

Ecological site R069XY053CO Sandstone 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. Highways 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 Sandstone Breaks Ecological Site, LRUs A and B, was developed from an earlier version of the Sandstone Breaks Ecological Site (2005, revised in 2007). This earlier version of the Sandstone Breaks Ecological Site (2005) was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information obtained from the Sandstone 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

This ecological site is a run-off site on slopes of greater than 10 percent. The soil depth is less than 20 inches over sandstone bedrock.

Associated sites

R069XY006CO	Loamy Plains The Loamy Plains Ecological Site is commonly adjacent.
R069XY026CO	Sandy Plains The Sandy Plains Ecological Site is commonly adjacent.

Similar sites

R069XY064CO	Gravel Breaks This ecological site is influenced by rock fragments and the soil depth is greater than 20 inches.
R069XY058CO	Limestone Breaks This ecological site is over limestone bedrock.

Table 1. Dominant plant species

Tree	(1) <i>Juniperus monosperma</i> (2) <i>Pinus edulis</i>
Shrub	(1) <i>Rhus trilobata</i> (2) <i>Cercocarpus montanus</i>
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Bouteloua gracilis</i>

Physiographic features

This site occurs on plains or canyonlands. Sandstone outcrops are common and can include vertical sandstone

cliffs.

Table 2. Representative physiographic features

Landforms	(1) Scarp (2) Mesa
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	3,700–6,200 ft
Slope	10–45%
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) EADS [USC00052446], Eads, CO
- (2) ORDWAY 21 N [USC00056136], Ordway, CO
- (3) PUEBLO MEM AP [USW00093058], Pueblo, CO
- (4) ORDWAY 2 ENE [USC00056131], Ordway, CO
- (5) PUEBLO RSVR [USC00056765], Pueblo, CO

- (6) ROCKY FORD 2 SE [USC00057167], Rocky Ford, CO
- (7) CHERAW 1 N [USC00051539], La Junta, CO
- (8) LA JUNTA 20 S [USC00054726], La Junta, CO
- (9) TACONY 13 SE [USC00058157], Boone, 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 or moderately rapid permeability. The surface layer thickness ranges from 3 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 sandstone. Parent material originated from sandstone.

Major soil series correlated to this ecological site include Travessilla and Rizozo.

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>.



Figure 8. Travessilla Series, Las Animas County

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Residuum
Surface texture	(1) Stony sandy loam (2) Very fine sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	8–20 in
Surface fragment cover ≤3"	0–35%
Surface fragment cover >3"	0–5%
Available water capacity (0–40in)	1.3–2 in

Calcium carbonate equivalent (0-40in)	0–14%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–35%
Subsurface fragment volume >3" (Depth not specified)	0–5%

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 mid warm-season bunchgrass (sideoats grama), and short warm-season bunchgrass (blue grama). Secondary grasses are mid warm-season bunchgrass (little bluestem), tall warm-season rhizomatous grass (prairie sandreed), mid cool-season rhizomatous grass (western wheatgrass), mid cool-season bunchgrass (needle and thread), and tall warm-season bunchgrasses (big bluestem, sand bluestem). Various shrubs (skunkbush sumac, true mountain mahogany), and forbs (purple prairieclover, dotted gayfeather) occur on the site. Short warm-season stoloniferous grass (black grama) and short warm-season bunchgrass (hairy grama) occur on the site in minor amounts. Other minor grasses and grass-likes are Indian ricegrass, galleta, littleseed ricegrass, Indiangrass and sun sedge. Trees such as oneseed juniper and pinyon pine are present in minor amounts.

Recurring seasonal herbivory causes sideoats grama, little bluestem, big bluestem, Indiangrass, prairie sandreed, sand bluestem, switchgrass, and palatable forbs and shrubs to decrease in frequency and production. Grasses and grass-like plants such as blue grama, black grama, hairy grama, and threadleaf sedge will increase. If adequate recovery periods between grazing events are not allowed during the growing season, blue grama will begin to dominate the plant community. Mid- and tallgrasses can eventually be removed from the plant community. Over the long-term, continuous use without adequate recovery opportunity between grazing events will cause species such as Fendler's threeawn, sand dropseed, small soapweed, broom snakeweed, wormwood, pricklypear cactus, and cheatgrass to increase or invade. Oneseed juniper is usually present in small amounts and increases with continuous grazing disturbance and lack of fire.

