USDA Natural Resources
Conservation Service

Ecological site R069XY048CO
Shale Breaks

Last updated: 12/09/2024
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General information

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

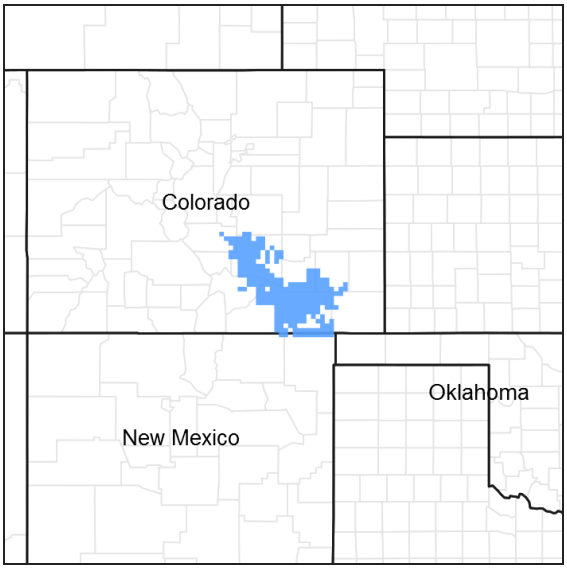


Figure 1. Mapped extent

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

MLRA notes

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

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

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

Classification relationships

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

LRU A (10 to 12 inches PZ) is 2.4 million acres in the central portion of MLRA 69. There is irrigated cropland in the Arkansas Valley. Precipitation is too limited for dryland crops. Most of LRU A is rangeland, and includes the Comanche National Grassland (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 Shale Breaks Ecological Site, LRUs A and B, was developed from an earlier version of the Shale Breaks Ecological Site (2005, revised in 2007). This earlier version of the Shale Breaks Ecological Site (2005) was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information obtained from the Shale 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 Shale Breaks Ecological Site is a run-off site on slopes of over 10 percent. The soil depth is less than 20 inches to shale bedrock.

Associated sites

R069XY006CO	**Loamy Plains** The Loamy Plains Ecological Site is commonly adjacent.
R069XY046CO	**Shaly Plains** The Shaly Plains Ecological Site is commonly adjacent.
R069XY058CO	**Limestone Breaks** The Limestone Breaks Ecological Site is commonly adjacent.
R069XY064CO	**Gravel Breaks** The Gravel Breaks Ecological Site is commonly adjacent.

Similar sites

R069XY046CO	**Shaly Plains** The Shaly Plains Ecological Site is on slopes of less than 10 percent.
R069XY064CO	**Gravel Breaks** The Gravel Breaks Ecological Site site is influenced by rock fragments and the soil depth is greater than 20 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens* (2) *Krascheninnikovia lanata*

Herbaceous	(1) *Bouteloua curtipendula* (2) *Pascopyrum smithii*

Physiographic features

This site occurs on plains.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Pediment (3) Terrace
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	4,100–6,400 ft
Slope	15–40%
Ponding depth	0 in
Water table depth	60 in
Aspect	Aspect is not a significant factor

Climatic features

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

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	127-134 days
Freeze-free period (characteristic range)	149-161 days
Precipitation total (characteristic range)	12-14 in
Frost-free period (actual range)	121-135 days
Freeze-free period (actual range)	141-164 days
Precipitation total (actual range)	11-16 in
Frost-free period (average)	129 days
Freeze-free period (average)	153 days
Precipitation total (average)	13 in

Climate stations used

- (1) LA JUNTA 20 S [USC00054726], La Junta, CO
- (2) ROCKY FORD 2 SE [USC00057167], Rocky Ford, CO
- (3) TACONY 13 SE [USC00058157], Boone, CO
- (4) ORDWAY 21 N [USC00056136], Ordway, CO
- (5) PUEBLO MEM AP [USW00093058], Pueblo, CO
- (6) EADS [USC00052446], Eads, CO
- (7) ORDWAY 2 ENE [USC00056131], Ordway, CO
- (8) PUEBLO RSVR [USC00056765], Pueblo, CO
- (9) CHERAW 1 N [USC00051539], La Junta, 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 shallow. They are well drained with slow permeability. The surface layer thickness ranges from 2 to 4 inches. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Parent material kind is slope alluvium over residuum weathered from shale. Parent material originated from shale.

