

Ecological site R049XY031CO Sandy Bottomland

Last updated: 9/07/2023
Accessed: 05/11/2025

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): 049X–Southern Rocky Mountain Foothills

MLRA 49 is in Colorado (58 percent), Wyoming (27 percent), and New Mexico (15 percent). It makes up about 11,130 square miles (28,845 square kilometers). The major cities in or adjacent to this MLRA are Laramie, Wyoming; Fort Collins, Boulder, Denver, Colorado Springs, and Pueblo, Colorado; and Santa Fe and Las Vegas, New Mexico. Interstates 25, 70, and 80 cross the MLRA. Part of the Medicine Bow National Forest is in the northern tip of this area, in Wyoming; parts of the Roosevelt, Pike, and San Isabel National Forests are in this area in Colorado; and part of the Santa Fe National Forest is in the southern end of this area, in New Mexico. The Rocky Flats Nuclear Arsenal, Peterson Air Force Base, most of the Air Force Academy grounds, and part of the Fort Carson Military Reservation are in the part of this area in Colorado.

Almost half of this area is in the Southern Rocky Mountains and Wyoming Basin Provinces in the Rocky Mountain System. The rest is in the Colorado Pediment, Raton, and High Plains Sections of the Great Plains Province of the Interior Plains. The northern part of the MLRA consists of the Laramie Mountains. The central and southern parts generally are bounded on the east by the Great Plains and on the west by the Southern Rocky Mountains. Elevation ranges from 5,000 feet (1,525 meters) to 8,000 feet (2,440 meters) in most of the MLRA, but small mountains in the area are as high as 10,000 feet (3,050 meters). The Laramie and North Platte Rivers and their associated tributaries are the principal streams in the Wyoming portion of the MLRA. The Cache La Poudre, Big Thompson, Saint Vrain, South Platte, Arkansas, Saint Charles, Huerfano, Cucharas, and Purgatoire Rivers, Clear Creek, Fountain Creek, and their associated tributaries are the principal streams in the Colorado portion. The Vermejo, Cimarron, Pecos, and Mora Rivers and their associated tributaries are the principal streams in the New Mexico portion.

This area has been impacted by the geologic processes of uplift, folding, and faulting and by subsequent erosion and deposition. The Southern Rocky Mountains were uplifted 50 to 70 million years ago during the Laramide uplift. Most of this MLRA is adjacent to this uplift and was also affected. The uplift induced erosion of the relatively soft Late Pennsylvanian to Cretaceous sedimentary rocks from the uplands and dissected the underlying crystalline Precambrian rocks. The relief of the area was reduced by a combination of erosion of uplands and alluvial filling. Approximately 7 million years ago, a large portion of the area was uplifted again to elevations of 14,000 feet (4,270 meters) or more at the core of the Laramide uplift. Since then, precipitation occurring as both rain and snow led to the renewal of erosion and subsequent alluvial fills. The Wyoming portion of the MLRA, the Laramie Mountains, consists primarily of Precambrian plutonic rocks with Pennsylvanian and Permian sedimentary rocks folded and faulted at the margin of the range. The Colorado and New Mexico portions of the area consist primarily of remnants of the uplifted and folded Pennsylvanian through Cretaceous sedimentary rocks forming hogbacks, ridges, and hills, the ranges of which trend in a general north-south direction, parallel to the uplifted Southern Rocky Mountains. Tertiary volcanic flows filled valleys in some areas. After extensive erosion, these more resistant volcanic rocks now form prominent mesas, such as North and South Table Mountains near Golden, Colorado, and Fishers Peak Mesa near the Colorado-New Mexico border. Stream erosion from the eastern front of the Southern Rocky Mountains fostered the creation of a sequence of large alluvial fan remnants, pediments, and terrace deposits in this MLRA.

