

Ecological site R069XY064CO Gravel 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.

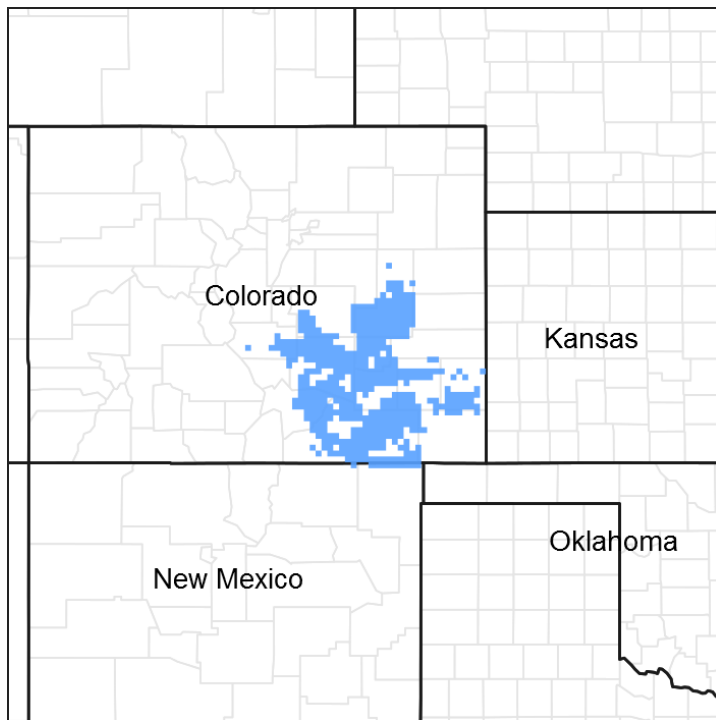


Figure 1. Mapped extent

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 Gravel Breaks Ecological Site, LRUs A and B, was developed from an earlier version of the Gravel Breaks Ecological Site (2005, revised in 2007). This earlier version of the Gravel Breaks Ecological Site (2005) was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information

obtained from the Gravel Breaks 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 Gravel Breaks Ecological Site is a run-off site on slopes of greater than 10 percent. The soil depth is greater than 20 inches and it is influenced by rock fragments.

Associated sites

R069XY006CO	Loamy Plains This ecological site is commonly adjacent.
R069XY046CO	Shaly Plains This ecological site is commonly adjacent.
R069XY047CO	Alkaline Plains This ecological site is commonly adjacent.

Similar sites

R069XY053CO	Sandstone Breaks This ecological site has a soil depth of less than 20 inches over sandstone bedrock.
R069XY058CO	Limestone Breaks This ecological site has a soil depth of less than 20 inches over limestone bedrock.
R069XY048CO	Shale Breaks This ecological site has a soil depth of less than 20 inches over shale bedrock.
R069XY080CO	Gypsum Breaks This ecological site has a soil depth of less than 20 inches over gypsum bedrock.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex canescens</i> (2) <i>Krascheninnikovia lanata</i>
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Schizachyrium scoparium</i>

Physiographic features

This site occurs on plains or river valleys.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Terrace (4) Fan remnant
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,128–1,951 m
Slope	2–40%
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) LA JUNTA 20 S [USC00054726], La Junta, CO
- (2) TACONY 13 SE [USC00058157], Boone, CO
- (3) ORDWAY 2 ENE [USC00056131], Ordway, CO
- (4) EADS [USC00052446], Eads, CO
- (5) PUEBLO RSVR [USC00056765], Pueblo, CO
- (6) CHERAW 1 N [USC00051539], La Junta, CO
- (7) ORDWAY 21 N [USC00056136], Ordway, CO
- (8) ROCKY FORD 2 SE [USC00057167], Rocky Ford, CO
- (9) PUEBLO MEM AP [USW00093058], 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 somewhat excessively or excessively drained with moderate through very rapid permeability. The surface layer thickness ranges from 3 to 10 inches. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Parent material kind is old sandy and gravelly alluvium. Parent material originated from mixed sources.

Major soil series correlated to this ecological site include Cascajo, Chicosa, Karval, and Schamber.

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>.

