USDA Natural Resources Conservation Service

Ecological site R069XY021CO
Choppy Sands

Last updated: 4/14/2025
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General information

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

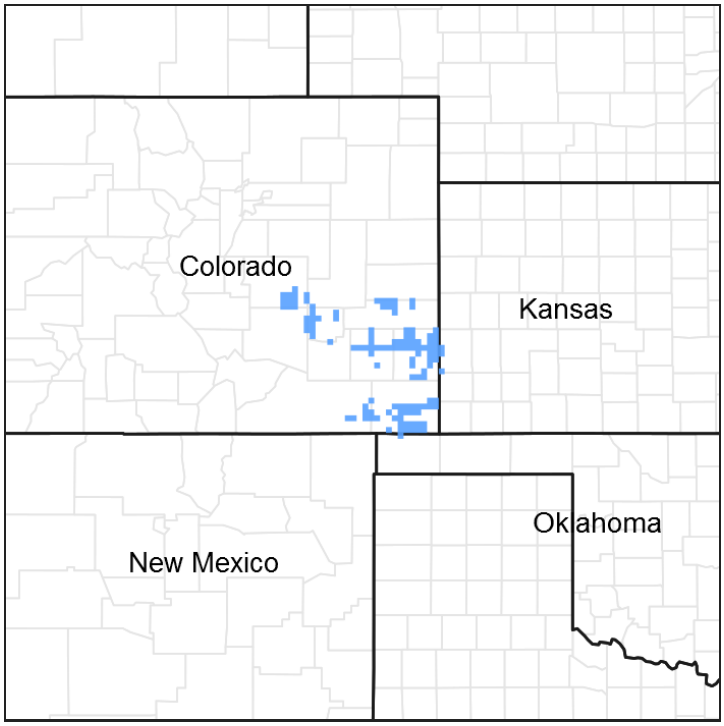


Figure 1. Mapped extent

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

MLRA notes

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

MLRA 69 is in the Arkansas Watershed of southeastern (SE)Colorado. It consists of rolling plains, river valleys, and canyonlands. The Arkansas River flows from the Rocky

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

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

Classification relationships

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

LRU A (10 to 12 inches PZ) is 2.4 million acres in the central portion of MLRA 69. There is irrigated cropland in the Arkansas Valley. Precipitation is too limited for dryland crops. Most of LRU A is rangeland, and includes the Comanche National Grassland (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 Choppy Sands Ecological Site, LRUs A and B, was developed from an earlier version of the Choppy Sands Ecological Site (2004, revised in 2007). This earlier version of the Choppy Sands ESD (2004) was based on input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Choppy Sands Range Site

description (1975). 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 Choppy Sands Ecological Site occurs in an upland position, on slopes greater than 10 percent. The soil is sandy and at least 60 inches deep. depth There are many small ridges, sharp peaks, and terracettes giving it a rough or “choppy” appearance. Blowouts are present.

Associated sites

R069XY019CO	**Deep Sand** The Deep Sands Ecological Site is commonly adjacent to and interspersed with the Choppy Sands Ecological Site.
R069XY026CO	**Sandy Plains** The Sandy Plains Ecological Site is commonly adjacent to and interspersed with the Choppy Sands Ecological Site.

Similar sites

R069XY019CO	**Deep Sand** The Deep Sands Ecological Site is on stabilized dunes and normally does not have blowouts.
R069XY026CO	**Sandy Plains** The Sandy Plains Ecological Site is on slopes of less than 10 percent, has developed soil horizons, and includes fine sandy loam and sandy loam surface textures.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Prunus pumila var. besseyi* (2) *Amorpha canescens*
Herbaceous	(1) *Andropogon hallii* (2) *Calamovilfa longifolia*

Physiographic features

This site occurs on plains.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Blowout
Runoff class	Low to very low
Flooding frequency	None
Ponding frequency	None
Elevation	1,128–1,859 m
Slope	5–25%
Ponding depth	0 cm
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

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

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

Table 3. Representative climatic features

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

Precipitation total (actual range)	279-406 mm
Frost-free period (average)	129 days
Freeze-free period (average)	153 days
Precipitation total (average)	330 mm

Climate stations used

- (1) EADS [USC00052446], Eads, CO
- (2) ORDWAY 2 ENE [USC00056131], Ordway, CO
- (3) PUEBLO RSVR [USC00056765], Pueblo, CO
- (4) CHERAW 1 N [USC00051539], La Junta, CO
- (5) LA JUNTA 20 S [USC00054726], La Junta, CO
- (6) ROCKY FORD 2 SE [USC00057167], Rocky Ford, CO
- (7) TACONY 13 SE [USC00058157], Boone, CO
- (8) ORDWAY 21 N [USC00056136], Ordway, CO
- (9) PUEBLO MEM AP [USW00093058], Pueblo, CO

Influencing water features

This site functions independently from the water table.