Major soil series correlated to this ecological site include Midway.

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

Table 4. Representative soil features

Parent material	(1) Alluvium–shale (2) Residuum
Surface texture	(1) Silty clay (2) Clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Soil depth	10–20 in
Surface fragment cover <=3"	0–14%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2.6–4 in
Calcium carbonate equivalent (0-40in)	1–14%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–15
Soil reaction (1:1 water) (0-40in)	7.4–9

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 warm-season mid-bunchgrass (sideoats grama), and cool-season mid- rhizomatous grass (western wheatgrass). Secondary grasses are warm-season short bunchgrass (blue grama) and warm-season mid-rhizomatous grass (galleta). Minor grasses include cool-season mid-bunchgrasses (green needlegrass, alkali sacaton) and warm-season mid-bunchgrass (little bluestem). Various shrubs (fourwing saltbush, winterfat, James's seaheath (James’ Frankenia), Bigelow sagebrush), and forbs (American vetch, purple prairie clover, leafy false goldenweed, and scarlet globemallow) occur on the site and are subdominant in composition.

Recurring seasonal herbivory without adequate recovery periods initially cause sideoats grama and western wheatgrass to decrease. Fourwing saltbush, and winterfat also decrease, while James' seaheath (James’ Frankenia), Bigelow sagebrush, and broom snakeweed begin to increase. Grasses such as little bluestem and green needlegrass decrease in both frequency and production. Blue grama and galleta increase. Continuing heavy grazing causes greater deterioration on this site. Blue grama becomes dominant and mid-grasses are eventually removed from the plant community, though they persist in trace amounts on rough steep side slopes. Over the long-term, continuous use will result in large amounts of bare ground. Species such as Fendler's threeawn, sand dropseed, small soapweed, broom snakeweed, and annuals increase or invade the site.

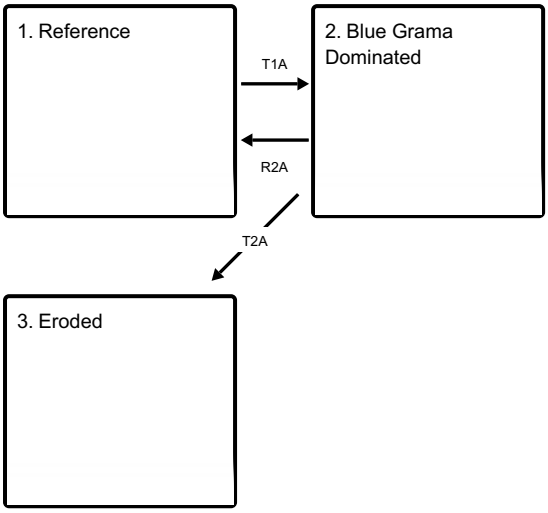
Drier and warmer climatic conditions exist in the central portion of MLRA 69. This area includes the eastern half of Pueblo county, northern Otero, extreme northwestern Bent, western edge of Kiowa, southern edge of Lincoln and all of Crowley County. These conditions are primarily caused by a rain shadow 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

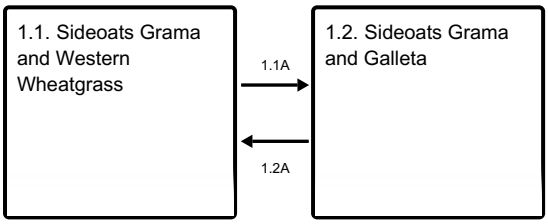


T1A - Heavy, continuous grazing. Lack of fire.