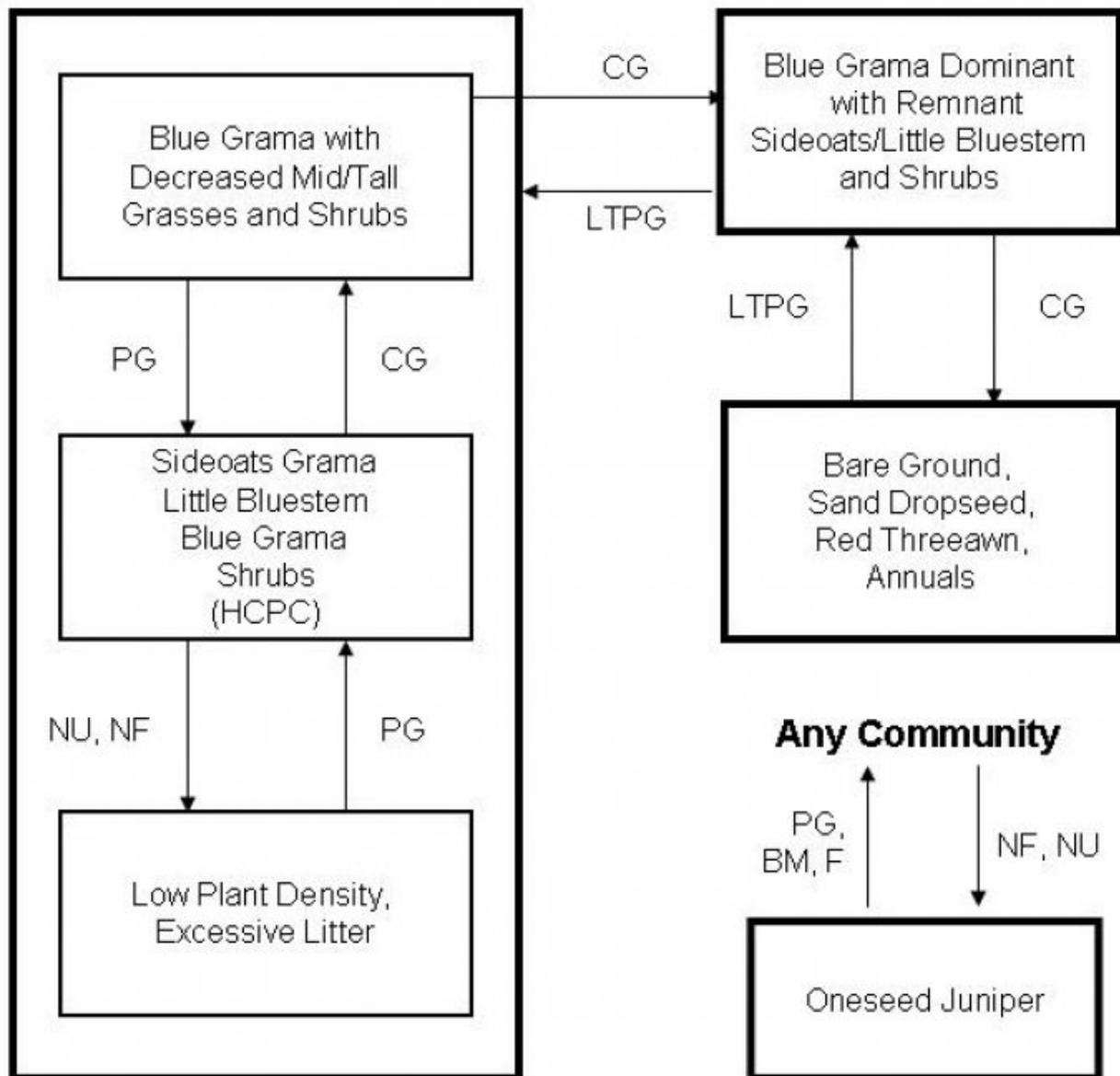
Drier and warmer climatic conditions exist in the central portion of MLRA 69. This area includes the eastern half of

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 revisited 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



BM - brush management, **CG** - continuous grazing without adequate recovery opportunity, **F** - fire, **HCPC** - Historic Climax Plant Community, **LTPG** - long-term prescribed grazing (>40 years), **NF, NU** - no fire, non-use, **PG** - prescribed grazing with adequate recovery opportunity

State 1 Reference State

The Reference State is characterized by three 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, grazing by large ungulates, and adequate recovery periods.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- skunkbush sumac (*Rhus trilobata*), shrub
- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 1.1

Bouteloua curtipendula-Bouteloua gracilis (sideoats grama-blue grama).

