USDA Natural Resources
Conservation Service

Ecological site R069XY046CO
Shaly Plains

Last updated: 9/07/2023
Accessed: 05/04/2024

General information

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

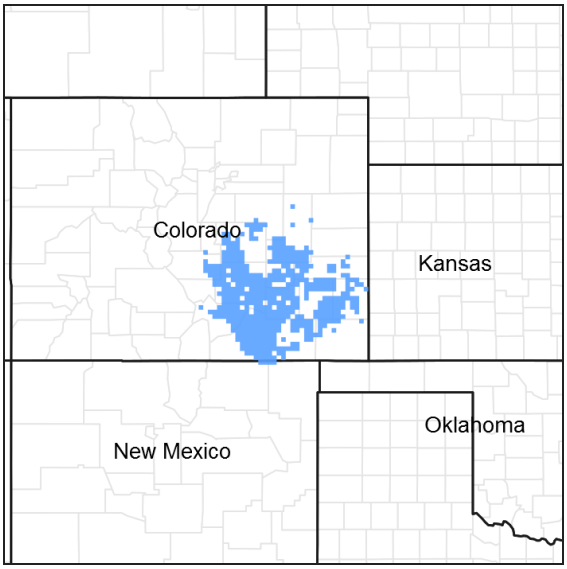


Figure 1. Mapped extent

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

MLRA notes

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

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

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

Classification relationships

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

LRU A (10 to 12 inches PZ) is 2.4 million acres in the central portion of MLRA 69. There is irrigated cropland in the Arkansas Valley. Precipitation is too limited for dryland crops. Most of LRU A is rangeland, and includes the Comanche National Grassland (FS). This LRU is in portions of Bent, Crowley, Otero, and Pueblo counties. Soil Moisture Regime is Ustic Aridic. The Mean Annual Air Temperature (MAAT) is 51 to 54 degrees Fahrenheit.

LRU B (12 to 14 inches PZ) is 4.7 million acres and includes portions of Baca, Bent, Crowley, El Paso, Fremont, Kiowa, Las Animas, Lincoln, Prowers, and Pueblo counties. Most of the LRU is in rangeland. Land uses include irrigated and dry cropland, small acreage and urban ownership. Land east of Interstate 25 remains largely agricultural. Canyonlands are in the southern half and include Piñon Canyon Maneuver Site and the Picket Wire Canyon of the Comanche National Grasslands. Soil moisture regime is Ustic Aridic. The mean annual air temperature is 50 to 54 degrees Fahrenheit.

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

Associated sites

R069XY048CO	**Shale Breaks** The Shale Breaks Ecological Site is commonly near or adjacent.
R069XY037CO	**Saline Overflow** The Saline Overflow Ecological Site is downslope and commonly near or adjacent.
R069XY006CO	**Loamy Plains** The Loamy Plains Ecological Site is commonly near or adjacent.

Similar sites

R069XY048CO	**Shale Breaks** Shale Breaks Ecological Site is on slopes greater than 10 percent.
R069XY042CO	**Clayey Plains** Clayey Plains Ecological Site has soils over 20 inches to bedrock and greater than 35 percent clay in the particle control section.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens* (2) *Krascheninnikovia lanata*
Herbaceous	(1) *Sporobolus airoides* (2) *Pascopyrum smithii*

Physiographic features

This site occurs on plains.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Pediment (3) Knoll (4) Hillslope (5) Interfluve
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,128–1,951 m
Slope	3–18%
Ponding depth	0 cm
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

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

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	127-134 days
Freeze-free period (characteristic range)	149-161 days
Precipitation total (characteristic range)	305-356 mm
Frost-free period (actual range)	121-135 days
Freeze-free period (actual range)	141-164 days
Precipitation total (actual range)	279-406 mm
Frost-free period (average)	129 days
Freeze-free period (average)	153 days
Precipitation total (average)	330 mm

Climate stations used

- (1) PUEBLO MEM AP [USW00093058], Pueblo, CO
- (2) ORDWAY 21 N [USC00056136], Ordway, CO
- (3) EADS [USC00052446], Eads, CO
- (4) ORDWAY 2 ENE [USC00056131], Ordway, CO
- (5) PUEBLO RSVR [USC00056765], Pueblo, CO
- (6) TACONY 13 SE [USC00058157], Boone, CO
- (7) CHERAW 1 N [USC00051539], La Junta, CO
- (8) LA JUNTA 20 S [USC00054726], La Junta, CO
- (9) ROCKY FORD 2 SE [USC00057167], Rocky Ford, 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 or moderately deep. They are well drained with moderately slow or slow permeability. The surface layer thickness ranges from 2 to 11 inches thick. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Parent material kind includes old alluvium or slope alluvium over residuum weathered from shale. Parent material originated from shale.