R2A - Long-term prescribed grazing. Prescribed fire.

T2A - Heavy, continuous grazing. Lack of fire.

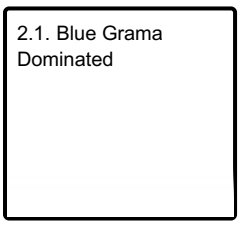
State 1 submodel, plant communities



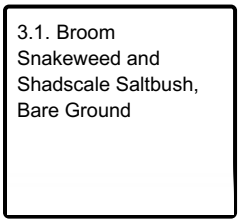
1.1A - Heavy season-long grazing. Prescribed grazing.

1.2A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities



State 3 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

- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1
Sideoats Grama and Western Wheatgrass

This is the interpretive plant community and is considered to be the reference plant community. This plant community evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. It can be found on areas that are properly managed with prescribed grazing. The reference plant community consists mainly of cool and warm-season midgrasses and shrubs. The principal dominant midgrasses are western wheatgrass and sideoats grama. Secondary grasses are blue grama and galleta. Little bluestem, Indian ricegrass, green needlegrass, and alkali sacaton are also present. Forbs and shrubs such as purple prairie clover, American vetch, leafy false goldenweed, scarlet globemallow, fourwing saltbush, and winterfat are significant. The reference plant community is about 70 to 85 percent grasses and grass-likes, 5 to 10 percent forbs and 10 to 20 percent woody plants. This is a sustainable plant community in terms of watershed function and biological integrity. Litter is properly distributed. 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 except heavy, continuous grazing, tillage and development into urban or other uses. Total annual production, during an average year, ranges from 150 to 700 pounds per acre air-dry weight and averages 300 pounds.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	115	232	600
Shrub/Vine	25	45	65
Forb	10	23	35
Total	**150**	**300**	**700**

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

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

Community 1.2
Sideoats Grama and Galleta

This community developed with heavy, recurring seasonal herbivory resulting from the lack of adequate recovery opportunity between grazing occurrences and lack of fire. Blue grama and galleta dominate this plant community.

Cool and warm-season midgrasses such as western wheatgrass, sideoats grama, and green needlegrass have decreased in amounts. American vetch, purple prairie clover, fourwing saltbush, and winterfat have decreased. Shadscale, James Frankenia, Bigelow sagebrush, and Louisiana sagewort are beginning to increase in abundance. Plant frequency and vigor have decreased. Reduction of rhizomatous grasses, nitrogen-fixing forbs, shrub component, and increased warm-season shortgrasses have begun to alter the biotic integrity of this community. Water and nutrient cycles are at risk of becoming impaired. Flow paths and small rills can be found on steeper slopes. Some mildly pedestaled plants can be found. Total annual production, during an average year, ranges from 100 to 400 pounds per acre air-dry weight and averages 200 pounds.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- blue grama (*Bouteloua gracilis*), grass
- James' galleta (*Pleuraphis jamesii*), grass

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

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

Pathway 1.1A
Community 1.1 to 1.2

Heavy, season-long grazing without adequate recovery opportunity and lack of fire shifts this plant community to the 1.2 community.

Pathway 1.2A
Community 1.2 to 1.1

Herbivory with adequate recovery opportunity following each grazing event and prescribed fire will move this plant community back to the reference plant community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Blue Grama Dominated

The Blue Grama Dominant state is represented by one plant community phase. This state evolved with heavy, continuous grazing pressure without adequate recovery, and an absence of fire. Extended drought may cause extensive mortality of blue grama. The loss of dominant and subdominant structural/functional groups reduces the biodiversity and productivity. A significant amount of production and diversity has been lost when compared to the Reference state. Loss of cool-season grasses, key shrubs, and nitrogen fixing forbs has negatively impacted energy flow and nutrient cycling. Soil loss is obvious where flow paths are connected. The plant community lacks diversity and exhibits a greatly impaired water cycle.

