USDA Natural Resources
Conservation Service

Ecological site R069XY080CO
Gypsum Breaks

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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.

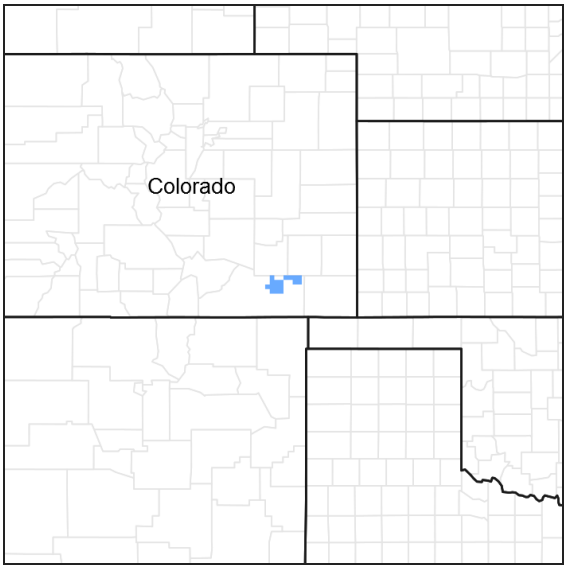


Figure 1. Mapped extent

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 (USFS). 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 Gypsum Breaks Ecological Site, LRUs A & B, was developed from an earlier version of the Gypsum Breaks Ecological Site (2004, revised in 2007). This earlier version of the Gypsum Breaks Ecological Site (2004) was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information obtained from the Gypsum Breaks Range Site descriptions. 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 Gypsum Breaks Ecological Site is a run-off site on slopes of greater than 10 percent. The soil depth is less than 20 inches over gypsum bedrock.

Associated sites

R069XY006CO	**Loamy Plains** This ecological site is commonly adjacent.
R069XY053CO	**Sandstone Breaks** This ecological site is commonly adjacent.

Similar sites

R069XY048CO	**Shale Breaks** This ecological site is over shale bedrock.
R069XY058CO	**Limestone Breaks** This ecological site is over limestone bedrock.
R069XY053CO	**Sandstone Breaks** This ecological site is over sandstone bedrock.

Table 1. Dominant plant species

Tree	(1) *Juniperus monosperma*
Shrub	(1) *Artemisia bigelovii* (2) *Krascheninnikovia lanata*
Herbaceous	(1) *Bouteloua eriopoda* (2) *Pleuraphis jamesii*

Physiographic features

This site occurs on plains or canyonlands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Pediment
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,128–1,951 m
Slope	1–30%
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) EADS [USC00052446], Eads, CO
- (2) PUEBLO RSVR [USC00056765], Pueblo, CO
- (3) LA JUNTA 20 S [USC00054726], La Junta, CO
- (4) TACONY 13 SE [USC00058157], Boone, CO

- (5) CHERAW 1 N [USC00051539], La Junta, CO
- (6) ORDWAY 21 N [USC00056136], Ordway, CO
- (7) ROCKY FORD 2 SE [USC00057167], Rocky Ford, CO
- (8) PUEBLO MEM AP [USW00093058], Pueblo, CO
- (9) ORDWAY 2 ENE [USC00056131], Ordway, 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 shallow or shallow. They are well drained with moderate slow or moderate permeability. The surface layer thickness ranges from 2 to 5 inches. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Parent material kind is slope alluvium over residuum weathered from gypsum and shale. Parent material originated from shale.

Major soil series correlated to this ecological site include Ovmesa and Shingle variant.

