic range)	97-106 days
Precipitation total (characteristic range)	6-12 in
Frost-free period (actual range)	69-84 days
Freeze-free period (actual range)	94-108 days
Precipitation total (actual range)	6-12 in
Frost-free period (average)	77 days
Freeze-free period (average)	101 days
Precipitation total (average)	9 in

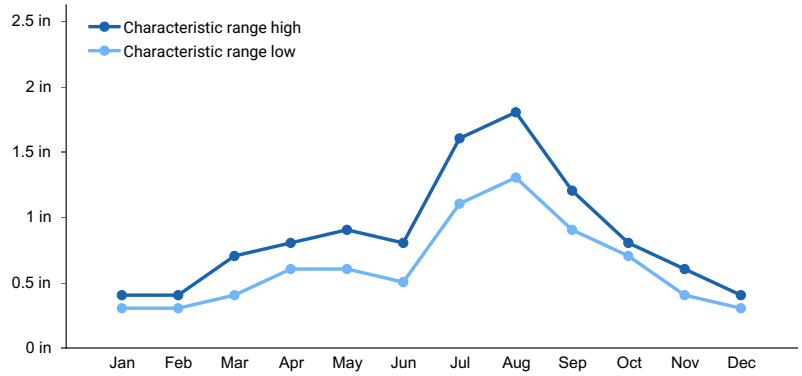


Figure 2. Monthly precipitation range

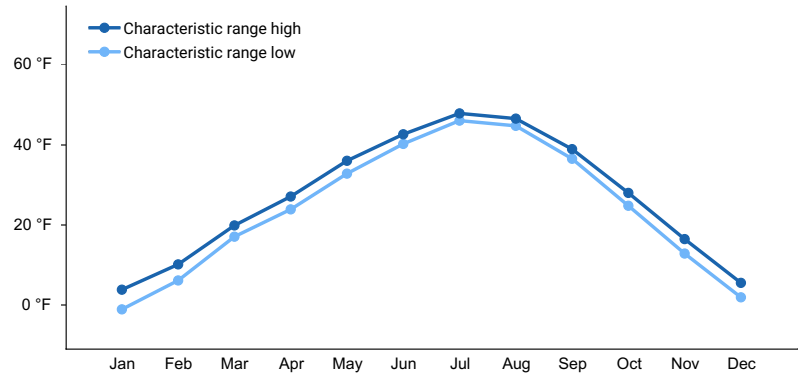


Figure 3. Monthly minimum temperature range

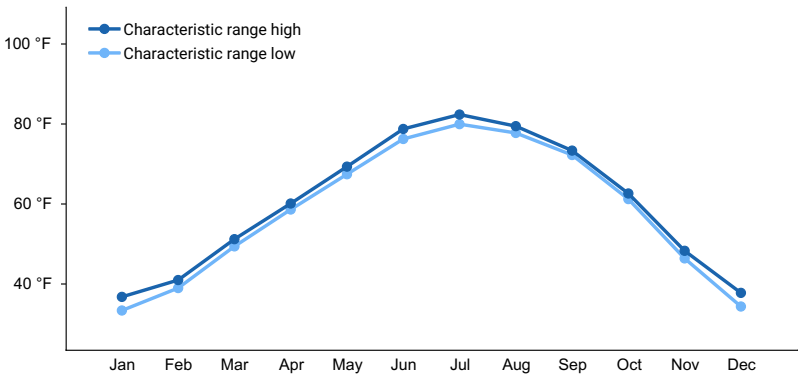


Figure 4. Monthly maximum temperature range

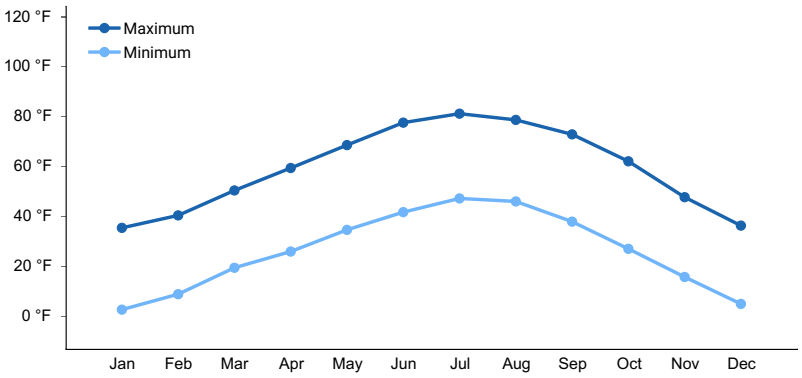


Figure 5. Monthly average minimum and maximum temperature

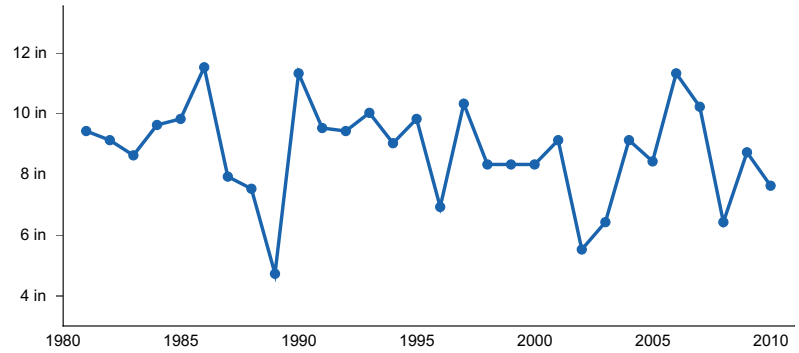


Figure 6. Annual precipitation pattern

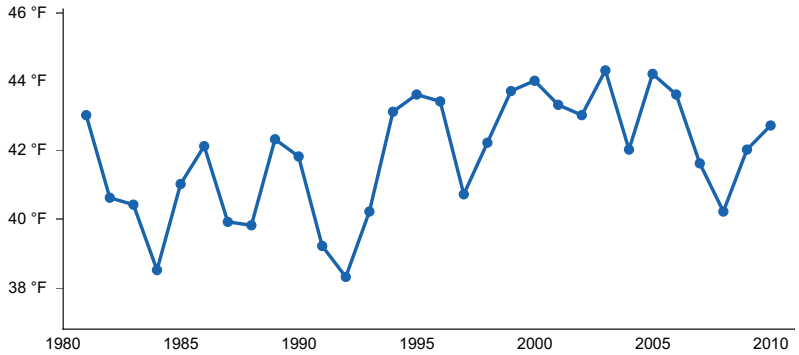


Figure 7. Annual average temperature pattern

Climate stations used

- (1) ALAMOSA SAN LUIS AP [USW00023061], Alamosa, CO
- (2) CENTER 4 SSW [USC00051458], Center, CO
- (3) DEL NORTE 2E [USC00052184], Del Norte, CO
- (4) MONTE VISTA 2W [USC00055706], Monte Vista, CO
- (5) BLANCA 4 NW [USC00050776], Blanca, CO
- (6) MANASSA [USC00055322], La Jara, CO
- (7) SAN LUIS 1 S [USC00057430], San Luis, CO

Influencing water features

The salt meadow site is mostly near main streams and receives periodic flooding, but are not under water for long periods. When flooding occurs it is usually in April. May and June. The water-table is usually within three feet of the surface early in the growing season and within four feet during the winter.

Soil features

Salt and alkali and a high water table are the main factors affecting plant growth. Some areas receive periodic flooding but are not under water for long periods. Salinity and alkalinity are mostly moderate, but either may range from low to high. Surface textures are mostly loams, but may be lighter or heavier.