Surface Texture: loamy sand, sandy loam, loam, or sand with gravelly, very gravelly, or very cobbly modifiers

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Gravelly, very gravelly, very cobbly loamy sand (2) Gravelly, very gravelly, very cobbly sandy loam (3) Gravelly, very gravelly, very cobbly loam (4) Gravelly, very gravelly, very cobbly sand
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Moderate to very rapid
Soil depth	152–203 cm
Surface fragment cover ≤3"	5–60%
Surface fragment cover >3"	0–35%
Available water capacity (0-101.6cm)	5.08–14.22 cm
Calcium carbonate equivalent (0-101.6cm)	0–40%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume ≤3" (Depth not specified)	5–60%
Subsurface fragment volume >3" (Depth not specified)	0–35%

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 (sideoats grama, little bluestem). Secondary grasses are warm-season short bunchgrass (blue grama) and warm-season mid rhizomatous grass (galleta). Minor grasses include cool-season mid bunchgrass (needle and thread), warm-season tall bunchgrasses (big bluestem, switchgrass), warm-season tall rhizomatous grass (prairie sandreed) and cool-season mid rhizomatous grass (wheatgrass). Other minor grasses and grass-like plants that occur in small amounts are hairy grama, Indian ricegrass, sand dropseed, and sun sedge. Various shrubs (fourwing saltbush, skunkbush sumac, winterfat), and forbs (dotted gayfeather, purple prairieclover, scarlet globemallow) occur on the site.

Recurring season herbivory without adequate recovery periods causes this site to degrade. Grasses such as sideoats grama, little bluestem, big bluestem, prairie sandreed, switchgrass, western wheatgrass, and needle and thread decrease in both frequency and production. Blue grama and hairy grama increase. Forbs and shrubs such as purple prairie clover, dotted gayfeather, fourwing saltbush, and winterfat decrease. With continuous grazing mid- and tallgrasses can eventually be removed from the plant community as blue and hairy grama become dominant. Over the long-term, continuous use or long term non-use and lack of fire will result in large amounts of bare ground. Species such as red threeawn, ring muhly, sand dropseed, mat loco, sessile nailwort, small soapweed, 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.

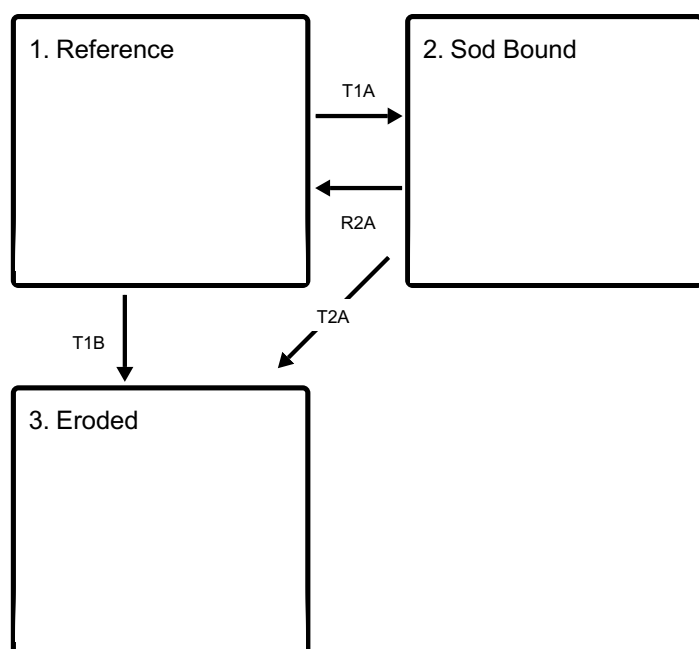
Southeastern Colorado was strongly affected by extended drought conditions in the "Dust Bowl" period of the 1930s, with recurrent drought cycles in the 1950s and 1970s. Extreme

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



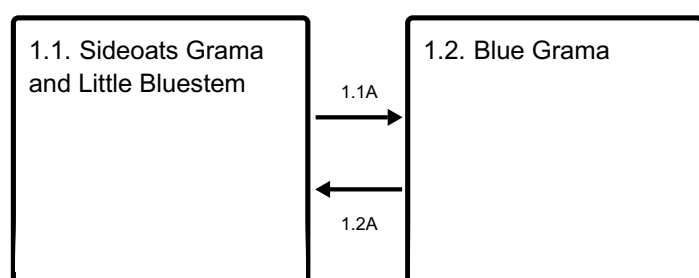
T1A - Heavy, continuous grazing. Lack of fire.

