USDA Natural Resources
Conservation Service

Ecological site R069XY032CO
Sandy Salt Flat

Last updated: 9/07/2023
Accessed: 05/03/2024

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.

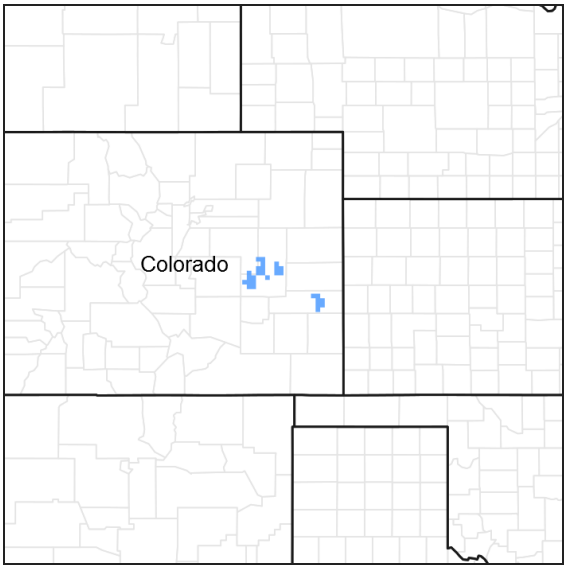


Figure 1. Mapped extent

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 Sandy Salt Flats Ecological Site, LRUs A and B, was developed from an earlier version of the Sandy Salt Flats Ecological Site (2005, revised in 2007). This earlier version of the Sandy Salt Flats Ecological Site (2005) was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information obtained from the Sandy Salt Flats 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 Sandy Salt Flat Ecological Site is a run-on site that occurs on terraces and hillslopes of plains. This site is not in a closed depression and has both calcium carbonate and other salts.

Associated sites

R069XY030CO	**Salt Meadow** The Salt Meadow Ecological Site is commonly adjacent to the Sandy Salt Flat Ecological Site.
R069XY019CO	**Deep Sand** The Deep Sands Ecological Site is located higher on the landscape and commonly adjacent to the Sandy Salt Flat Ecological Site.
R069XY026CO	**Sandy Plains** The Sandy Plains Ecological Site is located higher on the landscape and commonly adjacent to the Sandy Salt Flat Ecological Site.
R069XY031CO	**Sandy Bottomland** The Sandy Bottomland Ecological Site is commonly adjacent to the Sandy Salt Flat Ecological Site.

Similar sites

R069XY033CO	**Salt Flat** The Sandy Salt Flat Ecological Site has a loamy sand surface texture that the Salt Flat Ecological Site lacks.
R069XY030CO	**Salt Meadow** The Salt Meadow Ecological Site is directly affected by the water table and has redoximorphic features characterized by mottles in the upper soil horizons.

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Artemisia filifolia* (2) *Atriplex canescens*
Herbaceous	(1) *Sporobolus airoides* (2) *Bouteloua gracilis*

Physiographic features

This site occurs on plains.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Hillslope
Runoff class	Low
Flooding frequency	None
Ponding frequency	None
Elevation	1,128–1,250 m
Slope	0–2%
Ponding depth	0 cm
Water table depth	152 cm
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)	305-356 mm
Frost-free period (actual range)	121-135 days
Freeze-free period (actual range)	141-164 days
Precipitation total (actual range)	279-406 mm
Frost-free period (average)	129 days
Freeze-free period (average)	153 days
Precipitation total (average)	330 mm

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) TACONY 13 SE [USC00058157], Boone, CO
- (7) LA JUNTA 20 S [USC00054726], La Junta, CO
- (8) EADS [USC00052446], Eads, 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 drained with moderately slow to rapid permeability. The surface layer thickness ranges from 9 to 11 inches. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Parent material originated from mixed sources.

Major soil series correlated to this ecological site include Keyner.

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) Eolian deposits (2) Alluvium
Surface texture	(1) Loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately slow to rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–14%
Electrical conductivity (0-101.6cm)	2–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–25
Soil reaction (1:1 water) (0-101.6cm)	7.4–9.6

Subsurface fragment volume <=3" (Depth not specified)	0%
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 warm-season tall bunchgrasses (switchgrass, sand bluestem), cool-season mid rhizomatous grass (western wheatgrass), and warm-season short bunchgrass (blue grama). Secondary grasses are cool-season mid bunchgrass (needle and thread), warm-season mid rhizomatous grass (galleta), warm-season short rhizomatous grass (inland saltgrass), and warm-season tall rhizomatous grass (prairie sandreed). Minor grasses include cool-season mid bunchgrass (Indian ricegrass), and warm-season mid bunchgrasses (little bluestem, sideoats grama, sand dropseed). Other minor grasses and grass-like plants that occur in small amounts are bottlebrush squirreltail, threeawn, ring muhly, annual barley, sixweeks fescue, and sun sedge. Various shrubs (fourwing saltbush, winterfat, sand sagebrush, rabbitbrush) and forbs (dotted gayfeather, silky prairie clover, annual buckwheat, lemon scurfpea) also occur on the site.