Dominant plant species

- James' seaheath (*Frankenia jamesii*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- blue grama (*Bouteloua gracilis*), grass

Community 2.1
Blue Grama Dominated

This plant community developed with heavy, continuous grazing without providing adequate recovery opportunity following each grazing event. Blue grama dominates this plant community. Sodbound conditions rarely develop because of shallow soils. Western wheatgrass and green needlegrass are absent and have been replaced by increased amounts of purple threeawn and sand dropseed. Sideoats grama, little bluestem, fourwing saltbush, and winterfat occur in remnant amounts confined to primarily rough, steep side slopes. Shadscale, James' Frankenia, and broom snakeweed continue to increase. Total annual production during an average year ranges from 50 to 200 pounds per acre air-dry weight and averages 100 pounds.

Dominant plant species

- shadscale saltbush (*Atriplex confertifolia*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- James' seaheath (*Frankenia jamesii*), shrub
- blue grama (*Bouteloua gracilis*), 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

State 3
Eroded

This state is characterized by the loss of the more palatable species and a significant increase in bare ground, resulting in impairment of all ecological functions. The erosion potential is high and soil loss can be severe. The state lacks stability, diversity, and productivity.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- cheatgrass (*Bromus tectorum*), grass

Community 3.1
Broom Snakeweed and Shadscale Saltbush, Bare Ground

Lower successional shrubs such as broom snakeweed, shadscale, and plain greasebush have replaced remnant amounts of blue grama, winterfat, and fourwing saltbush. Annual invaders such as burningbush, Russian thistle, and cheatgrass have increased. Increased bare ground is a major concern. Erosion potential is high and soil loss can be severe. This community lacks stability, diversity, and productivity. Total annual production, during an average year, ranges from 25 to 100 pounds per acre air-dry weight.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- cheatgrass (*Bromus tectorum*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

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

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

Transition T1A
State 1 to 2

Heavy, continuous grazing without adequate recovery opportunity between grazing events and lack of fire will shift this plant community across an ecological threshold toward the Blue grama Dominated State.

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing with adequate recovery opportunity between grazing events and prescribed fire moves this state to the Reference State. This change will require a long period of time and may be difficult to attain depending on the degree of degradation.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

Heavy, continuous grazing without adequate recovery opportunity between grazing events and lack of fire shifts this plant community across an ecological threshold to the Eroded State. This transition can occur in a short time span (10 to 20 years).

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				210–255	
	sideoats grama	BOCU	*Bouteloua curtipendula*	60–90	–
	western wheatgrass	PASM	*Pascopyrum smithii*	45–60	–
	blue grama	BOGR2	*Bouteloua gracilis*	25–35	–
	James' galleta	PLJA	*Pleuraphis jamesii*	15–30	–
	little bluestem	SCSC	*Schizachyrium scoparium*	10–20	–
	alkali sacaton	SPAI	*Sporobolus airoides*	10–20	–
	green needlegrass	NAVI4	*Nassella viridula*	5–15	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	3–10	–
	Grass, perennial	2GP	*Grass, perennial*	3–10	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–5	–
	saltgrass	DISP	*Distichlis spicata*	0–5	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–5	–
	little barley	HOPU	*Hordeum pusillum*	0–5	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–5	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–3	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0–3	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–3	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–3	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–3	