Wetland description

N/A

Soil features

The soils of this site are very deep. They are excessively drained with very rapid permeability. The surface layer thickness ranges from 4 to 7 inches. The soil moisture regime is ustic aridic. The soil temperature regime is mesic.
Major soil series correlated to this ecological site include: Valent.

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

Table 4. Representative soil features

Parent material	(1) Eolian sands
Surface texture	(1) Sand
Family particle size	(1) Sandy

Drainage class	Excessively drained
Permeability class	Very rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.06–8.13 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–5%
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.

This is a mixed tallgrass and midgrass prairie with a diverse forb and shrub component. Sand bluestem (warm-season, tall bunchgrass) and prairie sandreed (warm-season, tall rhizomatous grass) are primary. Secondary components include midgrasses, such as needle and thread and Indian ricegrass (cool-season bunchgrass) and little bluestem (warm-season bunch). Forbs, such as lemon scurfpea, are common. Shrubs include sand

sagebrush and western sandcherry.

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).

Continuous grazing without adequate recovery opportunities following each grazing event during the growing season will initially cause blue grama, hairy grama, and small soapweed to increase. Species such as sand bluestem, prairie sandreed, switchgrass, western sandcherry, leadplant, and palatable forbs will decrease in frequency and production. Sandhill muhly will increase under continuous grazing and can become dominant. Non-use, continuous grazing, wildfire, brush management, or any type of physical disturbance can lead to serious erosion problems (blowouts, wind scoured areas) on these fragile soils.

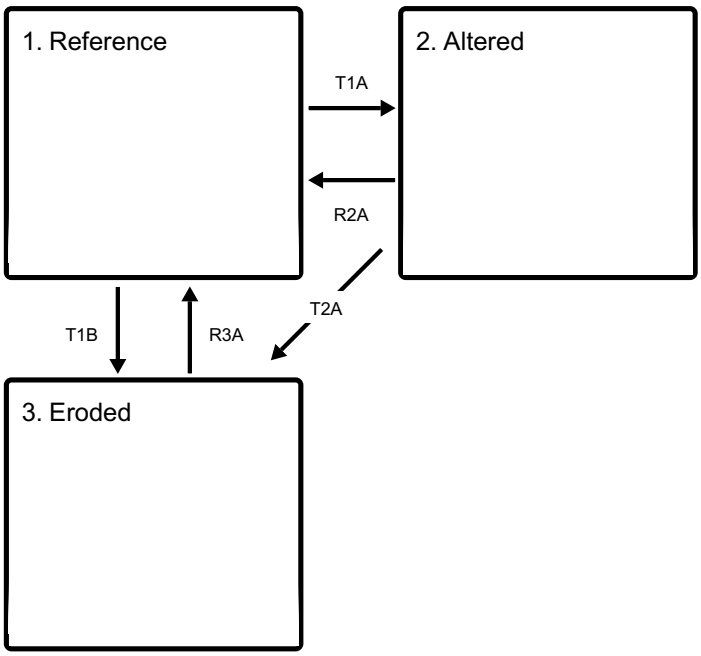
Drier and warmer climatic conditions exist in the central portion of MLRA 69. This area includes the eastern half of Pueblo county, northern Otero, extreme northwestern Bent, western edge of Kiowa, southern edge of Lincoln and all of Crowley County. These conditions are primarily caused by a rain shadow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

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

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

State and transition model

Ecosystem states



T1A - Heavy, season-long grazing. Lack of fire.