Recurring seasonal herbivory without adequate recovery opportunity, and extended drought degrade. Grasses such as alkali sacaton, western wheatgrass, switchgrass, and sand bluestem decrease in frequency and production as do key shrubs (fourwing saltbush and winterfat). Blue grama and inland saltgrass increase. Forbs such as dotted gayfeather and purple prairie clover also decrease. Slick spots (high sodium areas of bare ground) increase. Continuous grazing without adequate recovery opportunity can eventually remove mid and tallgrasses from the plant community as blue grama and inland saltgrass become dominant and eventually form a sod-bound appearance. Over the long-term, continuous use without adequate recovery opportunity or long term non-use and lack of fire will result in large amounts of bare ground. Sand dropseed, annuals, and bare ground increase with long-term continuous grazing. Species such as red threeawn, ring muhly, broom snakeweed, and annuals increase. Slick spots become enlarged and connected by flow paths. Non-use in the absence of fire will result in excessive litter and reduced plant density.

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.

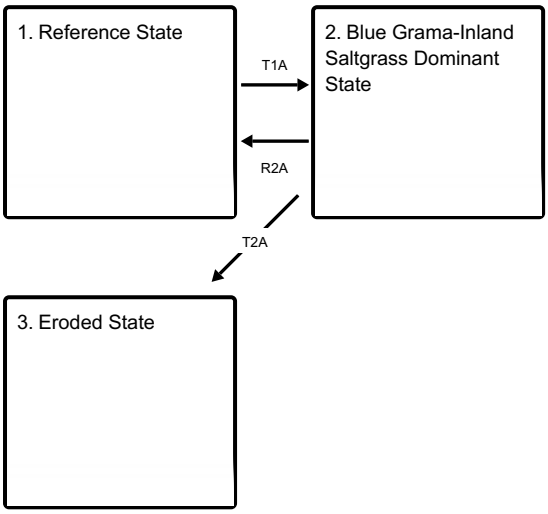
Southeastern Colorado was strongly affected by extended drought conditions in the “Dust Bowl” period of the

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

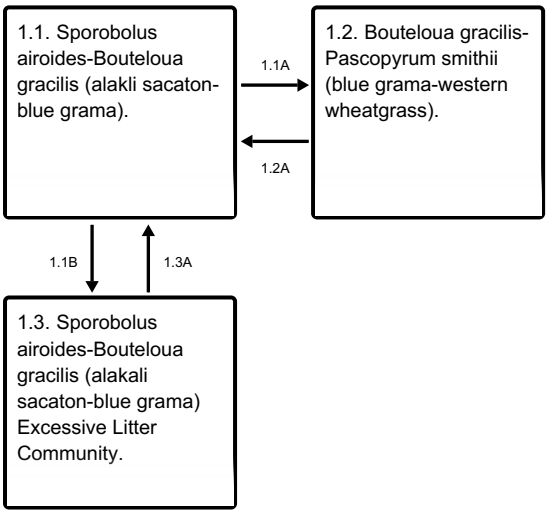


T1A - Continuous, heavy grazing. Lack of fire.

R2A - Prescribed grazing. Prescribed fire.

T2A - Continuous, heavy grazing. Lack of fire.

State 1 submodel, plant communities



1.1A - Continuous, heavy 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. Bouteloua gracilis-Distichlis spicata (blue grama-inland saltgrass).

State 3 submodel, plant communities

3.1. Sporobolus cryptandrus-Distichlis spicata (sand dropseed-inland saltgrass).

State 1
Reference State

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 opportunity. High production of perennial grasses and extensive soil cover allow for increased soil moisture retention, vegetative production, and overall soil quality.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- blue grama (*Bouteloua gracilis*), grass
- switchgrass (*Panicum virgatum*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1
Sporobolus airoides-Bouteloua gracilis (alakli sacaton-blue grama).

