USDA Natural Resources
Conservation Service

Ecological site R069XY037CO
Saline Overflow

Last updated: 12/09/2024
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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

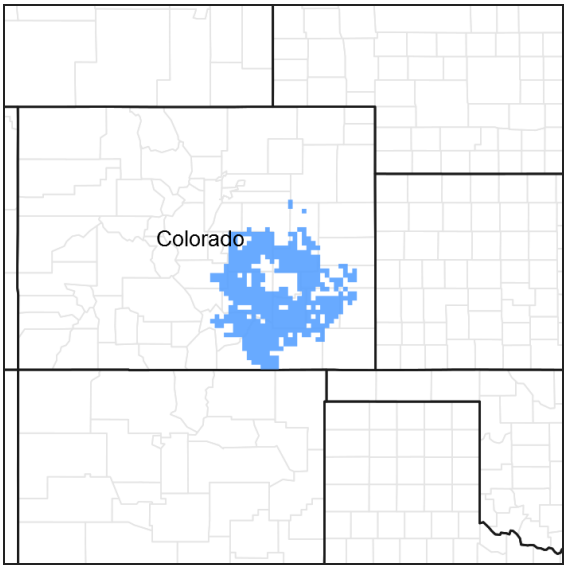


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 069X–Upper Arkansas Valley Rolling Plains

MLRA 69 is in the Arkansas Watershed of southeastern (SE) Colorado. It consists of rolling plains, river valleys, and canyonlands. The Arkansas River flows from the Rocky Mountains to Kansas. Tributaries include the Huerfano and Purgatoire Rivers. The MLRA is traversed by Interstate 25 and U.S. Highway 50, and includes the cities of Pueblo, La Junta, and Lamar. Other cities include Cañon City, and Walsenburg. Bent's Fort was once a major trading post along the Santa Fe Trail. The majority of land use is rangeland (greater than 75 percent), and 6 percent cropland. The remainder is urban, recreation, etc. Land ownership is mostly private. Federal lands include U.S. Forest Service Comanche National Grassland, Department of Defense Piñon Canyon Maneuver Site and Fort Carson. There is a minor amount of Bureau of Land Management and other federal land. State areas include Pueblo and John Martin reservoirs. Elevations MLRA-wide are 3,700 to 6,400 feet.

The "Dust Bowl" region (1930s) included SE Colorado, which is periodically affected by severe drought. Dust storms may form during drought years, in windy periods. Annual precipitation is 10 to 16 inches. Precipitation occurs mostly during the growing season, often during rapidly developing thunderstorms. Mean annual air temperature (MAAT) is 48 to 52 degrees Fahrenheit. Summer temperatures may exceed 100 degrees Fahrenheit. Evapotranspiration rates are high. Winter temperatures may be subzero. Snowfall varies from 20 to 40 inches per year. Blizzards can form quickly.

Classification relationships

MLRA 69 is in the Piedmont and Raton Sections of the Great Plains Province. The MLRA is further defined by Land Resource Units (LRUs) A, B, and C. The modal concepts of each LRU can be defined by soil properties and annual precipitation zones (PZ). Other features, such as climate, geology, landforms, and key vegetation, further refine these concepts and are described in the Ecological Site Description (ESD).

LRU A (10 to 12 inches PZ) is 2.4 million acres in the central portion of MLRA 69. There is irrigated cropland in the Arkansas Valley. Precipitation is too limited for dryland crops. Most of LRU A is rangeland, and includes the Comanche National Grassland (FS). This LRU is in portions of Bent, Crowley, Otero, and Pueblo counties. Soil Moisture Regime is Ustic Aridic. The Mean Annual Air Temperature (MAAT) is 51 to 54 degrees Fahrenheit.

LRU B (12 to 14 inches PZ) is 4.7 million acres and includes portions of Baca, Bent, Crowley, El Paso, Fremont, Kiowa, Las Animas, Lincoln, Prowers, and Pueblo counties. Most of the LRU is in rangeland. Land uses include irrigated and dry cropland, small acreage and urban ownership. Land east of Interstate 25 remains largely agricultural. Canyonlands are in the southern half and include Piñon Canyon Maneuver Site and the Picket Wire Canyon of the Comanche National Grasslands. Soil moisture regime is Ustic Aridic. The mean annual air temperature is 50 to 54 degrees Fahrenheit.

The Saline Overflow Ecological Site, LRUs A and B, site was developed from an earlier version of the Saline Overflow Ecological Site (2005, revised in 2007). This earlier version of the Saline Overflow Ecological Site (2005) was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information obtained from the Saline Overflow Range Site descriptions (1975, revised 1983). This ESD meets the Provisional requirements of the National Ecological Site Handbook (NESH). This ESD will continue refinement towards an Approved status according to the NESH.

Ecological site concept

The Saline Overflow Ecological Site is a run-on site that is not a closed depression. It has sodium, calcium carbonates, and other salts.

