

Ecological site R069XY026CO

Sandy Plains

Last updated: 4/15/2025
Accessed: 10/04/2026

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.

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.

LRU notes

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. REVISION NOTES: The Sandy Plains Ecological Site, LRUs A and B, was developed from an earlier version of the Sandy ESD (2004, re-named Sandy Plains Ecological Site in 2007). The earlier version of the Sandy Ecological Site (2004) was based on input from NRCS and historical information obtained from the Sandy Plains Range Site descriptions (Soil Conservation Service 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.

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. REVISION NOTES: The Sandy Plains Ecological Site, LRUs A and B, was developed from an earlier version of the Sandy ESD (2004, re-named Sandy Plains Ecological Site in 2007). The earlier version of the Sandy Ecological Site (2004) was based on input from NRCS and historical

information obtained from the Sandy Plains Range Site descriptions (Soil Conservation Service 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 Sandy Plains Ecological Site is in an upland run-off position on plains. The slope is less than 10 percent and the soil is deeper than 20 inches. Calcium carbonate is the only salt in the soil, and the surface texture is sandy loam or loamy sand.

Associated sites

R069XY006CO	Loamy Plains Loamy Plains Ecological Site is commonly adjacent to Sandy Plains Ecological Site.
R069XY019CO	Deep Sand The Deep Sand Ecological Site is on similar landforms and commonly adjacent to the Sandy Plains Ecological Site.
R069XY053CO	Sandstone Breaks Sandstone Breaks Ecological Sites are on shallow soils and commonly adjacent to Sandy Plains Ecological Sites.

Similar sites

R069XY006CO	Loamy Plains The surface textures of the Loamy Plains Ecological Site includes loam, silt loam, silty clay loam, and clay loam.
R069XY019CO	Deep Sand The Deep Sand Ecological Site is on stabilized dunes on slopes of greater than 10 percent.
R069XY031CO	Sandy Bottomland Sandy Bottomlands Ecological Sites are run-on sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex canescens</i> (2) <i>Prunus pumila</i> var. <i>besseyi</i>
Herbaceous	(1) <i>Calamovilfa longifolia</i> (2) <i>Andropogon hallii</i>

Physiographic features

This site occurs on gently sloping to moderately sloping uplands and plains.

Table 2. Representative physiographic features

Landforms	(1) Interfluve (2) Hillslope (3) Ridge (4) Sand sheet (5) Fan remnant
Runoff class	Very low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,130 – 1,890 m
Slope	0 – 10 %
Ponding depth	0 cm
Water table depth	150 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)	130-130 days
Freeze-free period (characteristic range)	150-160 days

Precipitation total (characteristic range)	310-360 mm
Frost-free period (actual range)	120-140 days
Freeze-free period (actual range)	140-160 days
Precipitation total (actual range)	280-410 mm
Frost-free period (average)	130 days
Freeze-free period (average)	150 days
Precipitation total (average)	330 mm

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

Influencing water features

There is no influential water table or wetland associated with this site.

Wetland description

N/A

Soil features

The soils of this site are very deep. They are well drained or somewhat excessively drained with rapid to moderately slow permeability. The surface layer thickness ranges from 2 to 7 inches thick. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Major soil series correlated to this ecological site include Ascalon, Bijoudry, Bresser, Fort, Gilcrest, Haxtun, Kimera, Minnequa, Olney, Oterodry, Romound, Sitcan, Stoneham, Truckton, Ulm, Vonid, and Yattle.

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 7. Olney sandy loam (Soil Survey of Otero County, Colorado 1972)

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Eolian sands
-----------------	----------------------------------

Surface texture	(1) Sandy loam (2) Fine sandy loam (3) Loamy sand
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to rapid
Soil depth	100 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	5.08 – 20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

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).

Blue grama is the primary grass species (warm-season bunchgrass) while prairie sandreed and sand bluestem (tallgrasses) are secondary. Shrubs such as fourwing saltbush, spreading buckwheat, and plains pricklypear vary in amounts. Western sandcherry, small soapweed, and sand sagebrush may occur in lesser amounts. Perennial forbs are a minor component on this site. Forbs include dotted gayfeather (dotted blazing star), purple prairieclover, scarlet globemallow, and American vetch. Others that may occur include white sagebrush, sand lily (starlily), tenpetal blazingstar, prairie spiderwort, Nuttall's evolvulus, and sand verbena (see Species Composition List for others).

