Ecological site R069XY047CO
Alkaline Plains

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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.

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 Alkaline Plains Ecological Site, LRUs A and B, was developed from an earlier version of the Alkaline Ecological Site (2004, revised in 2007). This earlier version of the Alkaline Plains Ecological Site (2004) was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information obtained from the Alkaline 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 Alkaline Plains Ecological Site is a run-off site on slopes of less than 10 percent. The soils have calcium carbonate and other salts.

Associated sites

R069XY006CO	**Loamy Plains** The Loamy Plains Ecological Site site is commonly adjacent.

R069XY033CO	**Salt Flat** The Salt Flat Ecological Site site is lower on the landscape and commonly adjacent.
R069XY037CO	**Saline Overflow** The Saline Overflow Ecological Site site is lower on the landscape and commonly adjacent.

Similar sites

R069XY046CO	**Shaly Plains** The Shaly Plains Ecological Site is less than 20 inches to bedrock.

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) Interfluve (2) Fan remnant (3) Pediment (4) Hillslope (5) Ridge (6) Terrace (7) Drainageway
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None

Elevation	1,160 – 1,950 m
Slope	0 – 20 %
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) ORDWAY 21 N [USC00056136], Ordway, CO
- (2) PUEBLO MEM AP [USW00093058], Pueblo, CO
- (3) EADS [USC00052446], Eads, CO
- (4) ORDWAY 2 ENE [USC00056131], Ordway, CO
- (5) PUEBLO RSVR [USC00056765], Pueblo, CO
- (6) CHERAW 1 N [USC00051539], La Junta, CO
- (7) LA JUNTA 20 S [USC00054726], La Junta, CO
- (8) ROCKY FORD 2 SE [USC00057167], Rocky Ford, CO
- (9) TACONY 13 SE [USC00058157], Boone, CO

Influencing water features

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

Wetland description

N/A

Soil features

The soils of this site are moderately deep or very deep. They are well drained with moderately slow or slow permeability. The surface layer thickness ranges from 2 to 12 inches thick. The soil moisture regime is ustic aridic. The soil temperature regime is mesic. Parent material kind includes old alluvium, old alluvium over residuum, and slope alluvium over residuum. Parent material originated from shale.

Major soil series correlated to this ecological site include Absted, Aguilar, Cadoma, Deertrail, Heldt, Keyner, Litle, Manzanola, Ordway, Pultney, Razor, and Tyrone.

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. Ordway Clay

Table 4. Representative soil features

Parent material	(1) Alluvium – shale
Surface texture	(1) Clay loam (2) Clay (3) Silty clay loam
Drainage class	Well drained
Permeability class	Slow to moderately slow
Soil depth	50 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified

Available water capacity (0-101.6cm)	12.7 – 20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Electrical conductivity (0-101.6cm)	0 – 20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 40
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 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).

This is a midgrass and shortgrass prairie site with a smaller forb and shrub component. Alkali sacaton (warm-season, mid- bunchgrass), is dominant while blue grama (warm-season, shortgrass), and western wheatgrass (cool-season, rhizomatous), and galleta (warm season, rhizomatous) are the subdominant grass species. Other grasses such as green needlegrass and vine mesquite may be found in lesser amounts. Fourwing saltbush and winterfat, and occasionally shadscale saltbush, James frankennia, greasewood, and rabbitbrush may be present. Perennial forbs are a minor component on this site. Forbs include leafy false goldenweed, two-grooved milkvetch, scarlet globemallow, and American vetch. Others that may occur include desert princesplume, dotted gayfeather (aka dotted blazing star), prairie coneflower, purple prairieclover, and silky sophora (see Species Composition List for others).

This site deteriorates from heavy, continuous grazing without adequate recovery periods. Blue grama, galleta, and inland saltgrass increase. Blue grama develops into a sod-bound condition. Alkali sacaton, alkali bluegrass, green needlegrass, and western wheatgrass all 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 long-term heavy, 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) 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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				1009-1143	
	alkali sacaton	SPAI	*Sporobolus airoides*	404-605	–
	western wheatgrass	PASM	*Pascopyrum smithii*	269-404	–
	blue grama	BOGR2	*Bouteloua gracilis*	202-336	–
	James' galleta	PLJA	*Pleuraphis jamesii*	202-269	–
	green needlegrass	NAVI4	*Nassella viridula*	11-67	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0-67	–
	Grass, perennial	2GP	*Grass, perennial*	11-45	–
	saltgrass	DISP	*Distichlis spicata*	0-39	–
	Sandberg bluegrass	POSE	*Poa secunda*	0-39	–
	vine mesquite	PAOB	*Panicum obtusum*	0-28	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-28	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	11-28	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0-28	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0-11	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0-11	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0-11	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0-11	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0-11	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0-11	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0-11	–
Forb					
2				67-135	
	Forb, perennial	2FP	*Forb, perennial*	11-39	–
	leafy false goldenweed	OOFOF	*Oonopsis foliosa var. foliosa*	11-39	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11-28	–

	twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	11-28	–
	American vetch	VIAM	*Vicia americana*	11-28	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	0-11	–
	povertyweed	IVAX	*Iva axillaris*	0-11	–
	dotted blazing star	LIPU	*Liatris punctata*	0-11	–
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	0-11	–
	desert princesplume	STPIP	*Stanleya pinnata var. pinnata*	0-11	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0-11	–
	silky sophora	SONU	*Sophora nuttalliana*	0-11	–
Shrub/Vine					
3				135-202	
	fourwing saltbush	ATCA2	*Atriplex canescens*	67-135	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	28-67	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	11-45	–
	rubber rabbitbrush	ERNAG	*Ericameria nauseosa ssp. nauseosa var. glabrata*	11-28	–
	James' seaheath	FRJA	*Frankenia jamesii*	0-11	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-11	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-11	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	0-11	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-11	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	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 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 - (1200) (0.33) 1.2 Community - (650) (0.18) 2.1 Community - (300) (0.08) These stocking rates are guidelines and grazing plans should be developed only after a field visit. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide yearlong forage under prescribed grazing for cattle, sheep, horses and other herbivores.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration is low and runoff potential for this site varies from moderate to high depending on ground cover. 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

None noted.

Other products

Site Development and Testing Plan: General Data (MLRA and Revision Notes, Hierarchical Classification, Ecological Site Concept, Physiographic, Climate, and Water Features, and Soils Data):Updated. All “Required” items are complete to Provisional level. Community Phase Data (Ecological Dynamics, STM, Transition & Recovery Pathways, Reference Plant Community, Species Composition List, Annual Production Table): Updated. All “Required” items are complete to Provisional level. NOTE: Annual Production Table and Species Composition List are from the “Previously Approved” ESD (2004). These need review for future updates at the next Approved level. Minor edit was made to Species Composition List. Each Alternative State/Community:Complete to Provisional level. Narrative for each state and community has been updated. Supporting Information (Site Interpretations, Assoc. & Similar Sites, Inventory Data References, Agency/State Correlation, References): Updated. All “Required” items are complete to Provisional level. Animal CommunityWildlife Interpretations:First “overview” paragraph retained. Individual Plant Community phase interpretations are removed and need to be updated at next “Approved” level. Livestock Interpretations: Updated to reflect the plant community name revisions. The Stocking rate calculations remain the same because they are based on the “Legacy” Total Annual Production table. The stocking rate calculations need to be updated when Total Annual Production and Plant Community annual production is revised at the next “Approved” level. Hydrology: From “Previously Approved” ESD (2004). This needs to be updated at next “approved” level. Other Site Interpretation: Recreational Uses, Wood Products, Other Products, and Plant Preferences table, and Rangeland Health Reference Sheet carried over from “Previously Approved” ESD (2004). LRU C Alkaline 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. Data Source # of Records Sample Period State County NRI 4 2004 CO Pueblo NRI 2 2005 CO El Paso NRI 2 2007 CO Crowley NRI 1 2010 CO Pueblo NRI 1 2012 CO Pueblo NRI 1 2012 CO Crowley NRI 2 2012 CO Otero NRI 4 2004 CO Otero NRI 2 2004 CO Crowley NAP* 4 sites 2005-2015 Kiowa *NRI- references to Natural Resource Inventory data

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Other references

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

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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
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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**

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2. **Presence of water flow patterns:** **Typically none, if present water flow patterns are short and not connected.**

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

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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 generally less than 2-3 inches in diameter. Extended drought can cause bare ground to increase upwards to 10-20 percent with bare patches reaching 6-12 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 5-6 in interspace 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 2-3 percent. Soils are typically deep but include some that are moderately deep. The A horizon is light brownish-gray, thick platy structure that part to weak, fine, crumb and is approximately 0-3 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 15-25 percent.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 500 lbs./ac. low precipitation years; 1200 lbs./ac. average precipitation years; 1500 lbs./ac. above average precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 200 – 450 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, and other non-native annuals may invade following extended drought or fire 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.