T1B - Heavy, long-term grazing. Non-use. No fire.

R2A - Prescribed grazing. Prescribed fire.

T2A - 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

2.1. Blue Grama,
Dominant

State 3 submodel, plant communities

3.1. Cheatgrass and
Spiny Phlox Bare
Ground, Cryptogams

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, and herbivory by large ungulates with adequate recovery periods.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 1.1 Sideoats Grama and Little Bluestem

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 likely 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 75 to 85 percent grasses and grass-likes, 10 to 15 percent forbs and 5 to 10 percent woody plants. The principal mid-grasses are little bluestem and sideoats grama. Secondary grasses include blue grama, galleta, big bluestem, prairie sandreed,

switchgrass, needle and thread, hairy grama, and western wheatgrass. Threadleaf and sun sedge are common. Dominant forbs are purple prairie clover, dotted gayfeather, and upright prairie coneflower. Winterfat, Bigelow sagebrush, and skunkbush sumac are some of the major shrubs found on this plant community. 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 is very low. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. This community is resistant to many 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 350 to 1200 pounds of air-dry weight and averages 750 pounds.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	275	673	1126
Forb	78	105	129
Shrub/Vine	39	63	90
Total	392	841	1345

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 Blue Grama

The dominant grass is blue grama. Little bluestem and sideoats grama are still present as secondary grasses in the community. Big bluestem, Indiangrass, switchgrass, prairie sandreed, needle and thread, western wheatgrass, purple prairie clover, and winterfat have been reduced. Hairy grama, sand dropseed, purple threeawn, Hoods phlox, hairy goldaster, Cuman ragweed, and slimflower scurfpea have increased. Woody plants include

fourwing saltbush, skunkbush sumac, winterfat, and small soapweed. Plant frequency and vigor have decreased. Reduction of tall, mid- and rhizomatous grasses, nitrogen-fixing forbs, the shrub component, and increased warm-season shortgrass 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 on steeper slopes. Pedestalled plants are common. Total annual production, during an average year, ranges from 200 to 700 pounds of air-dry weight and averages 400 pounds.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- skunkbush sumac (*Rhus trilobata*), shrub
- blue grama (*Bouteloua gracilis*), 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

Pathway 1.1A Community 1.1 to 1.2

Heavy, season-long grazing without adequate recovery periods between grazing events and reduced fire frequency shifts this plant community to the 1.2 community.

Pathway 1.2A Community 1.2 to 1.1

Herbivory with adequate recovery periods and prescribed fire move this plant community to the reference plant community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2 Sod Bound

The Sod Bound state is represented by one plant community phase. Species diversity and production have been severely reduced. Litter levels are very low. Mineral and water cycles are impaired due to the loss of deeper-rooted grasses, forbs, and shrubs. Rills are evident and soil loss is obvious, especially on steeper slopes. Pedestalled plants with

exposed roots are common. The loss of dominant and subdominant structural and functional groups reduces the biodiversity and productivity.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- Bigelow sage (*Artemisia bigelovii*), shrub
- blue grama (*Bouteloua gracilis*), grass

Community 2.1

Blue Grama, Dominant

Blue grama dominates the community and exhibits a mosaic sod-bound appearance. Tallgrasses have been removed. Little bluestem and sideoats grama may remain in remnant amounts on steeper slopes. Forbs and shrubs that have increased are wormwood, Cuman ragweed, rush skeletonplant, hairy goldaster, Bigelow sagebrush, small soapweed, and broom snakeweed. Cushion plants such as mat loco, Hood's phlox, and sessile nailwort have increased. Production ranges from 100 to 350 pounds of air-dry vegetation per acre per year and averages 200 pounds.