Continuous grazing without adequate recovery following each grazing event during the growing season causes blue grama to increase, and eventually form a sod-bound condition. Major warm-season grasses such as sand bluestem, prairie sandreed, yellow indiagrass, and switchgrass decrease in frequency and production. Needle and thread initially increases, then decreases. Key forbs and shrubs such as American vetch, purple prairie clover, scarlet globemallow, western sandcherry, and fourwing saltbush also decrease. Red threeawn, annuals, and bare ground increase with excessive defoliation. Years of non-use or lack of fire allows litter to accumulate and reduce plant density.

Drier and warmer climatic conditions exist in the central portion of MLRA 69 (LRU A). 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 Counties. These conditions are primarily caused by a rain shadow effect from the southern Rocky Mountains. Evapotranspiration rates (atmospheric demand) is higher in LRU A and total annual production is typically lower.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				1177-1429	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	336-471	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	135-269	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	95-202	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	67-135	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	28-95	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	28-95	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	28-95	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	11-67	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	11-67	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	11-45	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	11-45	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0-28	–
	Indiagrass	SONU2	<i>Sorghastrum nutans</i>	0-28	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0-28	–

	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-28	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	0-27	–
	little barley	HOPU	<i>Hordeum pusillum</i>	0-13	–
	tumblegrass	SCPA	<i>Schedonnardus paniculatus</i>	0-13	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0-13	–
	ring muhly	MUTO2	<i>Muhlenbergia torreyi</i>	0-11	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-11	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0-11	–
Forb					
2				168-252	
	Forb, perennial	2FP	<i>Forb, perennial</i>	11-45	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-28	–
	purple prairie clover	DAPUP	<i>Dalea purpurea</i> var. <i>purpurea</i>	11-28	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	11-28	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	11-28	–
	American vetch	VIAM	<i>Vicia americana</i>	11-28	–
	bush morning-glory	IPLE	<i>Ipomoea leptophylla</i>	0-13	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-13	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0-13	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-11	–
	common starlily	LEMO4	<i>Leucocrinum montanum</i>	0-11	–
	white heath aster	SYERE	<i>Symphyotrichum ericoides</i> var. <i>ericoides</i>	0-11	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0-11	–
	shaggy dwarf morning-glory	EVNU	<i>Evolvulus nuttallianus</i>	0-11	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-11	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0-11	–
	crownleaf evening primrose	OECO2	<i>Oenothera coronopifolia</i>	0-11	–
	broadbeard beardtongue	PEAN4	<i>Penstemon angustifolius</i>	0-11	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0-11	–
	crested pricklypoppy	ARPO2	<i>Argemone polyanthemus</i>	0-11	–
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaarpus</i>	0-11	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	0-11	–
	purple poppymallow	CAIN2	<i>Callirhoe involucrata</i>	0-11	–
	sanddune cryptantha	CRFE3	<i>Cryptantha fendleri</i>	0-11	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0-11	–
	snowball sand verben	ABFR2	<i>Abronia fragrans</i>	0-11	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0-11	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0-11	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	0-11	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-11	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0-11	–
Shrub/Vine					
3				84-252	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	28-67	–
	western sandcherry	PRPUB	<i>Prunus pumila</i> var. <i>besseyi</i>	11-45	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	11-45	–

	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-45	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-28	–
	spreading buckwheat	EREF	<i>Eriogonum effusum</i>	11-28	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-27	–
	tree cholla	CYIM2	<i>Cylindropuntia imbricata</i>	0-13	–
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	0-11	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-11	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-11	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-11	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-11	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 10. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 11. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Animal community