Major soil series correlated to this ecological site include Gaynor, Midway, Ordway, Pultney, Razor, Samsil, Shingle, and Thedalund.

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. Razor Series

Table 4. Representative soil features

Parent material	(1) Alluvium–shale
Surface texture	(1) Clay loam (2) Clay (3) Silty clay loam (4) Silty clay
Drainage class	Well drained
Permeability class	Slow to moderately slow

Soil depth	25–102 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
Electrical conductivity (0-101.6cm)	2–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–13
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–35%
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).

This is a mid and shortgrass prairie site with a smaller forb and shrub component. Alkali sacaton (warm-season mid bunchgrass)and western wheatgrass (cool-season mid rhizomatous grass) are dominant. Blue grama (warm-season short-grass), sideoats grama and galleta (warm-season mid rhizomatous grasses) are the sub-dominant grass species. Other grasses such as green needlegrass and Indian ricegrass (cool-season mid bunchgrasses) and little bluestem (warm-season mid bunchgrass) may be found in lesser amounts. Shrubs such as fourwing saltbush and winterfat, and occasionally shadscale saltbush, James' frankenia, greasewood, and rabbitbrush may be present. Perennial forbs are a minor component on this site. Forbs include leafy false goldenweed, scarlet globemallow, and dotted gayfeather (also known as dotted blazing star). Leguminous forbs include American vetch, purple prairie clover, two-grooved milkvetch, and silky sophora. Other forbs that may occur include prairie coneflower, Louisiana sagewort, desert princesplume, and sulphur-flower buckwheat (see Species Composition List for others).

This site deteriorates from heavy, continuous grazing without adequate recovery periods following each grazing occurrence. Blue grama, galleta, and inland saltgrass increase. Blue grama develops into a sod-bound condition.

Alkali sacaton, green needlegrass, and western wheatgrass decrease in frequency and production as do key shrubs such as fourwing saltbush and winterfat. American vetch and other highly palatable forbs also decrease. Fendler's threeawn, sand dropseed, ring muhly, annuals, and bare ground increase when subjected to heavy, long-term continuous grazing. Non-use in the absence of fire results in excessive litter and reduced plant density.

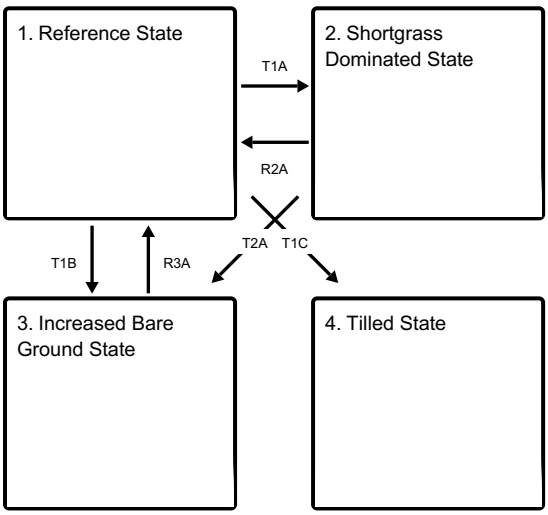
Drier and warmer climatic conditions exist in the central portion of MLRA 69. This area includes the eastern half of Pueblo county, northern Otero, extreme northwestern Bent, western edge of Kiowa, southern edge of Lincoln and all of Crowley County. These conditions are primarily caused by a rain shadow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

Southeastern Colorado was strongly affected by extended drought conditions in the “Dust Bowl” period of the 1930s, with recurrent drought cycles in the 1950s and 1970s. Extreme to exceptional drought conditions have re-visited the area from 2002 to 2012, with brief interludes of near normal to normal precipitation years. “During periods of drought, high winds give rise to the dust storms which are especially characteristic of the southeastern plains (WRCC, 2022).” Recent drought events have increased mortality of blue grama upwards of 80 percent in some locales. The long-term effects of these latest drought years have yet to be determined.