Dominant plant species

- Bigelow sage (*Artemisia bigelovii*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass

Figure 11. 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

This state has one community. It is characterized by an impairment of all ecological functions. Bare ground, cushion plants, and cryptogamic crusts have significantly increased. Water erosion can be severe on steeper slopes as evidenced by pedestaled plants and connected water flow paths.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub

- cheatgrass (*Bromus tectorum*), grass
- Fendler threeawn (*Aristida purpurea* var. *longiseta*), grass
- spiny phlox (*Phlox hoodii*), other herbaceous
- creeping nailwort (*Paronychia sessiliflora*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Community 3.1

Cheatgrass and Spiny Phlox Bare Ground, Cryptogams

Bare ground, cushion plants, and cryptogamic crusts have significantly increased. Remnant amounts of blue and hairy grama may still be found. In the case of long term non-use or no fire plant decadence increases. Other plants that may be present are Russian thistle, burningbush, purple threeawn, cheatgrass, cushion plants (mat loco, creeping nailwort, Hood's phlox), and small soapweed. Water erosion can be severe on steeper slopes as evidenced by pedestaled plants and connected water flow paths. Total annual production can vary from 25 to 150 pounds of air-dry vegetation per acre per year.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- cheatgrass (*Bromus tectorum*), grass
- Fendler threeawn (*Aristida purpurea* var. *longiseta*), grass
- spiny phlox (*Phlox hoodii*), other herbaceous
- creeping nailwort (*Paronychia sessiliflora*), other herbaceous
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Figure 12. 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

Heavy, continuous grazing without adequate recovery periods and lack of fire shifts this state across an ecological threshold to the Sod Bound state.

Transition T1B

State 1 to 3

Heavy, continuous grazing, lack of fire, and long-term non-use move this state to the

Eroded state. This transition may take 40 years or more.

Restoration pathway R2A State 2 to 1

Long-term prescribed grazing with adequate recovery opportunity between grazing events and prescribed fire move this plant community to the Reference State. This transition may take upwards of 40 years or more to achieve.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A State 2 to 3

Heavy, continuous grazing without adequate recovery periods and lack of fire shift this state 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				628–717	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	252–297	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	84–168	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	45–129	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	11–45	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	11–45	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	11–45	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	17–45	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	11–28	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	11–28	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	11–28	–
	Grass, . . .	2GP	<i>Grass, perennial</i>	11–22	–

	perennial				
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	11–22	–
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	0–22	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	11–17	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	11–17	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–17	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	11–17	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–11	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	0–11	–
	ring muhly	MUTO2	<i>Muhlenbergia torreyi</i>	0–11	–
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	0–11	–
	hairy woollygrass	ERPI5	<i>Erioneuron pilosum</i>	0–11	–
Forb					
2				84–129	
	Forb, perennial	2FP	<i>Forb, perennial</i>	11–22	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	11–17	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	11–17	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–6	–
	lacy tansyaster	MAPIP4	<i>Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida</i>	0–6	–
	white locoweed	OXSE	<i>Oxytropis sericea</i>	0–6	–
	New Mexico groundsel	PANEM	<i>Packera neomexicana var. mutabilis</i>	0–6	–
	creeping nailwort	PASE	<i>Paronychia sessiliflora</i>	0–6	–
	beardtongue	PENST	<i>Penstemon</i>	0–6	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–6	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–6	–
	threadleaf ragwort	SEFLF	<i>Senecio flaccidus var. flaccidus</i>	0–6	–

	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–6	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–6	–
	spiny milkvetch	ASKE	<i>Astragalus kentrophyta</i>	0–6	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	0–6	–
	stiff greenthread	THFI	<i>Thelesperma filifolium</i>	0–6	–
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	0–6	–
	shaggy dwarf morning-glory	EVNU	<i>Evolvulus nuttallianus</i>	0–6	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–6	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–6	–
	twogrooved milkvetch	ASBI2	<i>Astragalus bisulcatus</i>	0–6	–
Shrub/Vine					
3				45–84	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	11–22	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	11–22	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–22	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	11–17	–
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	0–17	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–11	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–11	–
	spreading buckwheat	EREF	<i>Eriogonum effusum</i>	0–11	–
	rubber rabbitbrush	ERNAG	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>	0–11	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–11	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	–
	golden currant	RIAU	<i>Ribes aureum</i>	0–11	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–11	–
	tree cholla	CYIMI	<i>Cylindropuntia imbricata var.</i>	0–11	–

	tree shrub	shrub	<i>Symptlocospora imbricata</i> var. <i>imbricata</i>		
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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 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 and Brewer's sparrow and lark bunting. Ferruginous and Swainson's hawks are commonly seen on this site. 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 plant community are expected. The loss of some vegetative structural diversity makes it less attractive to many species.