This plant community is the interpretive plant community for this site and is considered to be the reference plant community. This community developed with grazing by large herbivores and is suited to grazing by domestic livestock. This plant community can be found on areas where grazed plants receive adequate periods of recovery during the growing season. The potential vegetation is about 70 to 90 percent grasses and grass-like, 5 to 15 percent forbs and 5 to 15 percent woody plants. Mid- and short warm-season grasses and shrubs dominate this community. The principal grasses are sideoats grama, little bluestem, blue grama, and prairie sandreed. Little bluestem increases in abundance on north facing aspects. Secondary grasses are big bluestem, sand bluestem, switchgrass, western wheatgrass, and needle and thread. Threadleaf and sun sedge are common. Dominant forbs are American vetch, dotted gayfeather, and purple prairie clover. Key shrubs are skunkbush sumac, true mountain mahogany, Bigelow sagebrush, and golden and wax currant. A light overstory of oneseed juniper and pinyon pine is usually present. 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, windswept 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, and development into urban or other uses. Areas having lost all vegetation such as livestock and vehicle trails are subject to wind and water erosion. Total annual production, during an average year, ranges from 600 to 1600 pounds of air-dry weight and averages 1000 pounds.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- skunkbush sumac (*Rhus trilobata*), shrub
- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	510	795	1275
Forb	45	100	155
Shrub/Vine	45	100	155
Tree	0	5	15
Total	600	1000	1600

Figure 10. Plant community growth curve (percent production by month).

CO6905, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland coarse-textured soils.

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

Community 1.2

***Bouteloua gracilis*-*Schizachyrium scoparium* (blue grama-little bluestem).**

Blue grama has increased and is the dominant species. Big bluestem, prairie sandreed, sand bluestem, and switchgrass have been reduced. Little bluestem and sideoats grama are still present as secondary grasses. American vetch, purple prairie clover, leadplant, western sandcherry, true mountain mahogany, and currants are present in reduced amounts. Needle and thread, western wheatgrass, and New Mexico feathergrass may initially increase or decrease depending on the season of grazing use. Louisiana sagewort, Cuman ragweed, hairy goldaster, slimflower scurfpea, small soapweed, and fringed sagebrush have increased. The tree component has increased slightly. Plant frequency, vigor, and production have decreased. Reduction of tall and mid- warm-season grasses, rhizomatous wheatgrass, 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. Wind scoured areas and pedestalled plants may be evident. Total annual production, during an average year, ranges from 300 to 900 pounds of air-dry weight and averages 550 pounds.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- Bigelow sage (*Artemisia bigelovii*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Figure 11. Plant community growth curve (percent production by month). CO6905, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland coarse-textured soils.

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

Community 1.3

***Bouteloua curtipendula*-*Bouteloua gracilis* (sideoats grama-blue grama) Excessive Litter Community.**

This plant community developed under many years of non-use and lack of fire. Plant species resemble the reference plant community but frequency and production will be reduced. Eventually, litter levels can become high enough to cause stagnation and mortality of various species such as Indiangrass, sand bluestem, switchgrass, and little bluestem. Bunchgrasses typically develop dead centers and rhizomatous grasses can form small decadent communities due to a lack of stimulation by grazing animals. Management changes can easily shift this plant community toward the reference plant community. Non-disturbance will initially increase litter levels, minimizing soil erosion. In advanced stages of non-use or lack of fire, plants will begin to die off and bare areas will increase causing an erosion concern. This plant community is uncommon in the natural range of variability. Total annual production can vary from 150 to 800 pounds of air-dry vegetation per acre and averages 350 pounds during an average year.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- skunkbush sumac (*Rhus trilobata*), shrub
- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass

- blue grama (*Bouteloua gracilis*), grass

Figure 12. Plant community growth curve (percent production by month). CO6906, Warm-season dominant, cool-season sub-dominant, excess litter; MLRA-69; upland coarse-textured soils.