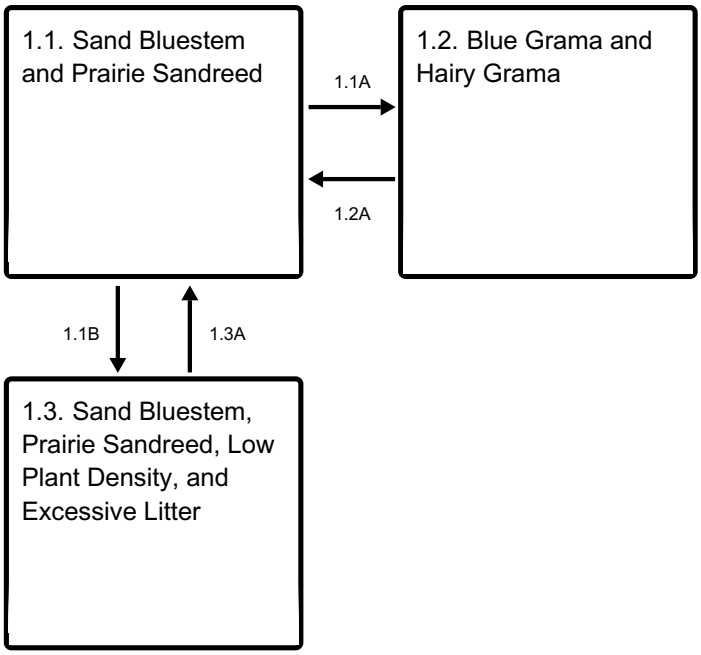
T1B - Non-use. Lack of fire.

R2A - Prescribed grazing. Prescribed fire.

T2A - Heavy, season-long grazing. Lack of fire.

R3A - Prescribed grazing. Prescribed fire.

State 1 submodel, plant communities



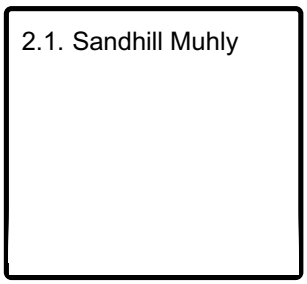
1.1A - Heavy, season-long grazing. Lack of fire.

1.1B - Non-use. Lack of fire.

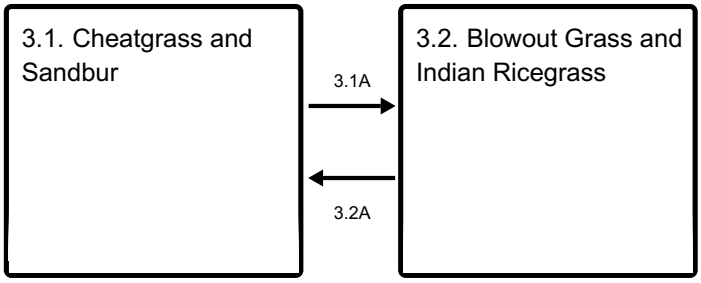
1.2A - Prescribed grazing. Prescribed burning.

1.3A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities



State 3 submodel, plant communities



3.1A - Prescribed grazing. Prescribed fire.

3.2A - Heavy, season-long grazing. Lack of fire.

State 1
Reference

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 (Guyette and others), and grazing by large ungulates with 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

- western sandcherry (*Prunus pumila var. besseyi*), shrub
- leadplant (*Amorpha canescens*), shrub
- sand sagebrush (*Artemisia filifolia*), shrub
- sand bluestem (*Andropogon hallii*), grass
- prairie sandreed (*Calamovilfa longifolia*), grass

Community 1.1
Sand Bluestem and Prairie Sandreed

This is the interpretive plant community and is considered to be the reference plant community. This plant community evolved with grazing by large herbivores, is well suited for grazing by domestic livestock and is in areas that are properly managed with grazing that allows adequate recovery periods following each grazing occurrence during the