Growth of native cool-season plants begins about April 15 and continues to mid-June. Native warm-season plants begin growth about May 1 and continue to about August 15. Regrowth of cool-season plants occurs in September and October in most years, depending on moisture. For detailed information, visit the Western Regional Climate Center website at https://wrcc.dri.edu/.

State and transition model

Ecosystem states



T1A - Heavy, continuous grazing. Lack of fire.

T1B - Long-term, heavy, continuous grazing. Lack of fire.

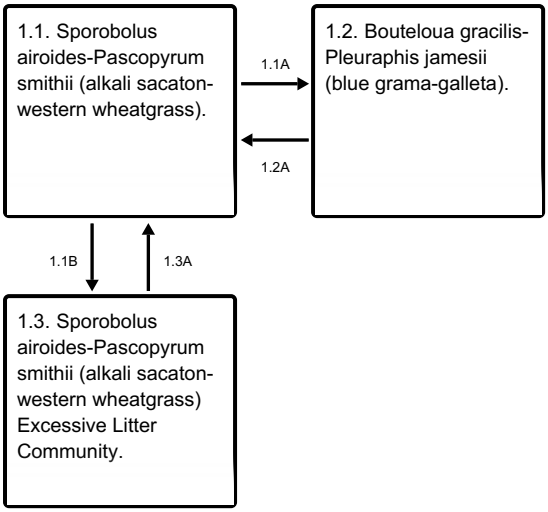
T1C - Mechanical tillage.

R2A - Prescribed grazing. Prescribed fire.

T2A - Long-term, heavy continuous grazing. Lack of fire.

R3A - Long-term prescribed grazing. Prescribed fire.

State 1 submodel, plant communities



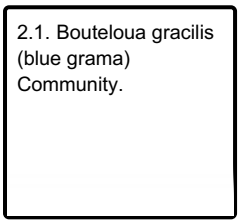
1.1A - Heavy, season-long grazing. Lack of fire.

1.1B - Non-use. Lack of fire.

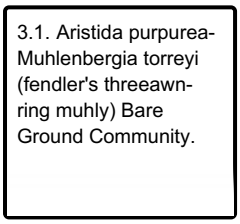
1.2A - Prescribed grazing. Prescribed fire.

1.3A - Prescribed grazing. Prescribed fire.

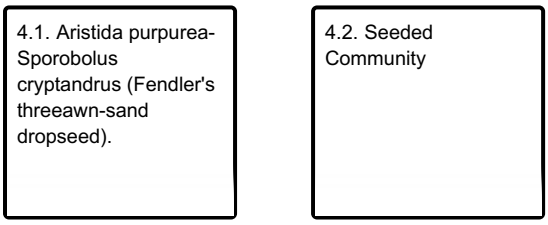
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Reference State

Figure 9. Shaly Plains, Crowley County, CO

The Reference State is characterized by three community phases that exist within the natural range of variability for the site. These phases are maintained by a historic fire frequency estimated to be on 15 to 20 year intervals, grazing by large ungulates, and adequate recovery periods. High production of perennial grasses and extensive soil cover allow for increased soil moisture retention, vegetative production, and overall soil quality.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1
Sporobolus airoides-Pascopyrum smithii (alkali sacaton-western wheatgrass).

This is the interpretive plant community and is considered to be the reference plant community. It evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. The plant community consists of 70 to 85 percent grasses and grass-likes, 5 to 10 percent forbs and 10 to 20 percent shrubs. Dominant grasses include alkali sacaton and western wheatgrass. Blue grama, sideoats grama, and Galleta are secondary grasses. Other grasses and grass-like plants that occur in minor amounts are green needlegrass, little bluestem, Indian ricegrass, and sun sedge. Significant forbs are American vetch, leafy false goldenweed, and scarlet globemallow. Dominant shrubs that occupy this community are fourwing saltbush, winterfat, shadscale saltbush, and James' frankenia. This plant community is diverse, stable, and productive. It is well suited to carbon sequestration, water yield, wildlife, and livestock use and is aesthetically pleasing. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This community is resistant to many disturbances with the exception of heavy, continuous grazing, tillage, and development into urban or other uses. Total annual production, during an average year, ranges from 250 to 1000 pounds per acre air-dry weight and averages 600 pounds. NOTE: The following Reference Plant Community Species Composition list and Annual Production Table is from the Legacy ESD 2004 and will be updated in the future.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	191	521	908
Shrub/Vine	62	101	140
Forb	28	50	73
Total	**281**	**672**	**1121**

Figure 11. 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
Bouteloua gracilis-Pleuraphis jamesii (blue grama-galleta).