Soils correlated to this site are:
Alamosa, Mishak, Nortonville, Hagga, LaManga and Vastine,

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock (2) Alluvium
Surface texture	(1) Loam

Family particle size	(1) Fine-loamy (2) Fine-loamy over sandy or sandy-skeletal
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Moderately slow to moderate
Soil depth	60 in
Surface fragment cover <=3"	0–9%
Surface fragment cover >3"	0–3%
Available water capacity (Depth not specified)	3.5–7.5 in
Calcium carbonate equivalent (Depth not specified)	0–20%
Electrical conductivity (Depth not specified)	0–8 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–40
Soil reaction (1:1 water) (Depth not specified)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–25%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

A rather uniform stand of grasses gives the site a smooth, meadow-like appearance. The plant community is dominated by various mixtures of alkali sacaton, alkali wildrye, western wheatgrass, and alkali cordgrass. Of these, alkali sacaton is usually dominant, and may form a nearly pure stand in places but other graminoid species may dominate in microsites.

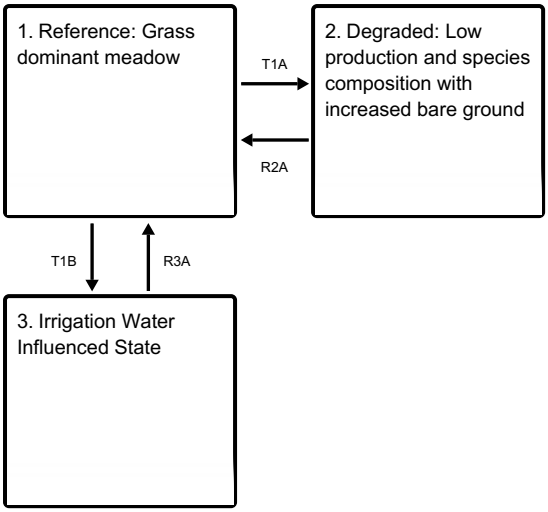
Overall, subdominant species include: slender wheatgrass, saltgrass, Baltic rush, sedges, and mat muhly can be expected. Forbs appear as scattered plants or in small isolated patches, and make up a small part of the total yield. Common forbs include: lanceleaf goldenweed, hearbaceous cinquefoils, horsetail, wild iris, American licorice, and Mexican dock. There may be traces of a few others. Greasewood tends to become more present as the site grades into the Salt Flats site. Rubber rabbitbrush and invasive species increase in disturbed areas.

Native species likely to invade the site or significantly increase from trace amounts are foxtail barley, alkali muhly, povertyweed, wild iris, and Baltic rush. Invasive species which may invade are swainsonpea, tall whitetop, Russian knapweed, Canada thistle, hoary cress and annuals such as kochia.

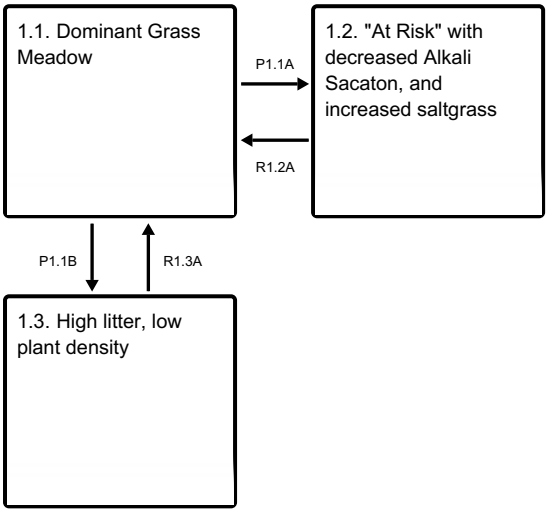
Drier, more coarse soils with a lower alkali/saline/sodic presence favor alkali sacaton and commonly have a more diverse plant understory. Fine-textured saline to sodic soils with a more elevated water table favor the inland saltgrass type which does not support much plant diversity.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference: Grass dominant meadow

This is a productive grass-dominant sub-irrigated meadow. This state evolved with grazing by herbivores such as bison and elk and is well suited for grazing by wildlife and livestock. It can be found on areas that are properly managed with grazing that allows for adequate recovery periods following each grazing event.