Associated sites

R069XY006CO	**Loamy Plains** The Loamy Plains Ecological Site is located upslope and commonly adjacent to the Saline Overflow Ecological Site.
R069XY030CO	**Salt Meadow** The Salt Meadow Ecological Site is commonly located adjacent to or near the Saline Overflow Ecological Site.
R069XY031CO	**Sandy Bottomland** The Sandy Bottomland Ecological Site is commonly located adjacent to or near the Saline Overflow Ecological Site.
R069XY033CO	**Salt Flat** The Salt Flat Ecological Site is commonly located adjacent to or near the Saline Overflow Ecological Site.
R069XY047CO	**Alkaline Plains** The Alkali Plains Ecological Site is located upslope and commonly adjacent to the Saline Overflow Ecological Site.

Similar sites

R069XY033CO	**Salt Flat** The Salt Flat Ecological Site has sodium and calcium carbonate but no other salts.
R069XY047CO	**Alkaline Plains** The Alkali Plains Ecological Site is a run-off site and located upslope of the Saline Overflow Ecological Site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens* (2) *Sarcobatus vermiculatus*
Herbaceous	(1) *Sporobolus airoides* (2) *Pascopyrum smithii*

Physiographic features

This site occurs on plains and river valleys.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Terrace (3) Drainageway (4) Flood-plain step
Runoff class	Very low to medium
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	3,800–6,300 ft
Slope	0–3%
Ponding depth	0 in
Water table depth	60 in
Aspect	Aspect is not a significant factor

Climatic features

Approximately 75 percent of the annual precipitation occurs during the growing season from mid-April to late September. Snowfall can vary greatly from year to year and can range from 20 to 40 inches per year. Winds are estimated to average 6 to 7 miles per hour annually. Daytime winds are generally stronger than nighttime winds. Occasional strong storms may bring brief periods of high winds with gusts to more than 60 miles per hour. The average length of the freeze-free period (28 °F) is 168 days. The average last freeze in the spring is April 22nd, and the average date of first freeze in fall is October 7th. The average length of the frost-free period (32 °F) is 149 days. The last frost in the spring is May 5th, and the average date for first frost in the fall (32 °F), is October 1. July is the hottest month, and January is the coldest. It is not uncommon for temperature to exceed 100 degrees Fahrenheit during the summer. Summer humidity is low and evaporation is high. The winters are characterized with frequent northerly winds, producing severe cold and temperatures dropping to -30 degrees Fahrenheit.

LRU A, in the Arkansas River Valley, is the hottest and driest portion of the MLRA. Mean Annual Precipitation (MAP) is 10 to 12 inches, and Mean Annual Air Temperature (MAAT) is 51 to 54 degrees Fahrenheit. LRU B is the largest extent. MAP is 12 to 14 inches, and MAAT is 50 to 54 degrees Fahrenheit.

Table 3. Representative climatic features

Frost-free period (characteristic range)	127-134 days
Freeze-free period (characteristic range)	149-161 days
Precipitation total (characteristic range)	12-14 in
Frost-free period (actual range)	121-135 days
Freeze-free period (actual range)	141-164 days
Precipitation total (actual range)	11-16 in

Frost-free period (average)	129 days
Freeze-free period (average)	153 days
Precipitation total (average)	13 in

Climate stations used

- (1) CHERAW 1 N [USC00051539], La Junta, CO
- (2) ORDWAY 21 N [USC00056136], Ordway, CO
- (3) ROCKY FORD 2 SE [USC00057167], Rocky Ford, CO
- (4) PUEBLO MEM AP [USW00093058], Pueblo, CO
- (5) ORDWAY 2 ENE [USC00056131], Ordway, CO
- (6) EADS [USC00052446], Eads, CO
- (7) LA JUNTA 20 S [USC00054726], La Junta, CO
- (8) TACONY 13 SE [USC00058157], Boone, CO
- (9) PUEBLO RSVR [USC00056765], Pueblo, CO

Influencing water features

There is no influential water table or wetland associated with this site.

Wetland description

N/A

Soil features

The soils of this site are very deep. They are well or moderately well drained with moderate, moderately slow, or slow permeability. The surface layer thickness ranges from 3 to 27 inches. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Parent material kind includes alluvium and old alluvium. Parent material originated from mixed sources.

Major soil series correlated to this ecological site include Hackamore, Haversid, Limon, Rago, and Sampson.

Other correlated soils that may be re-assigned include Absted, Manzanola, Shanta, and Tyrone.