The average annual precipitation is 12 to 25 inches (305 to 635 millimeters) in most of this area, but it ranges from 10 to 35 inches (255 to 890 millimeters), generally increasing with elevation. The highest precipitation occurs in the Laramie Mountains, in Wyoming, and the lowest precipitation occurs in the Arkansas River Valley, above Salida, Colorado. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Winter precipitation occurs as snow. The average annual temperature is 36 to 54 degrees F (2 to 12 degrees C). The freeze-free period averages 140 days and ranges from 90 to 195 days, decreasing in length with elevation and from south to north.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the Colorado and New Mexico portions of the MLRA dominantly have a frigid or mesic soil temperature regime. Those in the Wyoming portion have a frigid or cryic soil temperature regime. A few of the higher peaks and some north aspects have a cryic soil temperature regime. Most of the soils in the area have an ustic soil moisture regime, but those on the higher peaks and on some north aspects have a udic soil moisture regime. The soils in the area dominantly have smectitic or mixed mineralogy. They are very shallow to very deep and are dominantly well drained. The texture is dominantly loamy in soils that formed in material weathered from igneous and metamorphic rocks and is dominantly loamy or clayey in soils that formed in material weathered from sedimentary rocks. Some of the most extensive and representative great groups are Haplustolls (Baller series), Argiustolls (Nederland, Nunn, Santa Fe, and Enmedio series), Haplustalfs (Fort Collins, Stoneham, and Dargol series), Haplustepts (Stout series), Ustorthents (Lorencito and Saruche series), and Paleustolls (Flatirons series). (USDA-NRCS, 2006)

Classification relationships

NRCS:

Major Land Resource Area 49, Southern Rocky Mountain Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:

M331Ib – North Front Range; M331Ic – North Laramie Mountains; M331Id – South Laramie Mountains; and M331Ii – Northern Arkansas Granitics – 39 mile Mountain M331I – Northern Parks and Ranges M331I – Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331Fb – Wet Mountains; M331Fc – Wet Mountain Valley; M331Ff – Raton Basin; M331Fg – Sangre de Cristo Mountains Woodland; and M331Fh – Sangre de Cristo Mountains Coniferous Forest M331F – Southern Parks and Rocky Mountain Range M331I – Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

331If – Arkansas Valley Tablelands; 331Ig- Arkansas Valley High Tablelands; 331Ih – Black Forest; and 331Ii – Southern Front Range Foothills < 331I – Arkansas Tablelands < 331 Great Plains – Palouse Dry Steppe

331Ha – Southern Denver-Julesburg Basin; 331Hc – Eastern Central High Plains; 331He – Northern Front Range Foothills and 331Hf – Denver-Julesburg Basin < 331H – Central High Plains < 331 Great Plains – Palouse Dry Steppe

EPA:

21b – Crystalline Subalpine Forests, 21c – Crystalline Mid-Elevations Forests, 21d -Foothill Shrublands, 21e – Sedimentary Subalpine Forests, and 21f – Sedimentary Mid-Elevation Forests, 21j – Grassland Parks < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains North American Deserts (Griffith, 2006).

25c – Moderate Relief Plains, 25d – Flat to Rolling Plains, and 25l – Front Range Fans < 25 High Plains < 9.4 South Central Semi-Arid Prairies < 9 Great Plains (Griffith, 2006).

26e – Piedmont Plains and Tablelands, 26f- Mesa de Maya/Black Mesa, 26h- Pinyon-Juniper Woodlands and Savannas, 26i – Pine-Oak Woodlands, 26j – Foothills Grasslands, 26k – Sandsheets, and 26l – Upper Canadian Plateau < 26 Southwestern Tablelands < 9.4 South Central Semi-arid Prairies < 9 Great Plains (Griffith, 2006).

USGS:

Southern Rocky Mountain Province, Colorado Piedmont and Raton

Ecological site concept

R049XY031CO Sandy bottomland occurs on flood plains and stream terraces. Slopes is between 0 to 4 percent. Soils are greater than 60 inches in depth. Soils are derived from alluvium from arkose. Soil surface texture is loamy coarse sand. Family particle size is sandy. It is a Switchgrass– Sand Bluestem community. It has an typic ustic moisture regime. The effective precipitation ranges from 14 to 19 inches.