Dominant plant species

- alkali sacaton (*Sporobolus airoides*), grass
- alkali cordgrass (*Spartina gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

- beardless wildrye (*Leymus triticoides*), grass

Community 1.1
Dominant Grass Meadow

Figure 8. Reference community phase in the foreground

Principle dominant plants are alkali sacaton, alkali wildrye, and alkali cordgrass. Grasses of secondary importance are western wheatgrass, slender wheatgrass, and inland saltgrass. Key forbs and shrubs include American licorice, scarlet globemallow, greasewood and rubber rabbitbrush. Forbs are sparse. The reference community phase is about 90% grasses and grass-likes, 5% forbs, and 5% shrubs. This plant community phase is stable and productive. Litter is properly distributed with very little movement off-site and natural plant mortality is low. This is a sustainable plant community in terms of soil stability, watershed function, and biological integrity.

Dominant plant species

- alkali sacaton (*Sporobolus airoides*), other herbaceous
- alkali cordgrass (*Spartina gracilis*), other herbaceous
- alkali wildrye (*Leymus simplex*), other herbaceous
- western wheatgrass (*Pascopyrum smithii*), other herbaceous

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1350	1800	2250
Forb	75	100	125
Shrub/Vine	75	100	125
Total	**1500**	**2000**	**2500**

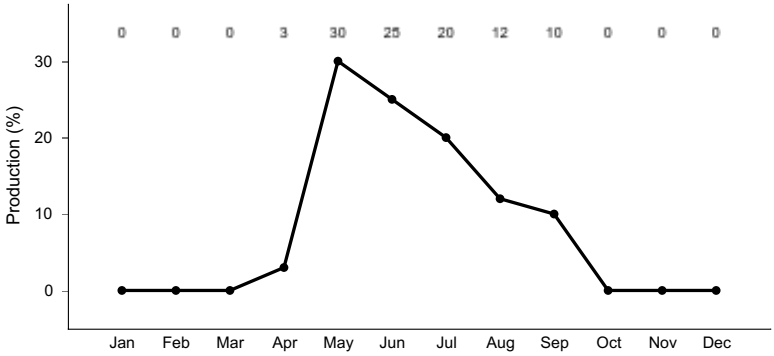


Figure 10. Plant community growth curve (percent production by month). CO5107, Warm season dominant, cool season sub-dominant; MLRA-51; valley floor-alkaline soils..

Community 1.2
"At Risk" with decreased Alkali Sacaton, and increased saltgrass

Figure 11. Decreased alkali sacaton, increased inland saltgrass

This community phase is characterized by Increased inland saltgrass with some rubber rabbitbrush in disturbed areas; along with decreased Alkali Sacaton and other more palatable species. This is an "at risk" community phase where ecological drivers are moving the site toward a threshold. Inland saltgrass has increased, and with its dense root system dominates the community.Species such as povertyweed, baltic rush, and a noxious weed, tall whitetop has increased in composition Alkali sacaton, alkali cordgrass, western wheatgrass, and alkali wildrye have been significantly reduced. Forbs are still present in reduced amounts. Greasewood is increasing while fourwing saltbush decreases in abundance. This plant community is at risk of losing key warm and cool season grasses, palatable forbs, and shrubs. The plants within this community have decreased in frequency and production. Less litter can be expected, however the soil remains stable. As inland saltgrass becomes more dominant, the site becomes less resilient and is susceptible to a trigger event such as drought. Bare patches are starting to develop.

Resilience management. Improving diversity and density of plant cover.