	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–3	–
	vine mesquite	PAOB	*Panicum obtusum*	0–3	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–3	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–3	–
Forb					
2				15–30	
	Forb, perennial	2FP	*Forb, perennial*	3–10	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	3–10	–
	American vetch	VIAM	*Vicia americana*	3–10	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	3–5	–
	leafy false goldenweed	OOFOF	*Oonopsis foliosa var. foliosa*	3–5	–
	creeping nailwort	PASE	*Paronychia sessiliflora*	0–3	–
	beardtongue	PENST	*Penstemon*	0–3	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–3	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–3	–
	desert princesplume	STPIP	*Stanleya pinnata var. pinnata*	0–3	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–3	–
	povertyweed	IVAX	*Iva axillaris*	0–3	–
	dotted blazing star	LIPU	*Liatris punctata*	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	–
Shrub/Vine					
3				30–60	
	fourwing saltbush	ATCA2	*Atriplex canescens*	15–30	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–20	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	3–10	–
	James' seaheath	FRJA	*Frankenia jamesii*	3–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–3	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–3	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–3	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	0–3	–
	rubber rabbitbrush	ERNAG	*Ericameria nauseosa ssp. nauseosa var. glabrata*	0–3	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	–
	soapweed yucca	YUGL	*Yucca glauca*	0–3	–

Animal community

WILDLIFE INTERPRETATIONS:
The heavy soils and grasses, forbs, and shrubs found on this ecological site provide habitat for numerous 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 species shifts in the bird community. The occasional wetland or spring found on this ecological site provides essential seasonal water needed for reproductive habitat by some reptiles and amphibians. Because of a lack of permanent water, fish are not commonly expected on this ecological site. Mule and white-tailed deer may use this ecological site. The gray wolf and wild bison used this ecological site in historic times. The wolf is thought to be extirpated from Eastern Colorado. Bison are currently found only as domestic livestock.

Reference Plant Community:
Reptiles using this community include western rattlesnake, bullsnake, western hognose snake, racer, western box turtle, and six-lined racerunner. The structural diversity in the plant community on this site provides habitat for Cassin's and Brewer's sparrow, lark bunting, scaled quail, and ferruginous and Swainson's hawks. The combination of mid and tallgrasses and shrubs provides habitat for lesser prairie chicken in the eastern part of this ecological site. Small mammals such as white-tailed jackrabbit, badger, swift fox, and several species of mice are common in this plant community. Pronghorn is a typical ungulate found in this community.

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

2.1 and 3.1 Communities:
As these communities develop into an open landscape the wildlife species will shift away from the reference species and toward the species that prefer unvegetated areas and short plants. Texas short- lizard, six-lined racerunner, and black-tailed jackrabbit would be expected more frequently here than in the reference plant community. In addition, black-tailed prairie dog and burrowing owl might use these communities.

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 - (300) (0.08)

1.2 Community - (200) (0.05)

2.1 Community - (100) (0.03)

These stocking rates are guidelines and range plans should be written only after a field 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

No appreciable wood products are present on the site.

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.

There has been discussion that the Blue Grama Dominated State/Plant Community belongs in the Reference Box, if grazing management will restore this community. However, the site authors feel that this should remain a separate state in MLRA 69 due to the lower precipitation, higher evapotranspiration rates, and in this case, shallow soils. It is felt that this restoration cannot be achieved within a 40-year planning horizon. Further discussion as needed.

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

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

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

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

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

Animal Community
- Wildlife interpretations, general narrative, updated (Provisional “+”). 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 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.

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: LRU C Shale Breaks ESD will be developed at a future date.

“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 will be present on steep slopes with shale outcrop.

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

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

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

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 8 inches deep.

6. **Extent of wind scoured, blowouts and/or depositional areas:** There is none to slight wind scour on exposed areas. Small depositional areas will occur as slope decreases.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is 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 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 anticipated to be 4-5 in interspaces at soil surface. These values need verification at reference site.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM is 1-2 percent. The soils are shallow. The A horizon is grayish-brown, very fine granular structure, and approximately 0-2 inches in depth.

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

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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 >

    Sub-dominant: Cool-season mid rhizomatous grass > shrubs > warm-season short bunchgrass > warm-season mid rhizomatous grass = cool-season mid bunchgrass >

    Other: warm-season forbs > leguminous forbs > cool-season forbs = sedges > warm-season short stoloniferous

    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.

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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; 700 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, 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.