In this community, western wheatgrass, alkali sacaton, green needlegrass, sideoats grama, American vetch, fourwing saltbush, and winterfat have been reduced in amounts. Blue grama and galleta have increased. Fendler's threeawn, bottlebrush squirreltail, ring muhly, and hairy goldaster have also increased. This plant community is at risk of losing western wheatgrass, green needlegrass, American vetch, fourwing saltbush, and winterfat. Continuous spring grazing with summer deferment will reduce the cool-season component (western wheatgrass, green needlegrass, and sun sedge) of this plant community and increase the warm-season component. Continuous summer grazing with spring deferment will reduce the warm-season component (sideoats grama and alkali sacaton) and increase the cool-season component. Prescribed grazing with adequate recovery periods between grazing events together with proper stocking will enable the land user to maintain the vegetation. Blue grama is increasing at the expense of the dominant grasses and deep-rooted shrubs. The water cycle, nutrient cycle, and energy flow are becoming impaired due to a shift in root structure and species composition. Total aboveground carbon has been reduced due to decreases in forage and litter production. Reduction of rhizomatous wheatgrass, nitrogen fixing forbs, the shrub component, and increased warm-season shortgrasses has begun to alter the biotic integrity of this community. Total annual production, during an average year, ranges from 150 to 600 pounds per acre air-dry weight and averages 300 pounds.

Dominant plant species

- James' seaheath (*Frankenia jamesii*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- blue grama (*Bouteloua gracilis*), grass
- James' galleta (*Pleuraphis jamesii*), grass

Figure 12. Plant community growth curve (percent production by month). CO6903, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland fine textured soils..

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

Community 1.3
Sporobolus airoides-Pascopyrum smithii (alkali sacaton-western wheatgrass) Excessive Litter Community.

This plant community occurs when grazing is lacking for long periods of time or in the absence of fire. Plant composition is similar to the Reference Plant Community, however individual species production and frequency will be lower. Much of the nutrients are tied up in excess litter. The semiarid environment and the absence of animal impact and herd effect to break down litter slow nutrient recycling. Aboveground litter also limits sunlight from reaching plant crowns. Many plants, especially bunchgrasses, die off. Thick litter and absence of grazing or fire reduce seed germination and establishment. In advanced stages, plant mortality can increase and erosion may

eventually occur if bare ground increases. This plant community is at risk of losing many key species and if ungrazed or without fire can go to a vegetative state resembling the Increased *Bare Ground* State. This plant community will change rapidly with the return of natural disturbances (grazing or fire). This plant community is uncommon in the natural range of variability. Total annual production can vary from 150 to 700 pounds of air-dry vegetation per acre during an average year.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 13. Plant community growth curve (percent production by month). CO6902, Warm-season/cool-season co-dominant, excess litter; MLRA-69; upland fine textured soils..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	22	33	18	12	5	0	0	0

Pathway 1.1A
Community 1.1 to 1.2

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

Pathway 1.1B
Community 1.1 to 1.3

Non-use or lack of fire shifts the reference plant community to the1.3 community. Due to the accumulation of standing plant litter the cycling of nutrients are be impaired. Plant decadence and mortality increase.

Pathway 1.2A
Community 1.2 to 1.1

The restoration of herbivory that allows for adequate recovery periods following grazing occurrences and prescribed fire shift this community phase back to the reference plant community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

The return of normal fire frequency and herbivory with adequate recovery periods shifts the community back to the reference community. Shifts in community phases are reversible through succession, disturbances, and short-term climatic variations that are within the natural range of variability for the site.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shortgrass Dominated State

The Shortgrass Dominated State contains one community phase which is dominated by blue grama. This is a very stable state, resistant to change due to the high tolerance of blue grama to grazing. The loss of dominant and subdominant functional/structural groups such as warm and cool-season grasses, nitrogen fixing legumes, and shrubs reduces the biodiversity and productivity of this site.