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

Pathway 1.1A Community 1.1 to 1.2

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

Pathway 1.1B Community 1.1 to 1.3

Non-use or reduced fire frequency will move this plant community to the 1.3 community.

Pathway 1.2A Community 1.2 to 1.1

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

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A Community 1.3 to 1.1

Herbivory with adequate recovery opportunities between grazing events, animal forage balance, and prescribed fire move this plant community toward the reference plant community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2 Blue Grama Dominant State

The Blue Grama Dominant State is represented by one plant community phase. Blue grama has become the dominant species. The loss of dominant and subdominant structural/functional groups reduces the biodiversity and productivity. Species diversity and production have been significantly decreased due to the major reduction of mid- and tallgrass species and key shrubs. Energy flow, water cycle, and mineral cycle have been negatively affected. Litter levels are very low and unevenly distributed. Soil erosion may be a concern on steeper slopes and exposed areas.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous

Community 2.1

Bouteloua gracilis (blue grama) Community.

Blue grama dominates the plant community and may develop into a patchy sod-bound appearance on areas that are more accessible to grazing animals. Sideoats grama and little bluestem may still be present in small amounts on steeper slopes. Forbs and shrubs that continue to increase are Cuman ragweed, hairy goldaster, Bigelow sagebrush, fringed sagebrush, broom snakeweed, and small soapweed. Oneseed juniper and pinyon pine have significantly increased. Production ranges from 100 to 600 pounds of air-dry vegetation per acre per year and averages 300 pounds.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass

Figure 13. Plant community growth curve (percent production by month). CO6907, Warm-season dominant; MLRA-69; upland coarse-textured soils.

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

State 3

Eroded State

Most of the more palatable plants have been replaced by less palatable plants, and bare ground has increased. Soil erosion has increased and may be severe on the steeper slopes. This state is characterized by an impairment of all ecological functions.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- Fendler threeawn (*Aristida purpurea* var. *longiseta*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- soapweed yucca (*Yucca glauca*), grass

Community 3.1

Sporobolus cryptandrus-Aristida purpurea (sand dropseed-Fendler's threeawn) Bare Ground Community.

Bare ground has increased. Remnant amounts of species found in higher successional plant communities can still be found in localized areas due to the inherent geologic formation and relief of the site. The dominant perennial plants are sand dropseed and Fendler's threeawn. Annuals such as sixweeks fescue, Russian thistle, burningbush, and cheatgrass have increased or invaded. Soil erosion hazard has increased due to the increase of bare ground and may be severe on steeper slopes. All ecological functions are impaired. Total annual production vary from 25 to 200 pounds of air-dry vegetation per acre and average 100 pounds.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- Bigelow sage (*Artemisia bigelovii*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- sand dropseed (*Sporobolus cryptandrus*), grass
- Fendler threeawn (*Aristida purpurea* var. *longisetata*), grass
- cheatgrass (*Bromus tectorum*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Figure 14. 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

State 4

Oneseed Juniper State

The tree canopy has increased significantly in this state. It is characterized by an altered hydrologic cycle as well as the landscape appearance. In higher canopy cover situations, the soil erosion increases. The water cycle is significantly altered under dense canopies. Infiltration is reduced because of interception of rainfall by the canopy. Runoff may or may not increase depending on the condition of the herbaceous component.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- skunkbush sumac (*Rhus trilobata*), shrub
- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 4.1

Juniperus monosperma (oneseed juniper) Community.

Oneseed juniper has significantly increased due to the lack of fire and long-term non-use. This tree component has significantly altered the hydrologic cycle as well as the landscape appearance. Prescribed grazing, brush management, and fire can be used to maintain acceptable juniper levels. Total annual production varies from 50 to 200 pounds of air-dry vegetation per acre and averages 100 pounds.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- skunkbush sumac (*Rhus trilobata*), shrub
- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Figure 15. 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

Transition T1A

State 1 to 2

Heavy, continuous grazing without adequate recovery periods and lack of fire shift this state across an ecological threshold to the Blue Grama Dominant State.