Dominant plant species

- rubber rabbitbrush (*Ericameria nauseosa*), shrub
- saltgrass (*Distichlis spicata*), grass

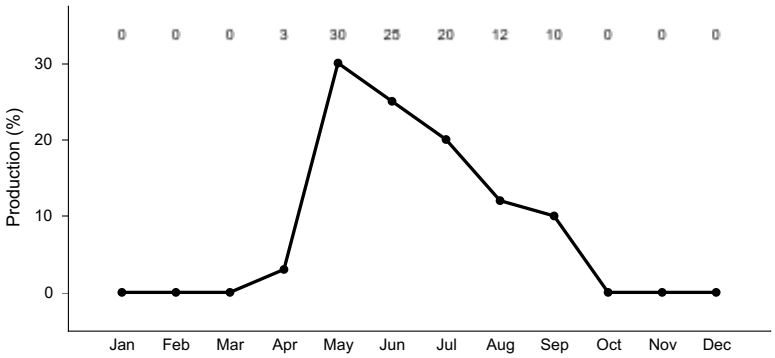


Figure 12. Plant community growth curve (percent production by month). CO5107, Warm season dominant, cool season sub-dominant; MLRA-51; valley floor-alkaline soils..

Community 1.3
High litter, low plant density

Plant composition is similar to the reference community phase, however individual species production and density will be lower. Much of the nutrients are tied up in excessive litter. The semiarid environment and the absence of animal traffic to break down litter slow nutrient cycling. Above ground litter also limits sunlight from reaching plant crowns. Many plants, especially bunchgrasses die off. Thick litter and the absence of grazing animals (animal impact) or fire reduce seed germination and establishment. In advanced stages, plant mortality can increase and erosion may eventually occur if bare ground increases. Once this happens it will require increased energy input in terms of practice cost and management to return to the reference community phase..This phase may also provide safe areas for invasive weed encroachment.

Pathway P1.1A
Community 1.1 to 1.2

Dominant Grass Meadow

"At Risk" with decreased Alkali Sacaton, and increased saltgrass

Repetitive defoliation with high utilization of preferred grazing species such as alkali sacaton will cause a shift to undesirable species such as inland saltgrass, povertyweed and baltic rush will increase.

Pathway P1.1B
Community 1.1 to 1.3

Dominant Grass Meadow

High litter, low plant density

Continued non-use for many years coupled with absence of fire will move this plant community to the Increased Plant Litter, Low Plant Density community phase.

Pathway R1.2A
Community 1.2 to 1.1

"At Risk" with decreased Alkali Sacaton, and increased saltgrass

Dominant Grass Meadow

Grazing management that allows for tillering, and seed during critical growing periods for both warm and cool season plants will allow the desirable, more vigorous meadow grasses to out-compete the inland saltgrass.

Pathway R1.3A
Community 1.3 to 1.1

High litter, low plant density

Dominant Grass Meadow

Grazing management with low to moderate stocking rates that allows appropriate rest and recovery, will stimulate tillering and reproduction. Long term monitoring and varying of seasonality of grazing are an important part of the grazing strategy.

State 2
Degraded: Low production and species composition with increased bare ground

Multiple species have been reduced and lost. There is still a remnant of alkali sacaton as the most abundant plant species along with mat muhly, povertyweed, seepweed and greasewood. There is a low frequency of cool season grasses. The greasewood is browsed but not hedged. Bare ground has increased throughout the area with

accumulations of salts evident. Compared to the reference community phase, production, perennial species diversity, and frequency has been significantly reduced. Litter amounts are low due to the loss of perennial production. Bare patches are large and erosion is a concern. Water and nutrient cycles are impaired. Annuals such as kochia, lambsquarters, Russian thistle, tansy mustard, and pepperweed may have invaded the community.Rubber rabbitbrush will exist where the soil has been disturbed. Multiple community phases are possible depending on various other management scenarios. Annual production ranges from 50-250-400 lbs per acre.