Wildlife Interpretations The combination of sandy soils and grasses, forbs, and shrubs on the ecological site, provide habitat for numerous wildlife species. Historic large grazers that influenced these communities were bison and pronghorn. Bison are currently found only as domestic livestock. Pronghorn, mule and white-tailed deer use this ecological site. Domestic grazers 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 community to other communities on this ecological site may result in species shifts in bird species. The occasional wetland or spring found on this site provides essential seasonal water needed for reproductive habitat by some reptiles and amphibians. Because of a lack of permanent water, fish are not common. Grazing Interpretations The following table lists suggested initial stocking rates for an animal unit (1,000 pound beef cow) under continuous grazing (yearlong 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. A properly stocked and applied prescribed grazing management system that provides adequate recovery periods following each grazing event, and 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 (total lbs./acre) and Stocking Rate (AUM/acre) are listed below: Example: Reference Community (1,500) (0.41) : 1,500 lbs. per acres X 25% Harvest Efficiency = 375 lbs. forage demand for one month. 375 pounds per acre/ 912.5 demand per AUM = 0.41 Reference Community (1,500) (0.41) 1.2 Community (1,100) (0.30) 1.3 Community (900) (0.25) 2.1 Community (700) (0.19) All stocking rates are estimates and an on-site inventory should be conducted prior to developing a grazing plan. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide year-long forage under prescribed grazing for cattle, sheep, horses, and other herbivores. During the dormant period, livestock may need supplementation based on reliable

forage analysis.

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 varies from high to moderate depending on soil hydrologic group and ground cover. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to NRCS Section 4, National Engineering Handbook (USDA–NRCS, 1972–2012) for runoff quantities and hydrologic curves).

Recreational uses

This site provides opportunities for hiking, horseback riding, wildlife viewing including bird watching, and photography. Hunting for large and small game may be available in rural areas and on public land. The wide variety of flowering plants from spring until fall are aesthetically pleasing.

Wood products

No appreciable wood products are present on this 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 are complete to Provisional level. Community Phase Data (Ecological Dynamics, STM, Transition & Recovery Pathways, Reference Plant Community, Species Composition List, Annual Production Table): Updated. All “Required” items are complete to Provisional level. Increased Bare Ground Plant Community: It’s unknown whether this plant community can be restored within an 80 year timeframe, if ever. More discussion and analysis is needed at the next Approved level. NOTE: Annual Production Table updated to reflect a higher total annual production per data review. Species Composition List (SCL) is the Legacy ESD with minor species addition. The SCL and APT will be re-visited at the Approved level. Each Alternative State and Community: Complete to Provisional level Supporting Information (Site Interpretations, Assoc. & Similar Sites, Inventory Data References, Agency/State Correlation, References): Updated. All “Required” items are complete to Provisional level. Livestock Interpretations are updated to reflect Total Annual Production revisions in each plant community. Wildlife interpretations and general narrative are updated. Interpretations for individual plant community states and phases are pending. Hydrology, Recreational Uses, Wood Products, Other Products, and Plant Preferences table, and Rangeland Health Reference Sheet are carried over from previously “Approved” ESD (2004). Reference Sheet: The Reference Sheet was previously approved in 2005. Attribute #12 Expected Annual Production is updated. LRU C Sandy 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)

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. Data Source: NRI Number of Records: 7 Sample Period: 2004-2013 State: CO Counties: El Paso, Kiowa, Lincoln, Pueblo

References

Guyette, R.P., M.C. Stambaugh, D.C. Dey, and R. Muzika. 2012. **Predicting Fire Frequency with Chemistry and Climate**. *Ecosystems* 15:322–335.

Other references

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

30 Year Climatic and Hydrologic Normals (1981-2010) Reports. National Water and climate Center: Portland, OR. August 2015

ACIS-USDA Field Office Climate Data (WETS), period of record 1971-2000 <http://agacis.rcc-acis.org> (powered by WRCC) Accessed March 2016

Andrews, R. and R. Righter. 1992. Colorado Birds. Denver Museum of Natural History, Denver, CO. 442

Armstrong, D.M. 1972. Distribution of mammals in Colorado. Univ. Kansas Museum Natural History Monograph #3. 415.

Butler, LD., J.B. Cropper, R.H. Johnson, A.J. Norman, G.L. Peacock, P.L. Shaver, and K.E. Spaeth. 1997, revised 2003. National Range and Pasture Handbook. National Cartography and Geospatial Center's Technical Publishing Team: Fort Worth, TX. <http://www.glti.nrcs.usda.gov/technical/publications/nrph.html> Accessed August 2015

Clark, J., E. Grimm, J. Donovan, S. Fritz, D. Engrstom, and J. Almendinger. 2002. Drought cycles and landscape responses to past Aridity on prairies of the Northern Great Plains, USA. *Ecology*, 83(3), 595-601.