2.2, 3.1 Communities:

The loss of shrubs and mid-tall grasses creates habitat for typical shortgrass species such as black-tailed prairie dog, burrowing owl, mountain plover, and horned lark. Black-tailed jackrabbit may replace white-tailed jackrabbit in these communities. Reptiles using these communities are short-horned lizard and lesser earless lizard.

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 - (750) (0.21)

1.2 Community - (400) (0.11)

2.1 Community - (200) (0.05)

These stocking rates are guidelines and specific grazing plans require 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. Soils in hydrologic group A and B dominate this site. Infiltration varies from moderate to high and runoff potential for this site varies from moderate to low depending on soil hydrologic group and 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

No appreciable wood products are present on the site.

Other products

This site is a source for gravel and is extensively mined in areas.

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

Need to run slope analysis to refine modal concept.

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

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.

The "*Bare Ground*" State can be arrived at by two pathways; By long term continuous grazing (from State 2), or by long term non-use, no fire (from State 1). A decadent plant community can occur with weedy species, and annuals coming into the site. This current concept needs further investigation and analysis.

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. Interpretations for individual plant community states/phases, pending. Pending PK updates...

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 is only a very minor extent of Gravel Breaks mapped 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 Division
Physiographic Province
Physiographic Section
Land Resource Region
Major Land Resource Area (MLRA)
Land Resource Unit (LRU).

USFS Classification Hierarchy:

National Hierarchical Framework of Ecological Units (Cleland et al, 181-200):

Domain
Division
Province
Section
Subsection
Landtype Association
Landtype
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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Those involved in developing earlier versions of this site description include: Ben Berlinger, rangeland management specialist (RMS); Scott Woodall, RMS; Lee Neve, soil scientist; Julie Elliott, RMS; Terri Skadeland, Colorado State biologist; and Herman Garcia, Colorado State RMS.

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

2. **Presence of water flow patterns:** None to minimal on gentle slopes (< 15 percent). Water flow paths should be broken, irregular in appearance. As slope steepness increases, flow paths become more apparent and may be connected.

3. **Number and height of erosional pedestals or terracettes:** None to slight on gentle slopes. Expect some evidence of pedestalled plants when slopes exceed 15 percent.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** this site five percent or less bare ground, with bare patches generally less than 3 inches. Extended drought may increase bare ground to 7-10 percent.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is associated with water flow patterns and may move as much as 2-5 feet down slope during severe precipitation events, especially on steeper slopes.

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 interspaces at soil surface. These values need verification.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM ranges from 1-3 percent. Soils are typically deep to very deep, excessive to well drained. Surface texture includes gravelly loamy sand, gravelly sandy loam, and gravelly loam that are weakly developed. A-horizon color is grayish brown, weak platy that parts to moderate, medium crumb structure, at 0-4 inch depth. Rock (gravel) is inherent to the site.

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.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

12. **Functional/Structural Groups (list in order of descending dominance by above-ground**

annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant: Warm-season mid bunchgrass >

Sub-dominant: Warm-season short bunchgrass > warm-season tall bunchgrass > cool-season mid bunchgrass >

Other: shrubs = warm-season forbs = leguminous forbs = warm-season mid rhizomatous > cool-season forbs > cushion forbs

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** None to slight. Bunchgrasses may show signs of decadence on steeper inaccessible slopes and/or lack of wildfire events.
-
14. **Average percent litter cover (%) and depth (in):** Litter cover during and following extended drought can range from 5-15 percent.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 350 lbs. /ac. low precipitation years; 750 lbs. /ac. average precipitation years; 1200 lbs. /ac. high precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 100-300 lbs./ac.
-
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 the reference plant community. Cheatgrass, Russian thistle, burningbush, and other non-native annuals may invade following extended drought or fire assuming a seed source is available.

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