This is the interpretive plant community and is considered to be the reference plant community. This plant community developed with herbivory by large grazing transient herbivores with adequate recovery opportunity. This community consists chiefly of tall and mid-warm and cool-season grasses. The landscape is undulating sand over fine textured alluvium. The potential vegetation is about 85 to 90 percent grasses and grass-like plants, 5 to 10 percent forbs, and 5 to 15 percent shrubs by air-dry weight. Principal dominant grasses consist of alkali sacaton, sand bluestem, switchgrass, western wheatgrass, and blue grama. Secondary grasses and grass-like plants are inland saltgrass, prairie sandreed, sand dropseed, little bluestem, and sun sedge. Forbs and shrubs such as silky prairie clover, prairie spiderwort, purple prairie clover, ironplant, goldenweed, Louisiana sagewort, dotted gayfeather, sand sagebrush, and rabbitbrush are common. This plant community is diverse, stable, and productive. Litter is properly distributed with very little movement off-site and natural plant mortality is very 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 many disturbances with the exception of heavy, continuous grazing, tillage, and development into urban or other uses. Production in this community can vary from 700 to 2000 pounds of air-dry vegetation per acre per year depending on the weather and averages 1300 pounds.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass

- blue grama (*Bouteloua gracilis*), grass
- switchgrass (*Panicum virgatum*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	650	1202	1866
Shrub/Vine	67	146	224
Forb	67	110	151
Total	**784**	**1458**	**2241**

Figure 9. Plant community growth curve (percent production by month). CO6905, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland coarse-textured soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	22	35	15	10	3	0	0	0

Community 1.2
Bouteloua gracilis-Pascopyrum smithii (blue grama-western wheatgrass).

This community developed with recurring heavy, seasonal herbivory with inadequate recovery opportunity. Plant frequency has decreased, but the overall integrity of the vegetation remains intact. Tall and mid warm-season grasses such as alkali sacaton, sand bluestem, and switchgrass are present but in decreased amounts compared to the reference plant community. Blue grama and inland saltgrass have increased. Western wheatgrass is still present and may have increased slightly. Total above ground carbon has been lost due to decreases in forage and litter production. Reduction of deep-rooted tallgrasses, forbs, and shrubs, and increased warm-season shortgrasses has begun to alter the biotic integrity of this community. Water and nutrient cycles may become impaired. Slick spots (bare high sodium areas) may be increasing. Production in this community can vary from 400 to 1200 pounds of air-dry vegetation per acre per year depending on the weather and averages 700 pounds.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), 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). CO6905, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland coarse-textured soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	22	35	15	10	3	0	0	0

Community 1.3
Sporobolus airoides-Bouteloua gracilis (alakali sacaton-blue grama) Excessive Litter Community.

This plant community occurs when herbivory is removed for long periods of time in the absence of fire. Plant composition is similar to the Reference Plant Community, however, individual species production and frequency are reduced. Many 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 (alkali sacaton, switchgrass) die off. Thick litter and 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. Total annual production ranges from 200 to 1100 pounds of air-dry vegetation per acre per year.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- blue grama (*Bouteloua gracilis*), grass
- switchgrass (*Panicum virgatum*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 11. Plant community growth curve (percent production by month). CO6906, Warm-season dominant, cool-season sub-dominant, excess litter; MLRA-69; upland coarse-textured soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	25	30	15	10	3	2	0	0

Pathway 1.1A
Community 1.1 to 1.2

Heavy, season-long herbivory without adequate recovery opportunity between grazing events and lack of fire shift this community to the 1.2 community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.1B
Community 1.1 to 1.3

Non-use or absence of fire moves the reference community to the 1.3 community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.2A
Community 1.2 to 1.1

Seasonal herbivory with adequate recovery opportunity between grazing events, and animal-forage balance move this plant community back to the reference plant community. Prescribed fire accelerates this process.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

Herbivory with adequate recovery opportunity or fire restores this plant community back to the reference plant community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Blue Grama-Inland Saltgrass Dominant State

The Blue Grama-Inland Saltgrass Dominant State contains one community phase. This is a very stable state that is resistant to change due to the high tolerance of blue grama and inland saltgrass to grazing. The loss of dominant and sub-dominant functional/structural groups such as cool-season grasses, nitrogen fixing legumes, and shrubs reduces the biodiversity and productivity of this site.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- blue grama (*Bouteloua gracilis*), grass
- saltgrass (*Distichlis spicata*), grass

Community 2.1
Bouteloua gracilis-Distichlis spicata (blue grama-inland saltgrass).