Revisions to soil surveys are on-going. For the most recent updates, visit the Web Soil Survey, the official site for latest soils information: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loam (2) Silt loam (3) Silty clay (4) Clay loam (5) Clay (6) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	60–80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-40in)	2.8–8.8 in
Calcium carbonate equivalent (0-40in)	0–20%
Electrical conductivity (0-40in)	0–16 mmhos/cm
Sodium adsorption ratio (0-40in)	0–25
Soil reaction (1:1 water) (0-40in)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The information in this ESD, including the state-and-transition model (STM), was developed using archeological and historical data, professional experience, and scientific studies. The information is representative of a complex set of plant communities. The plant composition has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal-use pastures, short-duration or time-controlled grazing strategies, and historical accounts.

Not all scenarios or plants are included. Key indicator plants, animals, and ecological processes are described to inform land management decisions.

This region was historically occupied by large grazing animals, such as bison, along with pronghorn and mule deer. Deer and pronghorn are widely distributed throughout the MLRA. This is an important site for livestock grazing, especially cattle.

Drought has historically impacted the vegetation of this region. Changes in species composition vary depending upon the duration and severity of the drought cycle and prior grazing management. Recent drought events have increased mortality of blue grama significantly in some locales, along with other bunchgrasses, such as sand bluestem, little bluestem, needle and thread, Fendler threeawn, and squirreltail. Historic fire frequency (pre-industrial) is estimated at 15 to 20 years (Guyette, 2012), randomly distributed, and started by lightning at various times throughout the growing season. Early human inhabitants were also likely to start fires (deliberate or accidental).

The site is dominated by warm-season mid bunchgrass (alkali sacaton) and cool-season mid rhizomatous grass (western wheatgrass). Secondary grasses are warm-season mid stoloniferous grass (vine mesquite) and warm-season short bunchgrass (blue grama). Warm-season shrub (fourwing saltbush) is an important secondary plant on this site. Minor grasses include warm-season tall bunchgrasses (big bluestem, switchgrass), warm-season mid rhizomatous grass (galleta) and cool-season mid bunchgrass (needle and thread, green needlegrass). Other minor grasses and grass-like plants that occur is small amounts are inland saltgrass, alkali cordgrass, Canada wildrye, and sun sedge. Various shrubs (black greasewood, rabbitbrush, fringed sagebrush) and forbs (American vetch, American licorice, leafy false goldenweed) also occur on the site.

Recurring, heavy seasonal herbivory without adequate recovery opportunity, reduced fire frequency, or extended drought cause the reference community to shift to the 1.2 community. Grasses such as alkali sacaton, western wheatgrass, vine mesquite, switchgrass, and big bluestem decrease both in frequency and production. Blue grama and inland saltgrass increase. Forbs and shrubs such as American vetch, purple prairie clover, and fourwing saltbush decrease. With continuous grazing, mid and tallgrasses can eventually be removed from the plant community as blue grama and inland saltgrass become dominant. Over the long-term, continuous use or long term non-use, and lack of fire result in large amounts of bare ground. Species such as scratchgrass, ring muhly, sand dropseed, walking stick cholla, black greasewood, broom snakeweed, and annuals increase or invade the site.

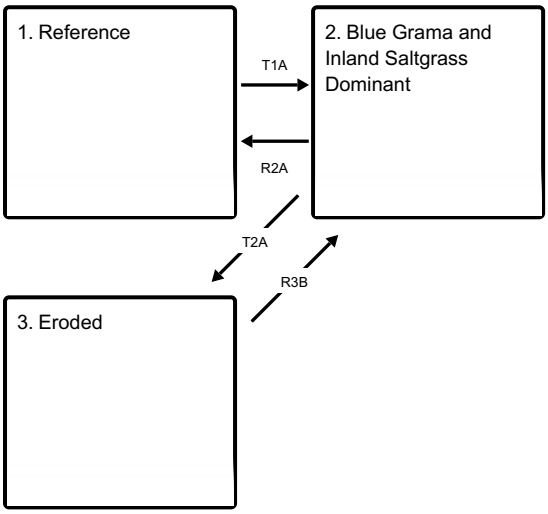
Drier and warmer climatic conditions exist in the central portion of MLRA 69. This area includes the eastern half of Pueblo county, northern Otero, extreme northwestern Bent, western edge of Kiowa, southern edge of Lincoln and all of Crowley County. These conditions are primarily caused by a rain shadow effect from the southern Rocky Mountains. Evapotranspiration rates (atmospheric demand) are higher in this area of MLRA 69. Total annual production is typically lower

Southeastern Colorado was strongly affected by extended drought conditions in the “Dust Bowl” period of the 1930s, with recurrent drought cycles in the 1950s and 1970s. Extreme to exceptional drought conditions have re-visited the area from 2002 to 2012, with brief interludes of near normal to normal precipitation years. “During periods of drought, high winds give rise to the dust storms which are especially characteristic of the southeastern plains (WRCC, 2022).” Recent drought events have increased mortality of blue grama upwards of 80 percent in some locales. The long-term effects of these latest drought years have yet to be determined.