Dominant plant species

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

Community 2.1
Bouteloua gracilis (blue grama) Community.

Most of the key grass, forb, and shrub species are absent. Alkali sacaton, western wheatgrass, sideoats grama, and galleta may persist in trace amounts, greatly reduced in vigor and not readily seen. Blue grama dominates the community with a “sod-bound” appearance. Fendler's threeawn, sand dropseed, annual barley, sixweeks fescue, and hairy goldaster have increased. This plant community is resistant to change due to the grazing tolerance of blue grama. A significant amount of production and diversity has been lost from this community when compared to the reference community. Total annual production, during an average year, ranges from 75 to 300 pounds per acre air-dry weight and averages 150 pounds.

Dominant plant species

- James' seaheath (*Frankenia jamesii*), shrub
- California saltbush (*Atriplex californica*), shrub
- blue grama (*Bouteloua gracilis*), grass

Figure 14. 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
Increased Bare Ground State

The Increased *Bare Ground* State lacks stability, diversity, and productivity. Litter levels are extremely low. Most of the palatable grasses, forbs, and shrubs have been replaced by less palatable species. Due to the increased bare ground erosion is evident where flow paths are continuous. Rills may occur on steeper slopes. The nutrient cycle, water cycle, and overall energy flow are greatly impaired. Organic matter and carbon reserves are greatly reduced.

Dominant plant species

- plains pricklypear (*Opuntia polyacantha*), shrub
- tree cholla (*Cylindropuntia imbricata var. imbricata*), shrub
- rubber rabbitbrush (*Ericameria nauseosa ssp. nauseosa var. glabrata*), shrub
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- ring muhly (*Muhlenbergia torreyi*), grass
- cheatgrass (*Bromus tectorum*), grass

Community 3.1
Aristida purpurea-Muhlenbergia torreyi (fendler's threeawn-ring muhly) Bare Ground Community.

Species that dominate this community are Fendler's threeawn, ring muhly, curlycup gumweed, and annual plants such as annual barley, and sixweeks fescue. Cheatgrass, Russian thistle, and burningbush have invaded. Blue grama may persist in localized areas or be totally absent. Introduced species such as field bindweed can also be present, especially on prairie dog towns. Total annual production, during an average year, can vary from 25 to 150

pounds of air-dry vegetation per acre.

Dominant plant species

- plains pricklypear (*Opuntia polyacantha*), shrub
- shadscale saltbush (*Atriplex confertifolia*), shrub
- rubber rabbitbrush (*Ericameria nauseosa ssp. nauseosa var. glabrata*), shrub
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- ring muhly (*Muhlenbergia torreyi*), grass
- cheatgrass (*Bromus tectorum*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Figure 15. 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 4
Tilled State

This state is defined by two separate vegetation communities that are highly variable. They are derived through two distinct management scenarios, and are not successionally related. Infiltration, runoff, and soil erosion vary depending on the vegetation present. The Reference State has been driven beyond the limits of ecological resilience and has crossed a threshold into the tillage state. The designation of the Tillage State denotes changes in plant community composition and soil structure. This change in plant species and soil structure affects the hydrologic function, biotic integrity, and soil site stability.

Dominant plant species

- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- cheatgrass (*Bromus tectorum*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Community 4.1
Aristida purpurea-Sporobolus cryptandrus (Fendler's threeawn-sand dropseed).

Go-back land is created when the soil is tilled or farmed (sodbusted) and abandoned. All of the native plants are eliminated, soil organic matter is depleted, soil structure is degraded and a compacted layer (plow pan) is formed. Residual synthetic chemicals may remain from past farming operations and erosion processes are active. Erosion is a major concern. Go-back land succeeds through several plant communities beginning with an early annual plant community, which initiates the revegetation process. Plants such as Russian thistle, burningbush, and other annuals begin to establish. These plants give some protection from erosion and start to build minor levels of soil organic matter. This early annual plant community lasts for two to several years. Red threeawn, sand dropseed, and several other early perennials can dominate the plant community for five to eight years beyond that. Eventually western wheatgrass, blue grama, and other natives can become reestablished. Prescribed grazing can accelerate the successional process.