Cleland, D., P. Avers, W.H. McNab, M. Jensen, R. Bailey, T. King, and W. Russell. 1997. National Hierarchical Framework of Ecological Units, published in *Ecosystem Management: Applications for Sustainable Forest and Wildlife Resources*, Yale University Press

Cooperative climatological data summaries. NOAA. Western Regional Climate Center: Reno, NV. Web. <http://www.wrcc.dri.edu/climatedata/climsum> Accessed August 2015

Egan, Timothy. 2006. *The Worst Hard Time*. Houghton Mifflin Harcourt Publishing Company: New York, NY.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. *Mammals of Colorado*. Denver Museum of Natural History, Denver, CO. 467.
Hammerson, G.A. 1986. *Amphibians and reptiles in Colorado*. CO Div. Wild. Publication Code DOW-M-I-3-86. 131.

Herrick, Jeffrey E., J.W. Van Zee, K.M. Haystad, L.M. Burkett, and W.G. Witford. 2005. *Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Volume II*. U.S. Dept. of Agriculture, Agricultural Research Service. Jornada Experimental Range, Las Cruces, N.M.

Kingery, H., Ed. (1998) *Colorado Breeding Birds Atlas*. Dist. CO Wildlife Heritage Foundation: Denver, CO. 636.

National Water & Climate Center. USDA-NRCS. USDA Pacific Northwest Climate Hub: Portland, OR. <http://www.wcc.nrcs.usda.gov/> Accessed March 2016

National Weather Service Co-op Program. 2010. Colorado Climate Center. Colorado State Univ. Web. <http://climate.atmos.colostate.edu/dataaccess.php> March 2016

Pellant, M., P. Shaver, D.A. Pyke, J.E. Herrick. (2005) *Interpreting Indicators of Rangeland Health, Version 4*. BLM National Business Center Printed Materials Distribution Service: Denver, CO.

PLANTS Database. 2015. USDA-NRCS. Web. <http://plants.usda.gov/java/> Accessed August 2015. February 2016

PRISM Climate Data. 2015. Prism Climate Group. Oregon State Univ. Corvallis, OR. <http://www.prism.oregonstate.edu/> Accessed August 2015.

Rennicke, J. 1990. *Colorado Wildlife*. Falcon Press, Helena and Billings, MT and CO Div. Wildlife, Denver CO. 138.

Schoeneberger, P.J., D.A. Wysockie, E.C. Benham, and Soil Survey Staff. 2012. *Field book for describing and sampling soils, Version 3.0*. Natural Resources Conservation Service, National Soil Survey Center: Lincoln, NE.

The Denver Posse of Westerners. 1999. *The Cherokee Trail: Bent's Old Fort to Fort Bridger*. The Denver Posse of Westerners, Inc. Johnson Printing: Boulder, CO

U.S. Dept. of Agriculture, Agricultural Research Service. September, 1991. *Changes in Vegetation and Land Use I eastern Colorado, A Photographic study, 1904-1986*.

U.S. Dept. of Agriculture, Natural Resources Conservation Service. 2006. *Land Resource Regions and Major Land Resource areas of the United States, the Caribbean, and the Pacific Basin*. US Department of Agriculture Handbook 296.

U.S. Dept. of Agriculture, Natural Resources Conservation Service. National Geospatial Center of Excellence. Colorado annual Precipitation Map from 1981-2010, Annual Average Precipitation by State

U.S. Dept. of Agriculture, Natural Resources Conservation Service. 2009. Part 630, Hydrology, National Engineering Handbook

U.S. Dept. of Agriculture, Natural Resources Conservation Service. 1972-2012. National Engineering Handbook Hydrology Chapters. <http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?&cid=stelprdb1043063> Accessed August 2015.

U.S. Dept. of Agriculture, Natural Resources Conservation Service. National Soil Survey Handbook title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054242 Accessed July 2015

U.S. Dept. of Agriculture, Soil Survey Division Staff. 1993. Soil Survey Manual.