Dominant plant species

- saltgrass (*Distichlis spicata*), grass

State 3
Irrigation Water Influenced State

Excessive influence of water to this site through direct irrigation, runoff from adjacent cropland or increased stream/river overflow. This increase in water changes the soil and plant community. While saturation is occurring annually, over multiple years, species shift in composition from alkali sacaton dominant to more water tolerant species such as rushes and sedges. Foxtail barley, wild iris, poverty weed, and alkali muhly may increase in abundance when specific conditions are met. Invasive perennials that could be present are Swainsonpea, Russian knapweed, and whitetop. Total annual production ranges from 100 to 500 pounds of air-dry vegetation per acre.Once the water is removed after years of irrigation, surface soils will have excessive accumulations of salt. Once the irrigation has stopped baltic rush will hang on without an elevated water table and/or irrigation for well over 2-3 decades. This site can also further degrade to bare ground, annuals, and noxious weeds.

Transition T1A
State 1 to 2

Reference: Grass dominant meadow

Degraded: Low production and species composition with increased bare ground

Long-term, repetitive defoliation with high utilization of plant species will decrease vigor and mortality of the most palatable species such as alkali sacaton while undesirable species become more prevalent. Production, perennial species diversity, and cover has been significantly reduced. Degrading feedbacks that are associated with bare ground and annuals have greatly increased.

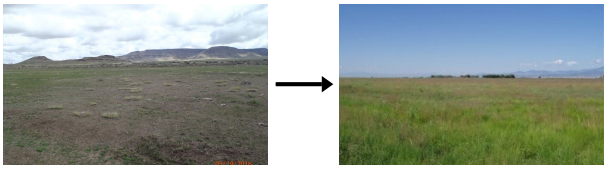
Transition T1B
State 1 to 3

Reference: Grass dominant meadow

Irrigation Water Influenced State

Multiple years of excessive irrigation runoff from adjacent crop fields. This excessive irrigation decreases tall warm season grasses such as alkali sacaton and increases species such as rushes and sedges that can withstand extra water.

Restoration pathway R2A
State 2 to 1

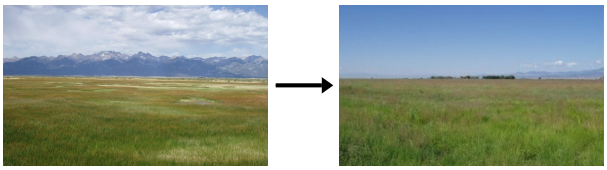


Degraded: Low production and species composition with increased bare ground

Reference: Grass dominant meadow

A well-managed, appropriately stocked livestock grazing rotation with tactical recovery periods will help reclaim this site. Local expertise suggests high density stocking with quick rotations (5-7 days) can reclaim the site from a bare ground, noxious weed community to one which produces 2500 lbs/ac in the reference community phase. .

Restoration pathway R3A
State 3 to 1



Irrigation Water Influenced State

Reference: Grass dominant meadow

Once the irrigation has stopped flowing annually the site dries out and has to contend with extra accumulated salts in the surface soil. Over a long period of time using cattle in a well-managed grazing situation with appropriate/adequate restoration periods this site can be restored to reference.

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	**Grasses**			1400–2100	
	alkali sacaton	SPAI	*Sporobolus airoides*	420–700	–
	alkali wildrye	LESI5	*Leymus simplex*	140–350	–
	western wheatgrass	PASM	*Pascopyrum smithii*	140–300	–
	alkali cordgrass	SPGR	*Spartina gracilis*	140–280	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	70–140	–
	sedge	CAREX	*Carex*	70–140	–
	saltgrass	DISP	*Distichlis spicata*	42–98	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	28–70	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	28–70	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	0–25	–
Forb					
2	**Forb**			75–125	
	American licorice	GLLE3	*Glycyrrhiza lepidota*	14–42	–
	lanceleaf goldenweed	PYLA	*Pyrrocoma lanceolata*	28–42	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	14–28	–
	povertyweed	IVAX	*Iva axillaris*	0–28	–
	slender spiderflower	CLMU	*Cleome multicaulis*	0–28	–
	Rocky Mountain beeplant	CLSE	*Cleome serrulata*	0–28	–
	horsetail	EQUIS	*Equisetum*	0–28	–
	cinquefoil	POTEN	*Potentilla*	0–28	–
	Rocky Mountain iris	IRMI	*Iris missouriensis*	0–28	–
	Mexican dock	RUSAM	*Rumex salicifolius var. mexicanus*	0–28	–
	seaside arrowgrass	TRMA20	*Triglochin maritima*	0–28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–28	–
Shrub/Vine					
3	**Shrubs**			75–125	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–42	–
	rubber rabbitbrush	ERNAC2	*Ericameria nauseosa ssp. consimilis*	0–14	–