growing season. The plant community consists chiefly of tall warm-season grasses. Principle dominants are sand bluestem, prairie sandreed, needle and thread, and little bluestem. Sub-dominant grasses include blue grama, hairy grama, switchgrass, and Indiangrass. Important forbs and shrubs include lemon scurfpea, silky prairie clover, bigtop dalea, leadplant, and sandcherry. The potential vegetation is about 70 to 85 percent grasses and grass-like plants, 10 to 15 percent forbs and 5 to 15 percent woody plants. Prescribed grazing that allows for adequate recovery periods after each grazing event and proper stocking will maintain this plant community. Continual or repeated spring grazing and summer deferment will reduce the cool-season component of this plant community and increase the warm-season component. Spring deferment and continual summer grazing will increase the cool-season component and decrease the warm-season component. This community is resistant to many disturbances except repeated heavy, seasonal herbivory without adequate recovery opportunity, plowing, and development into urban or other uses. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. Nutrient cycle, water cycle, energy flow, and community dynamics are all functioning and intact. Extensive and diverse rooting systems are present. Carbon sequestration above and below ground is excellent. If continually grazed or over stocked to the point of leaving little stubble or litter, wind erosion will become a major concern. Production in this community can vary from 600 to 1400 pounds of air-dry vegetation per acre per year depending on the weather and averages 1150 pounds.

Dominant plant species

- western sandcherry (*Prunus pumila var. besseyi*), shrub
- leadplant (*Amorpha canescens*), shrub
- sand sagebrush (*Artemisia filifolia*), shrub
- sand bluestem (*Andropogon hallii*), grass
- prairie sandreed (*Calamovilfa longifolia*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	488	998	1177
Forb	123	163	196
Shrub/Vine	62	129	196
Total	**673**	**1290**	**1569**

Figure 9. Plant community growth curve (percent production by month). CO6905, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland coarse-textured soils.

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

Community 1.2
Blue Grama and Hairy Grama

This plant community evolves with heavy, continuous grazing without adequate recovery periods during the growing seaso. Sand bluestem, yellow Indiangrass, switchgrass, prairie sandreed, purple prairieclover, western sandcherry, and leadplant have decreased but are still present in small amounts. Blue grama, hairy grama, needleandthread, and small soapweed have increased and dominate the community. Sand dropseed, red threeawn, sandhill muhly, lemon scurfpea, hairy goldaster, croton, Cuman ragweed, tenpetal blazingstar, and groundplum milkvetch have also increased. This plant community is relatively stable but at risk of losing key tall grass species, palatable forbs, western sandcherry, and leadplant. The nutrient cycle, water cycle, and energy flow have been impaired due to reduced production, a shift in root structure, and species composition. Less litter is being produced. Small blowouts or wind scoured areas can be forming at this stage. Production can vary from 300 to 750 pounds of air-dry vegetation per acre per year and averages 550 pounds.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass
- hairy grama (*Bouteloua hirsuta*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass

Figure 10. Plant community growth curve (percent production by month). CO6905, Warm-season dominant, cool-season sub-dominant; MLRA-69; upland coarse-textured soils.

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

Community 1.3
Sand Bluestem, Prairie Sandreed, Low Plant Density, and Excessive Litter

This plant community results from a lack of grazing for long periods of time in the absence of fire. Plant composition is similar to the reference plant community. In time, however, individual species production and frequency lowers. Much of the nutrients are tied up in excessive litter. The semiarid environment and the absence of animal traffic to break down litter slows nutrient cycling. 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. This plant community changes rapidly with prescribed grazing which allows animal impact and adequate recovery periods between grazing events. Production can vary from 150 to 1100 pounds of air-dry vegetation per acre per year.

Dominant plant species

- western sandcherry (*Prunus pumila var. besseyi*), shrub
- leadplant (*Amorpha canescens*), shrub
- sand sagebrush (*Artemisia filifolia*), shrub
- sand bluestem (*Andropogon hallii*), grass
- prairie sandreed (*Calamovilfa longifolia*), grass

Figure 11. 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

Recurring, heavy growing season herbivory without adequate recovery opportunity moves this plant community toward the 1.2 community. Lack of fire accelerates the process. Reduced production and erosion are a concern.