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) Slope alluvium–shale
Surface texture	(1) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	23–51 cm
Surface fragment cover <=3"	0–6%
Surface fragment cover >3"	0%
Available water capacity (0-50.8cm)	6.1–10.16 cm
Calcium carbonate equivalent (0-50.8cm)	1–14%
Electrical conductivity (0-50.8cm)	9–20 mmhos/cm
Sodium adsorption ratio (0-50.8cm)	1–10
Soil reaction (1:1 water) (0-50.8cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–14%
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 short warm-season stoloniferous grass (black grama), mid warm-season rhizomatous grass (galleta), mid warm-season bunchgrass (little bluestem, sideoats grama, Nealley dropseed), and short warm-season bunchgrass (blue and hairy grama). Mid cool-season bunchgrass (New Mexico feathergrass, Indian ricegrass, needle and thread) and mid- cool-season rhizomatous grass (western wheatgrass) are secondary. Minor grasses include mid- warm-season bunchgrass (alkali sacaton, sand dropseed), short warm-season bunchgrass (purple threeawn, ring muhly), and short cool-season bunchgrass (bottlebrush squirreltail). Various shrubs (Bigelow sagebrush, fourwing saltbush, winterfat) and forbs (dotted gayfeather, scarlet globemallow, James’ cryptantha) also occur on the site. Trees such as oneseed juniper are present in minor amounts.

Recurring heavy, seasonal herbivory without adequate recovery periods causes black grama to decrease along with mid- warm-season grasses and winterfat. Bigelow sagebrush increases. Grasses such as little bluestem, sideoats grama, New Mexico feathergrass, western wheatgrass, and needle and thread decrease in both frequency and production. Blue grama, galleta, Nealley dropseed, hairy grama, and galleta increase. Forbs and shrubs such as purple prairie clover, American vetch, and fourwing saltbush decrease. Continuous, heavy grazing causes this site to continue to deteriorate. Black grama persists in trace amounts in areas inaccessible to grazing. Mid- and tallgrasses can eventually be removed from the plant community. Over the long-term, continuous use will result in large amounts of bare ground. Species such as Fendler's threeawn, sand dropseed, small soapweed, and broom snakeweed increase on the site. Mat loco, sessile nailwort, and annuals also increase. Annual weeds such as burningbush and Russian thistle may invade.

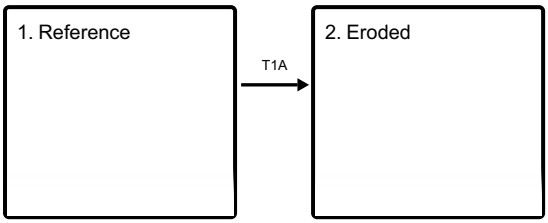
Drier and warmer climatic conditions exist in the central portion of MLRA 69 (LRU A). This area includes the eastern half of Pueblo county, northern Otero, extreme northwestern Bent, western edge of Kiowa, southern edge of Lincoln and all of Crowley County. These conditions are primarily caused by a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

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.

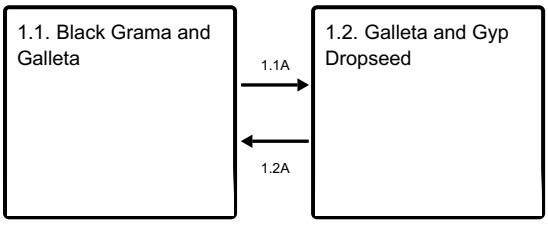
State and transition model

Ecosystem states



T1A - Heavy, continuous grazing. Lack of fire.

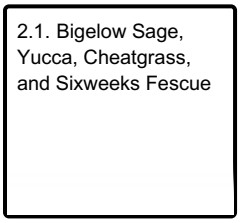
State 1 submodel, plant communities



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

1.2A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities



State 1
Reference

The Reference State is characterized by two plant community phases that represent the natural range of variability and disturbance regimes within the site. These plant community 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.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- fourwing saltbush (*Atriplex canescens*), shrub
- black grama (*Bouteloua eriopoda*), grass
- James' galleta (*Pleuraphis jamesii*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 1.1