Growth of native cool-season plants begins about April 15 and continues to mid-June. Native warm-season plants begin growth about May 1 and continue to about August 15. Regrowth of cool-season plants occurs in September and October in most years, depending on moisture. For detailed information, visit the Western Regional Climate Center website at https://wrcc.dri.edu/.

State and transition model

Ecosystem states



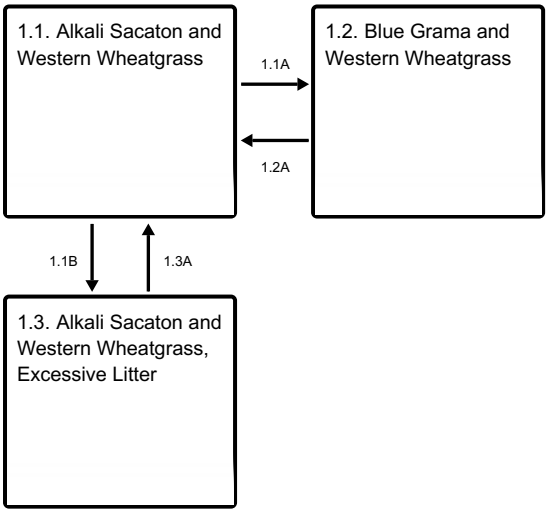
T1A - Heavy, continuous grazing. Lack of fire.

R2A - Prescribed grazing. Prescribed fire.

T2A - Heavy, continuous grazing. Lack of fire.

R3B - Prescribed grazing. Prescribed fire.

State 1 submodel, plant communities



1.1A - Heavy, season-long grazing. Lack of fire.

1.1B - Non-use. Lack of fire.

1.2A - Prescribed grazing. Prescribed fire.

1.3A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities

2.1. Blue Grama and Inland Saltgrass

State 3 submodel, plant communities

3.1. Purple Threeawn and Ring Muhly

State 1
Reference

The reference state is characterized by three community phases that exist within the natural range of variability for the site. These phases are maintained by a historic fire frequency estimated to be on 15 to 20 year intervals, herbivory by large ungulates, and adequate recovery periods. High production of perennial grasses and extensive soil cover allow for increased soil moisture retention, vegetative production, and overall soil quality.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- greasewood (*Sarcobatus vermiculatus*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1
Alkali Sacaton and Western Wheatgrass

The interpretive plant community for this site is the reference plant community. This community developed with herbivory by large herbivores. The potential vegetation is about 70 to 85 percent grasses and grass-likes, 5 to 10 percent forbs, and 10 to 20 percent shrubs by air-dry weight. Dominant grasses include alkali sacaton, western wheatgrass, vine mesquite, blue grama, and switchgrass. Grasses of secondary importance are big bluestem, galleta, green needlegrass, and needle and thread. Fourwing saltbush is an important shrub in this plant community. Inland saltgrass and sun sedge are common. Forbs such as American vetch, American licorice, leafy false goldenweed, scarlet globemallow, and dotted gayfeather are significant. This plant community is diverse, stable, and productive. Litter is properly distributed with very little movement and natural plant mortality is low. It is well suited to carbon sequestration, water yield, wildlife use by many species, livestock use, and is aesthetically pleasing. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. This community is resistant to most disturbances with the exceptions of heavy, continuous grazing, tillage, and development into urban or other uses. Total annual production ranges from 750 to 2500 pounds of air-dry vegetation per acre and averages 1500 pounds during an average year.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- greasewood (*Sarcobatus vermiculatus*), shrub
- alkali sacaton (*Sporobolus airoides*), grass

- western wheatgrass (*Pascopyrum smithii*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	535	1162	2020
Shrub/Vine	145	225	325
Forb	70	113	155
Total	**750**	**1500**	**2500**

Figure 9. Plant community growth curve (percent production by month). CO6901, Warm-season/cool-season co-dominant; MLRA-69; upland fine textured soils..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	30	20	10	3	2	0	0

Community 1.2
Blue Grama and Western Wheatgrass

This community developed with heavy, seasonal herbivory, reduced fire frequency, or extended drought. Blue grama and inland saltgrass have increased but have not developed into a sod-bound condition. Alkali sacaton, western wheatgrass, switchgrass and vine-mesquite have been reduced. Fourwing saltbush is reduced in abundance. American vetch and green needlegrass have been reduced. Forbs and shrubs such as scarlet globemallow, leafy false goldenweed, rabbitbrush, and broom snakeweed have increased. Plant vigor, litter, frequency, and production have decreased. Reduction of key warm and cool-season grasses, nitrogen fixing legumes and shrubs, and an increase in blue grama and inland saltgrass have negatively affected nutrient cycling. The biological integrity, water, and nutrient cycles of this plant community are becoming impaired. Total annual production ranges from 350 to 1300 pounds of air-dry vegetation per acre and averages 700 pounds during an average year.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- tree cholla (*Cylindropuntia imbricata var. imbricata*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- rubber rabbitbrush (*Ericameria nauseosa ssp. nauseosa var. glabrata*), shrub
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- saltgrass (*Distichlis spicata*), grass