Pathway 1.1B
Community 1.1 to 1.3

Non-use and lack of fire shift this plant community to the Low Plant Density, Excessive Litter Plant Community.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that allows for adequate recovery periods following each grazing event 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

Grazing that allows for adequate recovery opportunity following each grazing event can shift this plant community toward the reference plant community. Prescribed fire

accelerates this process.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Altered

This state is dominated by Sandhill muhly, and results from continuous, heavy grazing without adequate recovery opportunity between grazing events, and lack of fire. The state is characterized by a lack of resiliency and resistance to disturbances. Biological integrity, site stability, and hydrologic function are greatly reduced.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- sandhill muhly (*Muhlenbergia pungens*), grass
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- blowout grass (*Redfieldia flexuosa*), grass

Community 2.1
Sandhill Muhly

This plant community established under historic, continuous grazing. Sandhill muhly has increased to the point of being the dominant species. Sand dropseed, red threeawn, blowout grass, and lemon scurfpea have also increased. Needle and thread, Indian ricegrass, and little bluestem have decreased to remnant amounts. Sand bluestem, Indiangrass, switchgrass, prairie sandreed, western sandcherry, and leadplant are absent from the community. Species diversity and overall production are reduced significantly. Litter levels are low. Bare ground has increased and blowouts are forming or enlarging. Carbon reserves have been severely depleted. Community dynamics, nutrient cycle, water cycle, and energy flow have been severely impaired. Production varies from 100 to 350 pounds of air-dry vegetation per acre per year and averages 250 pounds.

Dominant plant species

- sandhill muhly (*Muhlenbergia pungens*), grass

Figure 12. Plant community growth curve (percent production by month). CO6907, Warm-season dominant; MLRA-69; upland coarse-textured soils.

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

State 3
Eroded

This state results from continued disturbances that further impair the stability of the site. Continuous, heavy grazing without providing adequate recovery opportunity following grazing events is the driver of the process. Blowouts can develop.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- cheatgrass (*Bromus tectorum*), grass
- sandbur (*Cenchrus*), grass
- sixweeks fescue (*Vulpia octoflora*), grass

Community 3.1
Cheatgrass and Sandbur

This early succession plant community can either be the result of continuous, heavy grazing applied to an early perennial plant community, or the result of controlled short-term animal impact and prescribed grazing applied to a blowout. Production can vary greatly depending on the plant density and weather conditions in any year. Cheatgrass, Japanese brome, kochia, Russian thistle, sunflower, pigweed, sandbur, sixweeks fescue, and annual buckwheat are common. Wind erosion is a concern. Production can vary from 0 to 200 pounds per acre of air-dry vegetation per year.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- cheatgrass (*Bromus tectorum*), grass
- sandbur (*Cenchrus*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- Russian thistle (*Salsola*), other herbaceous
- pigweed (*Amaranthus*), other herbaceous

Community 3.2
Blowout Grass and Indian Ricegrass

This plant community evolves with long term heavy, continuous grazing from a more advanced plant community, or with prescribed grazing from the 3.1 community. Blowout grass, Indian ricegrass, sandhill muhly, needle and thread, and lemon scurfpea are some of the first perennials to occupy this community. Wind erosion remains a concern. Production can vary from 50 to 200 pounds per acre of air-dry vegetation per year.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blowout grass (*Redfieldia flexuosa*), grass
- Indian ricegrass (*Achnatherum hymenoides*), grass

Pathway 3.1A
Community 3.1 to 3.2

Prescribed grazing that allows adequate recovery opportunity between grazing events moves this plant community toward the 3.2 community. Prescribed fire will accelerate this transition.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 3.2A
Community 3.2 to 3.1

Continuous, heavy grazing without adequate recovery opportunity between grazing events moves this plant community toward the 3.1 community. Lack of fire accelerates this transition. Eventually blowouts can result.

Transition T1A
State 1 to 2

Repeated, heavy season-long grazing without adequate recovery opportunity between grazing events and lack of fire shift this plant community across an ecological threshold to the Altered state. Decreased production and increased erosion are concerns.

Transition T1B
State 1 to 3

Non-use of greater than 25 years and lack of fire can move this plant community across an ecological threshold causing accelerated erosion. Annuals or early perennial plant communities can result depending on the amount of non-use or rest involved with the transition. Blowouts can occur.

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing moves this state to the Reference state. This transition may take greater than 25 years depending on the size of the area, proximity to seed source and remnant species present. Prescribed fire will accelerate this process.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

Continuous, heavy grazing without an adequate recovery period will cause this state to cross an ecological threshold to the Eroded state. Lack of fire can accelerate this transition. Blowouts can result, and severe erosion is a major concern.