Black Grama and Galleta

This plant community is the interpretive plant community for this site and is considered to be the reference plant community. This community evolved with grazing by large herbivores and is suited to grazing by domestic livestock. Historically, fires occurred infrequently. This plant community can be found on areas that are grazed and where the grazed plants receive adequate recovery periods during the growing season. The potential vegetation is about 70 to 85 percent grasses and grass-likes, 5 to 10 percent forbs, and 10 to 20 percent woody plants. The principal short and mid-grasses are black grama, galleta, little bluestem, sideoats grama, New Mexico feathergrass, and western wheatgrass. Secondary grasses include blue grama, needle and thread, and gyp dropseed. Sun sedge is common. Dominant forbs are dotted gayfeather, leafy false goldenweed, James' cryptantha, and scarlet globemallow. Bigelow sagebrush, winterfat, fourwing saltbush, and skunkbush sumac are some of the major shrubs found on this plant community. Oneseed juniper can occasionally be found on the site. This is a sustainable plant community in terms of soil stability, watershed function, and biological integrity. Litter is properly distributed where vegetative cover is continuous. Some litter movement may occur on steeper slopes. Decadence and natural plant mortality are very low. 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. Areas having lost all vegetation, such as livestock and vehicle trails are subject to high erosion rates and extreme runoff. Total annual production, during an average year, ranges from 150 to 500 pounds of air-dry weight and averages 300 pounds.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub
- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- black grama (*Bouteloua eriopoda*), grass
- James' galleta (*Pleuraphis jamesii*), grass
- blue grama (*Bouteloua gracilis*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	129	258	443
Shrub/Vine	28	50	73
Forb	11	26	39
Tree	–	2	6
Total	**168**	**336**	**561**

Figure 9. 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 1.2
Galleta and Gyp Dropseed

This plant community developed with heavy, season-long grazing and lack of fire. The dominant grasses are Gyp dropseed and galleta. Black grama, New Mexico feathergrass, little bluestem, and sideoats grama are still present as secondary grasses in the community. Alkali sacaton, Indian ricegrass, needle and thread, western wheatgrass, American vetch, winterfat, and fourwing saltbush have been reduced. Sand dropseed, purple threeawn, Hood’s phlox, hairy goldaster, Cuman ragweed, and slimflower scurfpea have increased. Woody plants that have increased include small soapweed and broom snakeweed. Plant frequency and vigor have decreased. Reduction of mid-rhizomatous wheatgrass, nitrogen-fixing forbs, the shrub component, and increased warm-season short-grasses has begun to alter the biotic integrity of this community. Water and nutrient cycles are becoming impaired. Litter

levels have been reduced. Flow paths and rills are more apparent. Pedestalled plants are common. Total annual production, during an average year, ranges from 75 to 250 pounds of air-dry weight and averages 150 pounds.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- James' galleta (*Pleuraphis jamesii*), grass
- gyp dropseed (*Sporobolus nealleyi*), grass

Figure 10. 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

Pathway 1.1A
Community 1.1 to 1.2

Recurring seasonal herbivory without adequate recovery periods and lack of fire shift this plant community to the 1.2 community.

Pathway 1.2A
Community 1.2 to 1.1

Herbivory with adequate recovery opportunity between grazing, animal forage balance, and prescribed fire move this community to the reference community.

Conservation practices

Cover Crop
Prescribed Grazing

State 2
Eroded

This state is represented by one community. The more palatable species have been replaced by less palatable species. Bare ground has increased and erosion potential is high. Soil loss can be severe. The Eroded State lacks stability, diversity, and productivity and is characterized by an impairment of all ecological functions.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- plains pricklypear (*Opuntia polyacantha*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- cheatgrass (*Bromus tectorum*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- little barley (*Hordeum pusillum*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Community 2.1
Bigelow Sage, Yucca, Cheatgrass, and Sixweeks Fescue