Figure 10. Plant community growth curve (percent production by month). CO6903, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland fine textured soils..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	15	35	25	15	5	0	0	0

Community 1.3
Alkali Sacaton and Western Wheatgrass, Excessive Litter

This plant community occurs with the lack of herbivory for long periods in the absence of fire. Plant composition is similar to the reference plant community, however individual species production and frequency 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 recycling. Aboveground litter also limits sunlight from reaching plant crowns. Many plants, especially bunchgrasses die off. Thick litter and absence of herbivory (animal impact) or fire reduce seed germination and establishment. Total annual production ranges from 500 to 1800 pounds of air-dry vegetation per

acre and averages 1100 pounds during an average year.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 11. Plant community growth curve (percent production by month). CO6902, Warm-season/cool-season co-dominant, excess litter; MLRA-69; upland fine textured soils..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	22	33	18	12	5	0	0	0

Pathway 1.1A
Community 1.1 to 1.2

Recurring, heavy seasonal herbivory without adequate recovery opportunity and reduced fire frequency shift the reference plant community to the 1.2 community.

Pathway 1.1B
Community 1.1 to 1.3

Non-use and lack of fire shifts the reference plant community to the 1.3 community. Due to the accumulation of standing plant litter the cycling of nutrients can be impaired. Plant decadence and mortality can increase.

Pathway 1.2A
Community 1.2 to 1.1

The restoration of normal fire frequency and herbivory that allows for adequate recovery opportunity following grazing occurrences cause the shift back to the reference plant community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

The return of normal fire frequency and herbivory with adequate recovery opportunity between grazing events cause the shift back to the reference plant community. Shifts in community phases are reversible through succession, disturbances, and short-term climatic variations that are within the natural range of variability for the site.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Blue Grama and Inland Saltgrass Dominant

The Blue Grama and Inland Saltgrass Dominated state contains one community phase. This is a very stable state, resistant to change due to the high tolerance of blue grama and inland saltgrass to grazing, the development of a shallow root system (also known as a root pan), and subsequent changes in hydrology and nutrient cycling. The loss of dominant and subdominant functional/structural groups such as cool-season grasses, nitrogen fixing

legumes, and shrubs reduces the biodiversity and productivity of this site.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- tree cholla (*Cylindropuntia imbricata var. imbricata*), shrub
- blue grama (*Bouteloua gracilis*), grass
- saltgrass (*Distichlis spicata*), grass

Community 2.1
Blue Grama and Inland Saltgrass

Inland saltgrass and blue grama dominate the plant community and have developed into a sod-bound condition. Isolated small bunches of low vigor alkali sacaton are evident. Other warm-season grasses have been removed. Fourwing saltbush has been significantly reduced in production and vigor. Western wheatgrass may persist in remnant amounts and reduced in vigor. Walking stick cholla, black greasewood, plains pricklypear, and broom snakeweed have increased. This plant community is resistant to change due to the grazing tolerance of blue grama and inland saltgrass. A significant amount of production and diversity has been lost when compared to the reference plant community. Total annual production ranges from 150 to 650 pounds of air-dry vegetation per acre and averages 350 pounds during an average year.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- tree cholla (*Cylindropuntia imbricata var. imbricata*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- blue grama (*Bouteloua gracilis*), grass
- saltgrass (*Distichlis spicata*), grass

Figure 12. Plant community growth curve (percent production by month). CO6904, Warm-season dominant; MLRA-69; upland fine textured soils..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	15	45	25	15	0	0	0	0

State 3
Eroded

In the Eroded state, most of the more palatable species have been greatly reduced or eliminated. Litter levels are extremely low and bare ground is increasing. Rills may be evident as well as some gully erosion. The nutrient cycle, water cycle, and overall energy flow are greatly impaired. Organic matter and carbon reserves are greatly reduced. This community is not stable.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- tree cholla (*Cylindropuntia imbricata var. imbricata*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- ring muhly (*Muhlenbergia torreyi*), grass
- cheatgrass (*Bromus tectorum*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- Russian thistle (*Salsola*), other herbaceous

Community 3.1
Purple Threeawn and Ring Muhly

This community develops by heavy, continuous grazing without adequate recovery opportunity between grazing events and a lack of fire. It is in an extremely degraded condition. Some inland saltgrass and blue grama may persist in localized areas. Lower successional species that dominate the community are purple threeawn, ring muhly, sand dropseed, Cuman ragweed, mouse-ear povertyweed, walking stick cholla, black greasewood, and plains pricklypear cactus. Typical invaders include burningbush, Russian thistle, and cheatgrass. Litter levels are extremely low. Erosion is evident where flow paths are continuous. Rills may be evident as well as some gully erosion. The nutrient cycle, water cycle, and overall energy flow are greatly impaired. Organic matter and carbon reserves are greatly reduced. This community is not stable. Total annual production ranges from 25 to 200 pounds of air-dry vegetation per acre.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- tree cholla (*Cylindropuntia imbricata var. imbricata*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- ring muhly (*Muhlenbergia torreyi*), grass
- cheatgrass (*Bromus tectorum*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- Russian thistle (*Salsola*), other herbaceous