This plant community developed with heavy, continuous grazing, and has crossed an ecological threshold. Blue grama and inland saltgrass are the dominant species. Sand bluestem and switchgrass have been removed. Western wheatgrass and alkali sacaton may persist in remnant amounts. Overall plant diversity and biotic integrity have been significantly reduced. The water and nutrient cycles, energy flow dynamics, and organic matter levels have been significantly impacted. Slick spots (bare areas between blue grama and saltgrass plants) have increased in size. Wind-blown salts and soil can accelerate formation of slick spots. Flow paths may be forming. Production in this community can vary from 150 to 600 pounds of air-dry vegetation per acre per year depending on the weather and averages 300 pounds.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- rubber rabbitbrush (*Ericameria nauseosa ssp. nauseosa var. glabrata*), shrub
- blue grama (*Bouteloua gracilis*), grass
- saltgrass (*Distichlis spicata*), grass

Figure 12. Plant community growth curve (percent production by month). CO6907, Warm-season dominant; MLRA-69; upland coarse-textured soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	30	40	20	5	0	0	0	0

State 3
Eroded State

In the Eroded State, inland saltgrass is present, but the more palatable species have been replaced by sand dropseed and annual grasses. Accelerated soil loss is a major concern. Wind scoured areas may be apparent as regression proceeds. Bare ground is becoming more apparent and slick spots have enlarged and are connected by flow paths. Soil stability, plant diversity, and productivity are lacking. Nutrient cycle, water cycle, energy flow, and community dynamics are severely impacted. Desertification is well advanced. The Reference State ecosystem has been driven beyond the limits of ecological resilience and has crossed a threshold. The designation "Eroded State" denotes complete deterioration of ecological processes.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- rubber rabbitbrush (*Ericameria nauseosa ssp. nauseosa var. glabrata*), shrub

- sand dropseed (*Sporobolus cryptandrus*), grass
- saltgrass (*Distichlis spicata*), grass
- cheatgrass (*Bromus tectorum*), grass
- Russian thistle (*Salsola*), other herbaceous

Community 3.1
Sporobolus cryptandrus-Distichlis spicata (sand dropseed-inland saltgrass).

Inland saltgrass persists in localized areas. Sand dropseed and annual plants such as sixweeks fescue, cheatgrass, Russian thistle, and burningbush have increased or invaded. Production in this community can vary from 50 to 200 pounds of air-dry vegetation per acre per year.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- rubber rabbitbrush (*Ericameria nauseosa ssp. nauseosa var. glabrata*), shrub
- sand dropseed (*Sporobolus cryptandrus*), grass
- saltgrass (*Distichlis spicata*), grass
- cheatgrass (*Bromus tectorum*), grass
- Russian thistle (*Salsola*), other herbaceous

Figure 13. Plant community growth curve (percent production by month). CO6905, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland coarse-textured soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	22	35	15	10	3	0	0	0

Transition T1A
State 1 to 2

Continuous, heavy grazing without adequate recovery opportunity following each grazing event and lack of fire shift this state to the Blue Grama-Inland Saltgrass Dominant State.

Conservation practices

Prescribed Burning
Prescribed Grazing

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing with adequate recovery opportunity between grazing events shifts this state to the Reference State. Prescribed fire accelerates this process.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

Continuous, heavy grazing without adequate recovery opportunity between grazing events and lack of fire moves this plant community across an ecological threshold to the Eroded State.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				1239–1311	
	alkali sacaton	SPAI	*Sporobolus airoides*	364–510	–
	blue grama	BOGR2	*Bouteloua gracilis*	219–364	–
	switchgrass	PAVI2	*Panicum virgatum*	146–291	–
	western wheatgrass	PASM	*Pascopyrum smithii*	146–219	–
	sand bluestem	ANHA	*Andropogon hallii*	146–219	–
	saltgrass	DISP	*Distichlis spicata*	17–73	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	45–73	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	17–45	–
	James' galleta	PLJA	*Pleuraphis jamesii*	17–45	–
	Grass, perennial	2GP	*Grass, perennial*	17–45	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	17–45	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	17–28	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–28	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	17–28	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–28	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–28	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–28	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–28	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0–17	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–17	–
Forb					
2				73–146	
	Forb, perennial	2FP	*Forb, perennial*	11–73	–
	silky prairie clover	DAVI	*Dalea villosa*	11–28	–
	dotted blazing star	LIPU	*Liatris punctata*	11–28	–
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	0–11	–
	tenpetal blazingstar	MEDE2	*Mentzelia decapetala*	0–11	–
	whitest evening primrose	OEAL	*Oenothera albicaulis*	0–11	–
	beardtongue	PENST	*Penstemon*	0–11	–
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	0–11	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–11	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–11	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–11	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–11	–
	shaggy dwarf morning-glory	EVNU	*Evolvulus nuttallianus*	0–11	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–11	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–11	–