Restoration pathway R3A
State 3 to 1

Long-term prescribed grazing that allows an adequate recovery period can eventually move this plant community toward the Reference state. Prescribed fire can accelerate this recovery.

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				902–1098	
	sand bluestem	ANHA	*Andropogon hallii*	258–325	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	191–258	–
	switchgrass	PAVI2	*Panicum virgatum*	67–191	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	67–129	–
	little bluestem	SCSC	*Schizachyrium scoparium*	39–90	–

	Indiangrass	SONU2	*Sorghastrum nutans*	39–67	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	11–67	–
	blue grama	BOGR2	*Bouteloua gracilis*	11–67	–
	Grass, perennial	2GP	*Grass, perennial*	11–67	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	11–39	–
	blowout grass	REFL	*Redfieldia flexuosa*	11–39	–
	Schweinitz's flatsedge	CYSC3	*Cyperus schweinitzii*	0–28	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–28	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	11–28	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–28	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	11–28	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–28	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–28	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–11	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–11	–
Forb					
2				129–196	
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	11–39	–
	Forb, perennial	2FP	*Forb, perennial*	11–39	–
	silky prairie clover	DAVI	*Dalea villosa*	11–28	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	11–28	–
	shaggy dwarf morning-glory	EVNU	*Evolvulus nuttallianus*	0–28	–
	phlox heliotrope	HECO5	*Heliotropium convolvulaceum*	0–11	–
	stiff sunflower	HEPAP2	*Helianthus pauciflorus ssp. pauciflorus*	0–11	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–11	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–11	–
	flaxflowered ipomopsis	IPLOL	*Ipomopsis longiflora ssp. longiflora*	0–11	–

	ipomopsis		*longiflora*		
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–11	–
	dotted blazing star	LIPU	*Liatris punctata*	0–11	–
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	0–11	–
	tenpetal blazingstar	MEDE2	*Mentzelia decapetala*	0–11	–
	broadbeard beardtongue	PEAN4	*Penstemon angustifolius*	0–11	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–11	–
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–11	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–11	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–11	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–11	–
	Texas croton	CRTE4	*Croton texensis*	0–11	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	0–11	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	0–11	–
	veiny dock	RUVE2	*Rumex venosus*	0–11	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–11	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–11	–
Shrub/Vine					
3				67–196	
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	22–67	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	11–39	–
	leadplant	AMCA6	*Amorpha canescens*	11–39	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	11–39	–
	soapweed yucca	YUGL	*Yucca glauca*	11–28	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–11	–

	prairie rose	ROAR3	*Rosa arkansana*	0–11	–
	spreading buckwheat	EREF	*Eriogonum effusum*	0–11	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–11	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0–11	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–11	–

Animal community

WILDLIFE INTERPRETATIONS:
The variety of grasses, forbs, and shrubs on this ecological site in the various plant communities provides habitat for a wide range of wildlife species. Historic large grazers that influenced these plant communities were bison, elk, and pronghorn. Changes over time have resulted in the loss of bison, the reduction in elk numbers, and pronghorn population swings. Domestic grazers now share these habitats with wildlife. The grassland communities of eastern Colorado are home to many bird species. Changes in the composition of the plant community when moving from the reference plant community to other communities on this ecological site may result in dramatic species shifts in the bird community. Because of a lack of permanent water, fish and many amphibians are not expected on this ecological site. Mule and white-tailed deer may use this ecological site, however the shrub cover is too low to expect more than occasional use. The gray wolf and wild bison used this ecological site in historic times. The wolf is thought to be extirpated from Eastern Colorado. Bison in the area are domesticated.

Reference Plant Community:
The grasses, forbs, and shrubs in this plant community provide habitat for 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.

Community 1.2:
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 to many wildlife species found in the reference plant community.

Communities 1.3-2.1-3.1:
As these communities develop into an open landscape the wildlife species shift away from reference plant community species and toward the wildlife species that prefer unvegetated

areas and short plants. Texas short- lizard, six-lined racerunner, and black-tailed jackrabbit would be expected more frequently.

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.

Plant Community Production (lbs./acre) and Stocking Rate (AUM/acre)

Reference Plant Community - (1150) (0.32)

Community 1.2 - (550) (0.15)

Community 2.1 - (250) (0.07)

All stocking rates are guidelines and on- site investigation is needed before developing actual grazing plans.