Figure 13. Plant community growth curve (percent production by month). CO6903, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland fine textured soils..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	15	35	25	15	5	0	0	0

Transition T1A
State 1 to 2

Continuous, heavy grazing without an adequate recovery period and lack of fire result in a shift between states. This transition involves a major loss of plant diversity resulting in the degradation of biotic integrity. The hydrologic function is significantly impaired.

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing management with proper stocking and adequate rest, and restoration of the fire regime are the management actions required to recover to the Reference State. The species to target for management are those that were dominant or sub-dominant within the reference plant community according to documented functional/structural groups. This restoration may take greater than 80 years to accomplish.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

Heavy, continuous grazing without an adequate recovery period and lack of fire will move the Blue Grama/Inland Saltgrass Dominant State across an ecological threshold to the Eroded State. This transition may take greater than 25 years to occur. Resilience and resistance to disturbance are lost. Soil site stability, hydrologic function, and biotic integrity are drastically altered.

Restoration pathway R3B
State 3 to 2

Long-term prescribed grazing with adequate recovery opportunity between grazing events and prescribed fire shift this state to the Blue Grama/Inland Saltgrass Dominant State. The species to target for management are those that were dominant or sub-dominant within the reference plant community according to the documented functional/structural groups. This transition may take up to 40 years or more to accomplish.

Conservation practices

Prescribed Burning
Prescribed Grazing

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				1050–1275	
	alkali sacaton	SPAI	*Sporobolus airoides*	450–525	–
	western wheatgrass	PASM	*Pascopyrum smithii*	300–375	–
	blue grama	BOGR2	*Bouteloua gracilis*	150–225	–
	vine mesquite	PAOB	*Panicum obtusum*	105–180	–
	switchgrass	PAVI2	*Panicum virgatum*	75–150	–
	big bluestem	ANGE	*Andropogon gerardii*	0–75	–
	buffalograss	BODA2	*Bouteloua dactyloides*	15–75	–
	Grass, perennial	2GP	*Grass, perennial*	15–45	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	15–45	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	15–45	–
	saltgrass	DISP	*Distichlis spicata*	15–45	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–45	–
	green needlegrass	NAVI4	*Nassella viridula*	0–45	–
	alkali cordgrass	SPGR	*Spartina gracilis*	15–30	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–30	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–30	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–15	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–15	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0–15	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	0–15	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–15	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–15	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–15	–
Forb					
2				75–150	
	American vetch	VIAM	*Vicia americana*	15–45	–
	Forb, perennial	2FP	*Forb, perennial*	15–45	–
	dotted blazing star	LIPU	*Liatris punctata*	0–30	–

	dotted blazing star	LIPU	*Liatris punctata*	0–30	
	leafy false goldenweed	OOFOF	*Oonopsis foliosa var. foliosa*	15–30	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	15–30	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–30	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–30	–
	stiff greenthread	THFI	*Thelesperma filifolium*	0–15	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–15	–
	povertyweed	IVAX	*Iva axillaris*	0–15	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–15	–
	white locoweed	OXSE	*Oxytropis sericea*	0–15	–
	New Mexico groundsel	PANEM	*Packera neomexicana var. mutabilis*	0–15	–
	broadbeard beardtongue	PEAN4	*Penstemon angustifolius*	0–15	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–15	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–15	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–15	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–15	–
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	0–15	–
	crownleaf evening primrose	OECO2	*Oenothera coronopifolia*	0–15	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–15	–
	twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	0–15	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–15	–
Shrub/Vine					
3				150–300	
	fourwing saltbush	ATCA2	*Atriplex canescens*	75–225	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	15–45	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–30	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–15	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	0–15	–
	rubber rabbitbrush	ERNAG	*Ericameria nauseosa ssp. nauseosa var. glabrata*	0–15	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–15	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–15	–

Animal community

WILDLIFE INTERPRETATIONS:

The variety of grasses, forbs, and shrubs on this ecological site in the various plant communities provides habitat for a wide range of wildlife species. Historic large grazers that influenced these plant communities were bison, elk, and pronghorn. Changes over time have resulted in the loss of bison, the reduction in elk numbers, and pronghorn population swings. Domestic grazers now share these habitats with wildlife. The grassland communities of eastern Colorado are home to many bird species. Changes in the composition of the plant community when moving from the reference plant community to other communities on this ecological site may result in dramatic species shifts in

the bird community. Because of a lack of permanent water, fish and many amphibians are not expected on this ecological site. Mule and white-tailed deer may use this ecological site, however the shrub cover is too low to expect more than occasional use. The gray wolf and wild bison used this ecological site in historic times. The wolf is thought to be extirpated from Eastern Colorado. Bison in the area are domesticated.