	white sagebrush	ARLU	*Artemisia ludoviciana*	0–11	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–11	–
	Texas croton	CRTE4	*Croton texensis*	0–11	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	0–11	–
Shrub/Vine					
3				73–219	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	17–73	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	17–45	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	17–45	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	17–45	–
	rubber rabbitbrush	ERNAG	*Ericameria nauseosa ssp. nauseosa var. glabrata*	17–28	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–17	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–17	–
	soapweed yucca	YUGL	*Yucca glauca*	0–17	–
	spreading buckwheat	EREF	*Eriogonum effusum*	0–17	–

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 plant community found on 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 are expected to use this community.

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 include western rattlesnake, bullsnake, western hognose snake, racer, western box turtle, and six-lined racerunner.

1.2 Plant Community:
All wildlife species are expected in this plant community. However, the loss of some of the vegetative structural diversity makes it less attractive to the reference plant community species.

1.3 - 2.1 Communities:
The lack of shrubs and taller grasses in these plant communities results in a shift of bird species. With the exception of the hawk species, most reference plant community bird species would be only occasional users of these communities, and only on sites with adequate drainage. The typical shortgrass prairie species such as horned lark, killdeer, long-billed curlew, mountain plover, and ferruginous hawk are the dominant species.

Black-tailed jackrabbit and black-tailed prairie dog may frequent these communities along with mammal species common to the reference plant community. Reptiles using these communities are short-horned lizard, the lesser

earless lizard, and the species listed for the reference plant community.

3.1 Community:
The presence of tall species such as kochia, Russian thistle, sand dropseed, and other invaders in this community limit use by mountain plover and other species requiring unobstructed visual distances. Most reference plant community species are not expected here because of the change in vegetative structure.

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 - (1300) (0.36)

1.2 Plant Community - (700) (0.19)

2.1 - (300) (0.08)

All stocking rates are guidelines and actual stocking rates should be determined on-site for planning purposes.

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 A. Infiltration is high and runoff potential for this site varies from moderate to high depending on ground cover. 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 noted.

Other products

Site Development and Testing 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 CommunityWildlife 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).

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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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:** None where vegetation is continuous. Slick spots (high sodium areas) can pond water and concentrate overland flow. Flow paths should be short in length and disconnected with numerous debris dams or vegetative barriers.

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3. **Number and height of erosional pedestals or terracettes:** None to slight depending on flow coming from slick spots. Pedestalled plants caused by wind erosion are minor. Terracettes are nonexistent.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground amounts to 3-5 percent or less. Bare areas can range from 3-5 inches around bunch grasses and up to 12-18 inches when slick spots exist. Bare ground includes slick spots, which are inherent to this site. Extended drought may cause bare ground to increase up to 10-15 percent (includes slick spots).

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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:** Some minor wind scouring may occur on this site. An increase in wind erosion can occur with disturbances such as wildfire, extended drought, and rodent activity.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter should be uniformly distributed with very little movement.

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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 3-4 under canopy and 2-3 on slick spots. On-site verification is needed.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** SOM ranges from 1-3 percent. Soils are very deep well drained. Significant salinity and sodic levels are present in the subsoil. A-horizon color is grayish brown at 0-6 inches in depth. Structure is weak fine granular.

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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 = warm-season tall bunchgrass >

    Sub-dominant: Warm-season short bunchgrass > cool-season mid rhizomatous > cool-season mid bunchgrass = shrubs >

    Other: Forbs > warm-season mid rhizomatous > grasslike > warm-season shortgrass rhizomatous

    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. Slight mortality and decadence can be observed on warm-season bunch grasses during and following drought.

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14. **Average percent litter cover (%) and depth (in):** Litter cover during and following extended drought ranges from 20-30 percent.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 700 lbs./ac. during low precipitation years; 1300 lbs./ac. average precipitation years; 2000 lbs./ac. high precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 400–700 lbs./ac.

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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. Rocky Mountain beeplant, Russian thistle, kochia or other non-native alkali tolerant species 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, and natural disease that

reduces reproductive capability.