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 and runoff potential for this site ranges from high to moderate. Water transmission through group A soils is normally greater than 0.30

inches per hour. Runoff is expected to occur only during the most intense storms (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 & Testing Plan:

General Data (MLRA and Revision Notes, Hierarchical Classification, Ecological Site Concept, Physiographic, Climate, and Water Features, and Soils Data):

- Updated, All “Required” items complete to Provisional level

Community Phase Data (Ecological Dynamics, STM, Transition & 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. These will need review for future updates at the next Approved level. Minor edit has been made to Species Comp List.

Each Alternative State/Community:

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

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

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

Supporting Information: Only one Inventory Data Reference located (NRI). More field data collection is needed to support this site concept.

- There is minimal NRI data (2004-2015) and no archived 417 data for Choppy Sands site.

Need to collect Medium/High Intensity site data to support this site.

Animal Community
Wildlife Interpretations:
- First “overview” paragraph was retained. Individual Plant Community phase interpretations have been 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 Interpretations:
- Recreational Uses, Wood Products, Other Products, and Plant Preferences table, are carried over from “previously Approved” ESD (2004).

Rangeland Health Reference Sheet:

- From “Previously Approved” ESD (2004). This needs to be updated at the next “Approved” level.

Note: Choppy Sands ESD is not in LRU C.

“Future work, as described in a project plan, to validate the information in this provisional ecological site description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.” (NI 430_306 ESI and ESD, April, 2015)

Other information

Relationship to Other Classifications:
NRCS Classification Hierarchy:
Physiographic Divisions of the United States (Fenneman, 1946): Physiographic DivisionPhysiographic ProvincePhysiographic SectionLand Resource RegionMajor Land Resource Area (MLRA)Land Resource Unit (LRU).

USFS Classification Hierarchy:

National Hierarchical Framework of Ecological Units (Cleland et al, 181-200): DomainDivisionProvinceSectionSubsectionLandtype Association LandtypeLandtype Phase.

Inventory data references

NRI: references to Natural Resource Inventory data
Information presented here has been derived from data collection on private and federal lands using:
• Double Sampling (clipped 2 of 5 plots)*
• Rangeland Health (Pellant et al., 2005)
• Soil Stability (Pellant et al., 2005)
• Line Point Intercept : Foliar canopy, basal cover (Forb, Graminoid, Shrub, subshrub, Lichen, Moss, Rock fragments, bare ground, percent 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, Kimberly Diller, Daniel Nosal
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 broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers, usually following intense rainfall events.

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3. **Number and height of erosional pedestals or terracettes:** Pedestalled plants caused by

wind erosion are minor. Terracettes are nonexistent.

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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 percent or less bare ground, with bare patches ranging from 5-10 inches in diameter. Prolonged drought, or wildfire events cause bare ground to increase upwards to 15-20 percent with bare patches ranging from 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:** Minor wind scouring naturally occurs on this site. An increase in wind erosion can result from disturbances such as wildfire, extended drought, and rodent activity.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter should be uniformly distributed with little movement. On steep slopes or knolls, litter may move from a few inches to 1-2 feet depending on intensity of storm.

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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 2-3 in interspaces at soil surface.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM ranges from 1-2 percent. Soils are very deep, light brownish gray, weak coarse granular to crumbly structure, at a 0-5 inch 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 tall bunch grass >>

    Sub-dominant: Warm-season tall rhizomatous > shrubs > cool-season mid bunch = warm-season mid bunch > warm-season short bunch >

    Other: Leguminous forbs > warm-season forbs > cool-season forbs = grasslikes > warm-season mid rhizomatous grass > warm-season short rhizomatous

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal. Minor plant decadence will occur in small areas that are steep and broken thereby limiting access to grazing animals.

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14. **Average percent litter cover (%) and depth (in):** Litter cover during and following drought can range from 15-25 percent, and 5-10 percent following wildfire.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 600 lbs. /ac. low precipitation years; 1150 lbs. /ac. average precipitation years; 1400 lbs. /ac. high precipitation years. After extended drought or the first growing season following wildfire, production may be significantly 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 reference plant community. Following fire or extended drought, Russian thistle, kochia, Rocky Mountain beeplant may invade assuming a seed source is available.

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