Reference Plant Community:
The structural diversity in the reference plant community is attractive to a number of wildlife species. Common bird species expected include Cassin's and Brewer's sparrow, lark bunting, western meadowlark, and ferruginous and Swainson's hawks. The combination of mid- and tallgrasses and shrubs provides habitat for lesser prairie chicken in the eastern parts of this site. Scaled quail may also use this site.

White-tailed and black-tailed jackrabbit, badger, pronghorn, coyote, swift fox, plains pocket gopher, long-tailed weasel, and several species of mice are mammals that commonly use this plant community. Reptiles using this community include western rattlesnake, bullsnake, plains garter snake, western hognose snake, racer, western box turtle, and six-lined racerunner.

1.2 Community:
The reduction of shrubs and taller grasses in this plant community results in a shift of bird species away from the reference plant community birds. Lark bunting and Cassin's sparrow use declines because of the loss in shrub cover. Habitat conditions improve for long-billed curlew, burrowing owl, mountain plover, killdeer, and horned lark. Ferruginous and Swainson's hawks are frequent users of this community. Most mammals will be the same as in the reference plant community, however, black-tailed prairie dog use will increase if the site is dry. Reptiles using this community are the same as in the reference plant community.

1.3 Community:
Both the reference plant community species and shortgrass prairie species such as burrowing owl, mountain plover, horned lark, McCown's longspur, killdeer, and long-billed curlew use this plant community. Conditions are shifting to favor shortgrass prairie species. Black-tailed jackrabbit and black-tailed prairie dog are frequent users of this community. All other mammal species from the reference plant community use the community. Reptiles include the species listed for the reference plant community.

2.1 and 3.1 Communities:
Conditions in these plant communities favor the shortgrass species. Most reference plant community bird species other than the hawks are not be expected here. All other mammal species from the reference plant community use these communities. Reptiles using these communities are short-horned lizard, lesser earless lizard, and the species listed for the reference plant community.

GRAZING INTERPRETATIONS:
The following table lists suggested initial stocking rates for an animal unit (1000 pound beef cow) under continuous grazing (yearlong grazing or growing-season-long grazing) based on normal growing conditions. However, continuous grazing is not recommended. These estimates should only be used as preliminary guidelines in the initial stages of the conservation planning process. Often, the existing plant composition does not entirely match any particular plant community described in this ecological site description. Therefore, field inventories are always recommended to document plant composition, total production, and palatable forage production. Carrying capacity estimates that reflect on-site conditions should be calculated using field inventories.

If the following production estimates are used, they should be adjusted based on animal kind or class and on the specific palatability of the forage plants in the various plant community descriptions. Under a properly stocked, properly applied, prescribed grazing management system that provides adequate recovery periods following each grazing event, improved harvest efficiencies eventually result in increased carrying capacity. See USDA-NRCS Colorado Prescribed Grazing Standard and Specification Guide (528).

The stocking rate calculations are based on the total annual forage production in a normal year multiplied by 25 percent harvest efficiency divided by 912.5 pounds of ingested air-dry vegetation for an animal unit per month (AUM).

Plant Community Production (lbs. /acre) and Stocking Rate (AUM/acre)

Reference Plant Community - (1500) (0.41)

1.2 Community: - (700) (0.19)

2.1 Community - (350) (0.10)

These stocking rates are guidelines and grazing plans should be written from information collected on-site.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide yearlong forage under prescribed grazing for cattle, sheep, horses and other herbivores.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration is moderate and runoff potential for this site varies from moderate to high depending on ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to NRCS Section 4, National Engineering Handbook (USDA–NRCS, 1972–2012) for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

None

Other products

Site Development and Test Plan:

General Data (MLRA and Revision Notes, Hierarchical Classification, Ecological Site Concept, Physiographic, Climate, and Water Features, and Soils Data):Updated. All “Required” items are complete to Provisional level.

Community Phase Data (Ecological Dynamics, STM, Transition & Recovery Pathways, Reference Plant Community, Species Composition List, Annual Production Table):

Updated. All “Required” items are complete to Provisional level.
NOTE: Annual Production Table and Species Composition List are from the “Previously Approved” ESD (2004). These need review for future updates at the next Approved level. Minor edit was made to Species Composition List.

Each Alternative State/Community:Complete to Provisional level. Narrative for each state and community has been updated.

Action Item: Need to find supporting data for The Sand Sagebrush and Grass Dominant Plant Communities. Further group discussion is needed.

Supporting Information (Site Interpretations, Assoc. & Similar Sites, Inventory Data References, Agency/State Correlation, References):
Updated. All “Required” items are complete to Provisional level.