U.S. Dept. of Agriculture. 1973. Soil Survey of Baca County, Colorado.

U.S. Dept. of Agriculture. 1970. Soil Survey of Bent County, Colorado.

U.S. Dept. of Agriculture. 1968. Soil Survey of Crowley County, Colorado.

U.S. Dept. of Agriculture. 1981 Soil Survey of El Paso County Area, Colorado.

U.S. Dept. of Agriculture. 1995. Soil Survey of Fremont County Area, Colorado.

U.S. Dept. of Agriculture. 1983. Soil Survey of Huerfano County Area, Colorado.

U.S. Dept. of Agriculture. 1981. Soil Survey of Kiowa County, Colorado.

Western Regional Climate Center. 2022. Climate of Colorado, climate of the eastern plains. https://wrcc.dri.edu/Climate/narrative_co.php (accessed 9 August 2022).

Contributors

Ben P. Berlinger Rangeland Management Specialist NRCS Retired

Doug Whisenhunt Ecological Site Specialist NRCS

Kimberly A. Diller Ecological Site Specialist NRCS

Laura L. Craven MLRA Project Leader NRCS

Approval

Kirt Walstad, 4/15/2025

Acknowledgments

Project Staff: Kimberly Diller, Ecological Site Specialist, NRCS MLRA, Pueblo Soil Survey Office (SSO) Laura Craven, MLRA 69 Soil Survey Leader, NRCS MLRA Pueblo SSO Amber Wyndham, Soil Scientist, NRCS MLRA Pueblo SSO Ben Berlinger, Rangeland Management Specialist, Ret. NRCS La Junta, CO Program Support: Rachel Murph, NRCS State Rangeland Management Specialist David Kraft, NRCS MLRA Ecological Site Specialist-QA (acting), Emporia, KS Chad Remley, Regional Director, N. Great Plains Soil Survey, Salina, KS B.J. Shoup, State Soil Scientist, Denver Eugene Backhaus, State Resource Conservationist, Denver Chanda Garcia, NRCS State Biologist, NRCS, Denver CO Patty Knupp, Area 3 Biologist, NRCS, Pueblo CO Partners/Contributors: James Kulbeth, Natural Resources Specialist, Department of the Army, Fort Carson, CO John Lamman, Rangeland Management Specialist, BLM, Cañon City, CO Steve Olson, Botanist, USFS, Pueblo, CO Renee Rondeau, Ecologist, CO Natural Heritage Program, Hesperus, CO Terri Schultz, The Nature Conservancy, Ft. Collins, CO John Valentine, District Manager, CO State Land Board, Pueblo, CO Those involved in developing earlier versions of this site description include: Ben Berlinger, rangeland management specialist (RMS); Scott Woodall, RMS; Lee Neve, soil scientist; Julie Elliott, RMS; Terri Skadeland, Colorado State biologist; and Herman Garcia, Colorado State RMS.

Rangeland health reference sheet

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

Author(s)/participant(s)	Ben Berlinger, Kimberly Diller, Daniel Nosal
--------------------------	--

Contact for lead author	Ben Berlinger, Area Rangeland Management Specialist, La Junta, CO,
Date	01/12/2005
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills: None

2. Presence of water flow patterns: 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.

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

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground): Five (5) percent or less bare ground, with bare patches ranging from 3-5 inches in diameter. Prolonged drought, or wildfire events causes bare ground to increase upwards to 15-20 percent with bare patches ranging from 8-12 inches in diameter.

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

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

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

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): Stability class rating is anticipated to be 4-5 in interspaces at soil surface.

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Average SOM ranges from 1-3 percent. Soils are very deep, light brownish gray, weak, fine crumb structure at a 0-4 inch depth.

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

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

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 short bunchgrass >>

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

Other: Leguminous forbs = warm-season forbs >; cool-season forbs >; cool-season mid rhizomatous >; warm-season mid rhizomatous

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Typically minimal. Expect slight short- and mid bunchgrass and shrub mortality/decadence during and following drought.

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

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 950 lbs./ac. low precipitation years; 1,500 lbs./ac. average precipitation years; 2,000 lbs./ac. high precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 300 – 600 lbs./ac.

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

assuming a seed source is available.

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