Remnant amounts of grama grasses, little bluestem, western wheatgrass and shrubs such as winterfat and fourwing saltbush have been replaced by shadscale, broom snakeweed, plains pricklypear and plains greasebush. Bigelow sagebrush remains the dominant shrub on this plant community. Annual increasers and invaders include annual barley, sixweeks fescue, kochia, Russian thistle and cheatgrass. Total annual production, during an average year, ranges from 25 to 100 pounds per acre air-dry weight.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- cheatgrass (*Bromus tectorum*), grass
- sixweeks fescue (*Vulpia octoflora*), grass

Figure 11. 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

Transition T1A
State 1 to 2

Heavy, continuous grazing without adequate recovery periods between grazing events and lack of fire shift this state 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				235–286	
	black grama	BOER4	*Bouteloua eriopoda*	50–67	–
	blue grama	BOGR2	*Bouteloua gracilis*	17–50	–
	James' galleta	PLJA	*Pleuraphis jamesii*	34–50	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	22–39	–
	little bluestem	SCSC	*Schizachyrium scoparium*	17–34	–
	western wheatgrass	PASM	*Pascopyrum smithii*	17–34	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	11–28	–
	gyp dropseed	SPNE	*Sporobolus nealleyi*	11–22	–
	Grass, perennial	2GP	*Grass, perennial*	3–17	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–11	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–11	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–6	–
	little barley	HOPU	*Hordeum pusillum*	0–6	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–6	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	3–6	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	3–6	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	3–6	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–6	–

	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–3	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0–3	–
Forb					
2				17–34	
	Forb, perennial	2FP	*Forb, perennial*	3–17	–
	dotted blazing star	LIPU	*Liatris punctata*	3–11	–
	James' cryptantha	CRCIJ	*Cryptantha cinerea var. jamesii*	3–6	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–6	–
	leafy false goldenweed	OOFOF	*Oonopsis foliosa var. foliosa*	3–6	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	3–6	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–3	–
	creeping nailwort	PASE	*Paronychia sessiliflora*	0–3	–
	beardtongue	PENST	*Penstemon*	0–3	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–3	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–3	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–3	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	0–3	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	0–3	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–3	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–3	–
	twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	0–3	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–3	–
	spiny milkvetch	ASKE	*Astragalus kentrophyta*	0–3	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–3	–
	American vetch	VIAM	*Vicia americana*	0–3	–
	desert princesplume	STPIP	*Stanleya pinnata var. pinnata*	0–3	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–3	–
Shrub/Vine					
3				34–67	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	17–34	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	3–17	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	3–17	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	6–17	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–6	–
	soapweed yucca	YUGL	*Yucca glauca*	0–6	–
	rubber rabbitbrush	ERNAG	*Ericameria nauseosa ssp. nauseosa var. glabrata*	0–3	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–3	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–3	–

	skunkbush sumac	RHTR	*Rhus trilobata*	0–3	–
Tree					
4				0–3	
	oneseed juniper	JUMO	*Juniperus monosperma*	0–3	–

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 Community:
The grasses, forbs, and shrubs in this plant community provide habitat for many reptiles including western rattlesnake, bullsnake, and racer. If water is available for breeding, spadefoot toads and tiger salamanders may be found here. The structural diversity in the plant community on this site provides habitat for Cassin's sparrow and lark bunting. Ferruginous and Swainson's hawks are commonly seen. Small mammals such as white-tailed jackrabbit, badger, swift fox, plains pocket gopher, and several species of mice are common. Pronghorn is a typical ungulate.

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

Increased Shrubs, Annuals and Bare Ground Plant Community:
Reptiles using this community are similar to the reference community species. As bare ground increases, conditions improve for Texas horned lizard. Increases in broom snakeweed, shadscale, and plains greasebush cause the bird community to shift from Cassin's sparrow to the grasshopper sparrow. Most mammals are similar to the reference community, however black-tailed jackrabbit and desert cottontail use may increase because of the increased bare ground and shrubs.