Dominant plant species

- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- cheatgrass (*Bromus tectorum*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Community 4.2
Seeded Community

This plant community can vary considerably depending on the degree of soil erosion and the species seeded. The Seeded plant community is represented by applying the conservation practice of rangeland seeding on go-back land or recently cropped land for the purpose of converting it to permanent vegetation. Plant species native to the site are used throughout the MLRA due to their suitability to the semi-arid climate. Native species are the most adapted to site conditions and therefore can be sustained in the MLRA. Improved cultivars (named varieties) of plant materials are used to enhance seeding establishment and meet specific reclamation resource objectives. There are several factors that make seeded rangeland a different grazing resource than native rangeland. Factors such as species selected, stand density, varieties and harvest efficiency all impact the production level and palatability. This results in uneven utilization when both seeded and native rangelands are in the same grazing unit. Therefore, the seeded rangeland should be managed as a separate grazing unit if possible. Species diversity on seeded rangeland is often lower than that of the Reference Plant Community and native forb species will generally take longer to re-establish.

Transition T1A
State 1 to 2

Heavy, continuous grazing without adequate recovery opportunity between grazing events and lack of fire contribute to the loss of state resilience and result in shifts between states. This transition involves a major loss of plant diversity resulting in the degradation of biotic integrity.

Transition T1B
State 1 to 3

Long-term, heavy, continuous grazing without adequate recovery opportunity and lack of fire will shift the plant communities within this state across an ecological threshold to the Increased *Bare Ground* State. This transition can occur within a 10-20 year time frame.

Transition T1C
State 1 to 4

Tillage (plowed & abandoned) causes this state to transition across an ecological threshold to the Tilled State. The resulting change in plant species and soil structure adversely affect hydrologic function, biotic integrity, and soil site stability. This transition is considered to be non-restorable to the due to the adverse effects on the ecological functioning of the plant communities in the Tilled State.

Restoration pathway R2A
State 2 to 1

Prescribed grazing management with proper stocking, adequate rest, and prescribed fire are the management actions required to recover to the Reference State. The species to target for management are those that were dominant or sub-dominant within the reference plant community according to documented functional/structural groups. This restoration may take greater than 40 years to accomplish.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

Long-term, heavy continuous grazing without adequate recovery periods between grazing events and lack of fire moves the Blue Grama State across an ecological threshold to the Increased *Bare Ground* State. This transition may take greater than 25 years to accomplish. Resilience and resistance to disturbance will be lost. Soil site

stability, hydrologic function, and biotic integrity will be significantly altered.

Restoration pathway R3A
State 3 to 1

Long-term prescribed grazing with adequate recovery periods between grazing events and prescribed fire are the management actions required to recover to the Reference State. The species to target for management are those that were dominant or sub-dominant within the reference plant community according to the documented functional/structural groups. It is theorized that this restoration may take greater than 80 years to accomplish.

Conservation practices

Prescribed Burning
Prescribed Grazing

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				588–757	
	alkali sacaton	SPAI	*Sporobolus airoides*	168–235	–
	western wheatgrass	PASM	*Pascopyrum smithii*	101–168	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	67–135	–
	blue grama	BOGR2	*Bouteloua gracilis*	101–135	–
	James' galleta	PLJA	*Pleuraphis jamesii*	67–101	–
	green needlegrass	NAVI4	*Nassella viridula*	22–45	–
	Grass, perennial	2GP	*Grass, perennial*	6–22	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–11	–
	saltgrass	DISP	*Distichlis spicata*	0–11	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–11	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–6	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0–6	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–6	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–6	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–6	–
	vine mesquite	PAOB	*Panicum obtusum*	0–6	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–6	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–6	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–6	–
Forb					
2				45–129	
	American vetch	VIAM	*Vicia americana*	6–22	–
	Forb, perennial	2FP	*Forb, perennial*	6–22	–
	prairie sunflower	HEPE	*Helianthus petiolaris*	0–11	–
	silky sophora	SONU	*Sophora nuttalliana*	0–11	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	6–11	–