Transition T1B

State 1 to 4

Lack of fire shifts the Reference State across an ecological threshold to the Oneseed Juniper State.

Restoration pathway R2A

State 2 to 1

Long-term prescribed grazing that allows adequate recovery opportunity between grazing events, proper stocking rate, and prescribed fire move this state 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 opportunity between grazing events and lack of fire will shift this state across an ecological threshold toward the Eroded State.

Transition T2B

State 2 to 4

Lack of fire moves this state across an ecological threshold to the Oneseed Juniper State.

Transition T3A

State 3 to 4

Lack of fire moves this state to the Oneseed Juniper State.

Restoration pathway R4A

State 4 to 1

Brush management, prescribed fire, and prescribed grazing with adequate recovery periods between grazing events moves this state back to the Reference State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Restoration pathway R4B

State 4 to 2

Brush management, prescribed fire, and prescribed grazing with adequate recovery opportunity between grazing

events moves this state back to the Blue Grama Dominant State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Restoration pathway R4C State 4 to 3

Brush management and prescribed fire move this state back to the Eroded State.

Conservation practices

Brush Management
Prescribed Burning

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				700–900	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	100–200	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	100–150	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	50–150	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	20–70	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	20–70	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	20–70	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	30–70	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	30–70	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–50	–
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	0–50	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	10–50	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	10–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	10–30	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–30	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–30	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	10–30	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	10–20	–
	poverty threawn	ARDI5	<i>Aristida divaricata</i>	0–20	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–20	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	10–20	–
	slim tridens	TRMUE	<i>Tridens muticus var. elongatus</i>	0–10	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–10	–
	rind muhly	MUTO2	<i>Muhlenbergia torreyi</i>	0–10	–

	spike muhly	MUWR	<i>Muhlenbergia wrightii</i>	0–10	–
	littleseed ricegrass	PIMI	<i>Piptatheropsis micrantha</i>	0–10	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	0–10	–
Forb					
2				50–150	
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–30	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	10–20	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	10–20	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–10	–
	lacy tansyaster	MAPIP4	<i>Machaeranthera pinnatifida</i> ssp. <i>pinnatifida</i> var. <i>pinnatifida</i>	0–10	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–10	–
	crownleaf evening primrose	OECO2	<i>Oenothera coronopifolia</i>	0–10	–
	New Mexico groundsel	PANEM	<i>Packera neomexicana</i> var. <i>mutabilis</i>	0–10	–
	broadbeard beardtongue	PEAN4	<i>Penstemon angustifolius</i>	0–10	–
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	0–10	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–10	–
	threadleaf ragwort	SEFLF	<i>Senecio flaccidus</i> var. <i>flaccidus</i>	0–10	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–10	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0–10	–
	American vetch	VIAM	<i>Vicia americana</i>	0–10	–
	Rocky Mountain zinnia	ZIGR	<i>Zinnia grandiflora</i>	0–10	–
	shaggy dwarf morning-glory	EVNU	<i>Evolvulus nuttallianus</i>	0–10	–
	common starlily	LEMO4	<i>Leucocrinum montanum</i>	0–10	–
	manyflowered stoneseed	LIMU3	<i>Lithospermum multiflorum</i>	0–10	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–10	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–10	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–10	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	0–10	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–10	–
Shrub/Vine					
3				50–150	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	10–30	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	10–30	–
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	10–30	–
	spreading buckwheat	EREF	<i>Eriogonum effusum</i>	0–20	–
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	0–20	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–10	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–10	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–10	–

	rubber rabbitbrush	ERNAG	<i>Ericameria nauseosa ssp. nauseosa var. glabrata</i>	0–10	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–10	–
	common hop	HULU	<i>Humulus lupulus</i>	0–10	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–10	–
	western sandcherry	PRPUB	<i>Prunus pumila var. besseyi</i>	0–10	–
	golden currant	RIAU	<i>Ribes aureum</i>	0–10	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–10	–
	tree cholla	CYIMI	<i>Cylindropuntia imbricata var. imbricata</i>	0–10	–
Tree					
4				0–10	
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	10–30	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–10	–

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 reptiles such as western rattlesnake and bullsnake. 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-tall grasses 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 in this community.