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 Community - (300) (0.08)

1.2 Community - (150) (0.04)

These rates are guidelines and developing a range plan requires an on-site visit.

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 due to the shallowness of the soil. This site is dominated by soils in hydrologic group D. Infiltration is low 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

Possible fire wood and fence posts.

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 complete to Provisional level

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

Plains greasebush was dropped from the species list and narrative since it is not expected to occur on shallow sites.

Updated. All “Required” items complete to Provisional level.

NOTE: Annual Production Table and Species Composition List are from the “Previously Approved ESD. These will need review for future updates at the next Approved level.

Each Alternative State/Community:

Complete to Provisional level. Narrative for each state/community has been updated.

Supporting Information (Site Interpretations, Associated and Similar Sites, Inventory Data References, Agency/State Correlation, References):

Updated. All “Required” items complete to Provisional level.

Animal Community
Wildlife interpretations, general narrative, updated (Provisional “+”). Interpretations for individual plant community

states/phases, pending.

Livestock Interpretations updated to reflect the Plant Community name revisions. The stocking rate calculations remain the same since they are based on the “Previously Approved” Total Annual Production table.

The stocking rate calculations will be updated when Total Annual Production and Plant
Community annual production is revised at the next “Approved” level.

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

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

Supporting Information:

Updated. All “Required” items complete to Provisional level.

Rangeland Health Reference Sheet:

From “Previously Approved” ESD (2004). Will be updated at the next “Approved” level.

Note: There are no Gypsum Breaks located in LRU C.

“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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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 on flatter slopes. Short, widely spaced rills are present on steep slopes with gypsum and shale outcrop.

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2. **Presence of water flow patterns:** On slopes of 15 percent or less, water patterns will be broken and irregular in appearance. Flow patterns will be evident as slope and gypsum outcrops increase (especially following intense storms). They will be short and connected with occasional debris dams or vegetative barriers.

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3. **Number and height of erosional pedestals or terracettes:** Small pedestals and terracettes exist, ranging in height from
0.25 – 0.5 inches. They are few in number and confined to the steeper slopes (>15 percent) and gypsum outcrops.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 7-12 percent or less bare ground, with bare patches generally less than 3-5 inches in diameter. Extended drought can cause bare ground to increase upwards to 15-20 percent with bare patches reaching upwards to 12-18 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** Typically none. However, on steep slopes, gullies may be up to 5 feet in length and wide-spread, not exceeding 6 inches deep.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None to slight wind scour. However, small depositional areas occur as the slope decreases.

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7. **Amount of litter movement (describe size and distance expected to travel):** Minimal and short on flatter slopes. Small herbaceous litter movement is associated with water flow patterns and may move as much as 1-3 feet or more down slope during severe precipitation events, especially on steeper slopes.

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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 4-5 in interspace at soil surface. These values need verification at reference site.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM is 1-2 percent. Soils are shallow to moderately deep to gypsum bedrock. The A horizon is light brownish-gray, very fine granular structure, approximately 0-2 inches in 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 sod-formers >

    Sub-dominant: Shrubs = warm-season mid bunchgrass > cool-season mid bunchgrass > warm-season short bunchgrass > cool-season mid rhizomatous >

    Other: Warm-season forbs > leguminous forbs > cool-season forbs = sedges > short trees

    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. Expect short and mid bunchgrass mortality and decadence during and following drought. Bunchgrasses may show signs of decadence on steeper inaccessible slopes and lack of wildfire events.

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14. **Average percent litter cover (%) and depth (in):** Litter cover during and following extended drought ranges from 5-15 percent.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 150 lbs. /ac. low precipitation years; 300 lbs. /ac. average precipitation years; 500 lbs. /ac. above average precipitation years. After extended drought or the first growing season following wildfire, production will be significantly reduced.

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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, burningbush, and other non-native annuals may invade following extended drought or fire if 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 may temporarily reduce reproductive capability.