Animal Community Wildlife Interpretations:First “overview” paragraph retained.
Individual Plant Community phase interpretations are removed and need to be updated at next “Approved” level.

Livestock Interpretations:
Updated to reflect the plant community name revisions. The Stocking rate calculations remain the same because they are based on the “Legacy” Total Annual Production table.
The stocking rate calculations need to be updated when Total Annual Production and Plant Community annual production is revised at the next “Approved” level.

Hydrology:
From “Previously Approved” ESD (2004). This needs to be updated at next “approved” level.

Other Site Interpretation:
Recreational Uses, Wood Products, Other Products, and Plant Preferences table, and Rangeland Health Reference Sheet carried over from “Previously Approved” ESD (2004).

Rangeland Health Reference Sheet:
From “Previously Approved” ESD (2004). This needs to be updated at the “Approved” level.

“Future work, as described in a project plan, to validate the information in this provisional ecological site description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.” (NI 430_306 ESI and ESD, April, 2015)

Other information

Relationship to Other Classifications:
NRCS Classification Hierarchy:
Physiographic Divisions of the United States (Fenneman, 1946): Physiographic DivisionPhysiographic ProvincePhysiographic SectionLand Resource RegionMajor Land Resource Area (MLRA)Land Resource Unit (LRU).

USFS Classification Hierarchy:
National Hierarchical Framework of Ecological Units (Cleland et al, 181-200):
DomainDivisionProvinceSectionSubsectionLandtype Association LandtypeLandtype Phase.

Inventory data references

NRI: references to Natural Resource Inventory data
Information presented here has been derived from data collection on private and federal lands using:
• Double Sampling (clipped 2 of 5 plots)*
• Rangeland Health (Pellant et al., 2005)
• Soil Stability (Pellant et al., 2005)
• Line Point Intercept : Foliar canopy, basal cover (Forb, Graminoid, Shrub, subshrub, Lichen, Moss, Rock fragments, bare ground, % Litter) (Herrick et al., 2005)
• Soil pedon descriptions collected on site (Schoeneberger et al., 2012)

*NRCS double-sampling method, CO NRCS Similarity Index Worksheet 528(1).
Additional reconnaissance data collection using numerous ocular estimates and other inventory data; NRCS clipping data for USDA program support; Field observations from experienced range trained personnel. Specific data information is contained in individual landowner/user case files and other files located in county NRCS field offices.

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Other references

Data collection for this ecological site was done in conjunction with the progressive soil surveys within the Upper Arkansas Valley (MLRA 69) of Colorado. The site has been mapped and correlated with soils in the following soil surveys: Baca County, Bent County, Crowley County, El Paso County Area, Fremont County Area, Huerfano County Area, Kiowa County, Las Animas County: Parts of Huerfano and Las Animas, Lincoln County, Otero County, Prowers County, and Pueblo Area: Parts of Pueblo and Custer Counties.

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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)	Ben Berlinger, Daniel Nosal, Kimberly Diller
Contact for lead author	Ben Berlinger, Area Rangeland Management Specialist, La Junta, CO,
Date	01/12/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Typically none, if present, water flow patterns are short and not connected.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** This site has 3 percent or less bare ground, with bare patches generally less than 2-3 inches in diameter. Extended drought can cause bare ground to increase upwards to 10-20 percent with bare patches reaching upwards to 6-12 inches in diameter.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter Movement is minimal and travels short distances. Extreme flooding events cause litter to be displaced or captured.

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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):** Stability class rating is anticipated to be 5-6 in interspace at the soil surface.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM is 2-3 percent. Soils are typically deep, light brownish-gray, weak thin platy structure parting to weak fine granular at a 0-6 inch depth.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Raindrop impact is reduced by the diverse grass, forb, shrub functional/structural groups and root structure. This slows overland flow and provides increased time for infiltration to occur. Extended drought, wildfire or both may reduce basal density, canopy cover, and litter amounts (primarily from tall, warm-season bunch and rhizomatous grasses), resulting in decreased infiltration and increased runoff on steep slopes following intense rainfall 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):** 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 mid bunchgrass > cool-season mid rhizomatous

    Sub-dominant: Shrubs > warm-season short bunchgrass = warm-season mid sod-formers = warm-season tall bunchgrass >

    Other: Leguminous forbs = other forbs > cool-season mid bunchgrass = warm-season mid bunchgrass > warm-season

short sod-former

Additional:

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

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14. **Average percent litter cover (%) and depth (in):** Litter cover during and following extended drought ranges from 25-35 percent.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 750 lbs. /ac. low precipitation years; 1500 lbs. /ac. average precipitation years; 2500 lbs. /ac. above average precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 250 – 800 lbs. /ac. or more.

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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:** Invasive plants should not occur in reference plant community. Cheatgrass, Russian thistle, burninbush, and other non-native annuals may invade following extended drought or fire assuming a seed source is available.

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