1.2 Community:

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

1.3, 2.1, 3.1 Communities:

As these communities develop into an open landscape the wildlife species will shift away from reference plant community 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. In addition, mountain plover, black-tailed prairie dog, and burrowing owl might use these communities where slopes are less than 5 percent and vision is unobstructed.

4.1 Community:

Because of the increased shrub cover in this community, use by some of the grassland reptiles and birds decline, being replaced by species that need woody cover. Although the western rattlesnake and coachwhip continue to use this community as the vegetation changes to shrubs, other reptiles such as the collared lizard may begin using this community because of the increase in juniper. Birds such as flickers, chickadees, robins, and blue jays are expected. Mule and white-tailed deer increase on this plant community because of the improved cover adjacent to grassland. Desert cottontails may take advantage of the edge habitat.

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 - (1000) (0.27)

1.2 Community - (550) (0.15)

2.1 Community - (300) (0.08)

Stocking rates are guidelines and grazing plans should be developed from 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. This site is dominated by soils in hydrologic group A. Infiltration is moderate to high and runoff potential for this site is moderate 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

Fence posts and firewood are potential wood products.

Other products

Site Development and Testing Plan:

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

Community Phase Data (Ecological Dynamics, STM, Transition & Recovery Pathways, Reference Plant

Community, Species Composition List, Annual Production Table):

Updated. All "Required" items are complete to Provisional level.

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

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

A canopy percent will need to be established for the threshold of the 4.1 One-seed Juniper community. This will need to be determined at the next "Approved" level after further site investigation and analysis.

1.3 Low Plant Density, Decadent Plants Plant Community is retained in STM as a concept for now. It is likely this plant community exists on steeper and less accessible slopes. This is due to increased plant decadence (not excessive litter accumulation). We need further site investigation and analysis at the next "Approved" level.

Supporting Information (Site Interpretations, Assoc. & Similar Sites, Inventory Data References, Agency/State Correlation, References):

Updated. All "Required" items complete to Provisional level.

Supporting Information:

Updated. All "Required" items complete to Provisional level.

Animal CommunityWildlife Interpretations:First "overview" paragraph retained.

Individual Plant Community phase interpretations are removed and need to be updated at next "Approved" level.

Livestock Interpretations:

Updated to reflect the plant community name revisions. The Stocking rate calculations remain the same because they are based on the "Legacy" Total Annual Production table.

The stocking rate calculations need to be updated when Total Annual Production and Plant Community annual production is revised at the next "Approved" level.

Hydrology:

From "Previously Approved" ESD (2004). This needs to be updated at next "approved" level.

Other Site Interpretation:

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

Rangeland Health Reference Sheet:

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

LRU C Sandstone 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

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 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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Other references

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

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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 on gentle slopes, slight on steeper slopes.

- 2. Presence of water flow patterns:** Typically none to minimal on gentle slopes (< 15 percent). Water flow patterns 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 has 5 percent or less bare ground, with bare patches generally less than 3 inches. Extended drought may increase bare ground 5-10 percent.

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

- 6. Extent of wind scoured, blowouts and/or depositional areas:** None to slight. Minor wind scouring may occur on steep ridges. Wind erosion can occur with disturbances such as wildfire or extended drought.

- 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 1-3 feet or more 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 3-4 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 dominantly very shallow to shallow and well drained. A-horizon color is light brownish-gray with a weak fine crumb structure. Exposed sandstone bedrock 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 tall bunchgrass = warm-season short bunchgrass > shrubs > Cool-season mid bunchgrass > warm-season tall rhizomatous = cool-season mid rhizomatous = leguminous forbs = other forbs >
- Other: Warm-season mid sod-former = sedges > short trees
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** None to slight. Decadence may exist on areas inaccessible to grazing animals.
-
14. **Average percent litter cover (%) and depth (in):** Litter cover during and following extended drought can range from 20-30 percent.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 600 lbs./ac. low precipitation years; 1000 lbs./ac. average precipitation years; 1600 lbs./ac. high precipitation years. After extended drought or the first growing season following wildfire, production may be reduced by 250-500 lbs./ac.
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Invasive plants should not occur in 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, natural disease, and insects that may temporarily reduce reproductive capability.
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