Other information

Rare, Threatened or Endangered Plants and Animals:
(Greater) Sandhill cranes frequent parts of this site for a month or more during their spring and fall migrations.

Healthy salt meadow complexes have the potential to support numerous at-risk species: the globally vulnerable sandhill skipper subspecies endemic the San Luis sandhill skipper (Polites sabuleti ministigma), which rely solely on salt meadows for survival; two rare SLV endemic rodent subspecies, the thirteen-lined ground squirrel (Spermophilus tridecemlineatus blanca) and silky pocket mouse (Perognathus flavus sanluisi); and slender spiderflower (Cleome multicaulis).

Slender spiderflower is a geographically rare plant with a global range from southern Wyoming to central Mexico (Kettler et al. 2000). It requires periodic soil disturbance and moist, alkaline soils. No occurrences have been

documented in Arizona or New Mexico since the 1940's; some occurrences are documented in Texas and Mexico while Wyoming has only one. There are approximately 35 occurrences documented in Colorado- the SLV contains the largest, most numerous, and healthiest populations in the world.

Inventory data references

Location of Typical Example of the Salt Meadow Site:
Walter Weiss meadows east of Moffat and Shellabarger meadow on east side of road about 2 miles northeast of Moffat in Saguache County.

Field Offices in Colorado where the site occurs:
Alamosa, Center, and San Luis

Other references

Chapman, S.S., G.E. Griffith, J.M. Omernik, A.B. Price, J. Freeouf, and D.L. Schrupp. 2006. Ecoregions of Colorado. (2-sided color posterwith map, descriptive text, summary tables, and photographs). U.S. Geological Survey, Reston, VA. Scale 1:1,200,000.

Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored.

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Approval

Kirt Walstad, 9/07/2023

Acknowledgments

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B.J. Shoup, CO State Soil Scientist, Denver
Eugene Backhaus, CO State Resource Conservationist, Denver

--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 are required to refine the Plant Production and Annual Production tables for this

ecological site. The extent of MLRA 51 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)	S. Woodall, C. Villa, H. Garcia
Contact for lead author	
Date	12/14/2004
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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** None

5. **Number of gullies and erosion associated with gullies:** None

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is minimal and short, if at all.

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 5-6 in interspaces at soil surface.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface soils range from fine loamy over sandy. The A-horizon is dark brown to dark gray that can extend to 8 inches deep. Structure ranges from weak fine granular to medium sub-angular blocky.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass, forb, shrub functional/structural groups and diverse root structure/patterns reduces raindrop impact slows overland flow providing increased time for infiltration to occur.

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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):** None

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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: warm season bunchgrass >>

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

    Other: forbs > shrubs

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimum. Expect some natural mortality and decadence on grasses/sedges and shrubs where excluded from grazing animals or wildfire.

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14. **Average percent litter cover (%) and depth (in):** 50-60% litter cover at 0.50-2.5 inch depth.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 900 lbs./ac. low precipitation years; 1400 lbs./ac. average precipitation years; 1800 lbs./ac. above average precipitation years.

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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:** None

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17. **Perennial plant reproductive capability:** The only limitations are weather-related, natural disease, inter-species competition, wildlife, and insects that may temporarily reduce reproductive capability.