	leafy false goldenweed	OOFOF	*Oonopsis foliosa var. foliosa*	6–11	–
	white locoweed	OXSE	*Oxytropis sericea*	0–11	–
	beardtongue	PENST	*Penstemon*	0–6	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–6	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–6	–
	desert princesplume	STPIP	*Stanleya pinnata var. pinnata*	0–6	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–6	–
	povertyweed	IVAX	*Iva axillaris*	0–6	–
	dotted blazing star	LIPU	*Liatris punctata*	0–6	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–6	–
	twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	0–6	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	0–6	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–6	–
Shrub/Vine					
3				45–129	
	fourwing saltbush	ATCA2	*Atriplex canescens*	34–67	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	11–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	6–22	–
	James' seaheath	FRJA	*Frankenia jamesii*	6–11	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	6–11	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	0–6	–
	rubber rabbitbrush	ERNAG	*Ericameria nauseosa ssp. nauseosa var. glabrata*	0–6	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	–
	pale desert-thorn	LYPA	*Lycium pallidum*	0–6	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–6	–
	soapweed yucca	YUGL	*Yucca glauca*	0–6	–

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.

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: (600) (0.16)

1.2 Community: (300) (0.08)

2.1 Community: (150) (0.04)

These stocking rates are guidelines and the actual stocking rate should be determined on site.

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.

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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 moderate to low and runoff potential for this site varies from moderate to high depending on ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. 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):

There is some overlap in soil series between Alkaline Plains Clayey Plains, and Shaly Plains. Further Soils and Vegetative Site Investigation is needed to update these soils at the next “Approved” level.

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

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

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

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

Animal Community Wildlife 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). This needs to be updated at the “Approved” level.

LRU C Shaly Plains 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 AssociationLandtypeLandtype Phase.

Inventory data references

NRI: references to Natural Resource Inventory data
Information presented here has been derived from data collection on private and federal lands using:
• Double Sampling (clipped 2 of 5 plots)*
• Rangeland Health (Pellant et al., 2005)
• Soil Stability (Pellant et al., 2005)
• Line Point Intercept : Foliar canopy, basal cover (Forb, Graminoid, Shrub, subshrub, Lichen, Moss, Rock fragments, bare ground, % Litter) (Herrick et al., 2005)
• Soil pedon descriptions collected on site (Schoeneberger et al., 2012)

*NRCS double-sampling method, CO NRCS Similarity Index Worksheet 528(1).
Additional reconnaissance data collection using numerous ocular estimates and other inventory data; NRCS clipping data for USDA program support; Field observations from experienced range trained personnel. Specific data information is contained in individual landowner/user case files and other files located in county NRCS field offices.

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

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Ben Berlinger, Daniel Nosal, Kimberly Diller
Contact for lead author	Ben Berlinger, Area Rangeland Management Specialist, La Junta, CO,
Date	01/12/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

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2. **Presence of water flow patterns:** Typically none, if present, water flow patterns are short and not connected, with numerous debris dams or vegetative barriers.

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3. **Number and height of erosional pedestals or terracettes:** None to slight.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** This site has 5-10 percent or less bare ground, with bare patches generally less than 2-3 inches in diameter. Extended drought can cause bare ground to increase upwards to 15-25 percent with bare patches reaching upwards to 12-18 inches in diameter.

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

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

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

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class rating is anticipated to be 4-6 in interspaces at soil surface. These values need verification at reference site.

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

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Raindrop impact is reduced by the diverse grass, forb, shrub functional/structural groups and root structure. This slows overland flow and provides increased time for infiltration to occur. Extended drought, wildfire or both may reduce basal density, canopy cover, and litter amounts (primarily from tall, warm-season bunch and rhizomatous grasses), resulting in decreased infiltration and increased runoff on steep slopes following intense rainfall events.

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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: warm-season mid bunchgrass >> cool-season mid rhizomatous >

    Sub-dominant: warm-season short bunchgrass = shrubs > warm-season mid rhizomatous > 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 10-15 percent.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 250 lbs./ac. low precipitation years; 600 lbs./ac. average precipitation years; 1000 lbs./ac. above average precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 100 – 250 lbs./ac.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Invasive plants should not occur in reference plant community. Cheatgrass, Russian thistle, burningbush, other non-native annuals may invade following extended drought or fire if a seed source is available. Oneseed juniper may invade from adjacent sites with lack of fire.

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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.