Associated sites

R049XY036CO	Overflow This site occurs on flood plains, terraces, valley floor and stream terraces. Slopes is between 0 to 9%. Soils are greater than 60 inches in depth. Soils are derived from slopes alluvium from sandstone and shale. Soil surface texture is loam or fine sandy loam. Family particle size is fine-loamy. It is a Western Wheatgrass– Green Needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 11 to 18 inches.
R049XY004CO	Loamy Plains This site occurs on hills, fans and terraces that are nearly level to gently rolling. Slopes is between 0 to 10%. Soils are greater than 60 inches in depth. Soils are derived from alluvium. Soil surface texture is clay loam. Family particle size is fine. It is a Blue Grama– Western Wheatgrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 14 to 16 inches.

Similar sites

R049XY036CO	Overflow This occurs on flood plains, terraces, valley floor and stream terraces. Slopes is between 0 to 9%. Soils are greater than 60 inches in depth. Soils are derived from slopes alluvium from sandstone and shale. Soil surface texture is loam or fine sandy loam. Family particle size is fine-loamy. It is a Western Wheatgrass– Green Needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 11 to 18 inches.
-------------	---

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Panicum virgatum</i> (2) <i>Andropogon hallii</i>

Physiographic features

Elevation ranges from 5,500 to 7,000 feet. Topography is nearly level to gently sloping. Surface may be smooth or there may be minor undulations. This site often occupies the first bench between the streambed and the higher sandy land. It may also be found in a few sandy valleys and drainageways where there is some effect from extra moisture.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace
Runoff class	Very low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	5,500–7,000 ft
Slope	0–4%

Climatic features

High intensity summer storms and hot dry periods between storms are common. The effect of the semi-arid climate is offset to some extent by occasional flooding. The average precipitation ranges from 14 to 19 inches with 75 to 80 percent falling from April to September. Optimum growing season of native plants is late spring and summer.

Table 3. Representative climatic features

Frost-free period (characteristic range)	107-118 days
Freeze-free period (characteristic range)	134-144 days
Precipitation total (characteristic range)	16-19 in
Frost-free period (actual range)	102-125 days
Freeze-free period (actual range)	132-147 days
Precipitation total (actual range)	14-19 in
Frost-free period (average)	113 days
Freeze-free period (average)	139 days
Precipitation total (average)	17 in

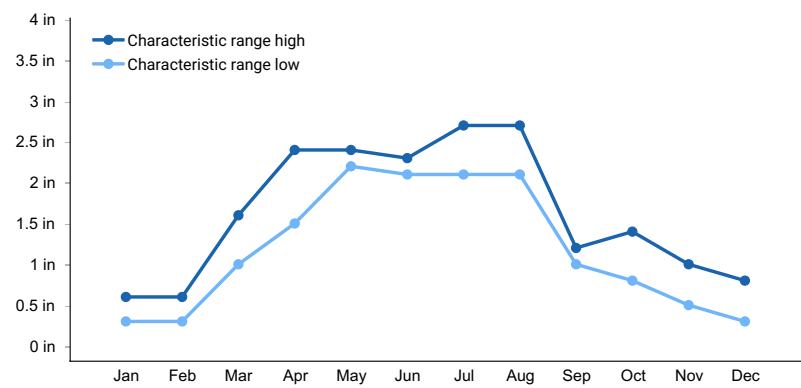


Figure 1. Monthly precipitation range

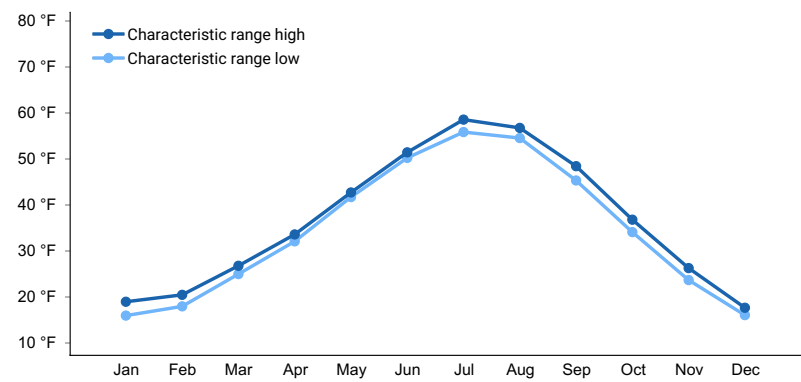


Figure 2. Monthly minimum temperature range

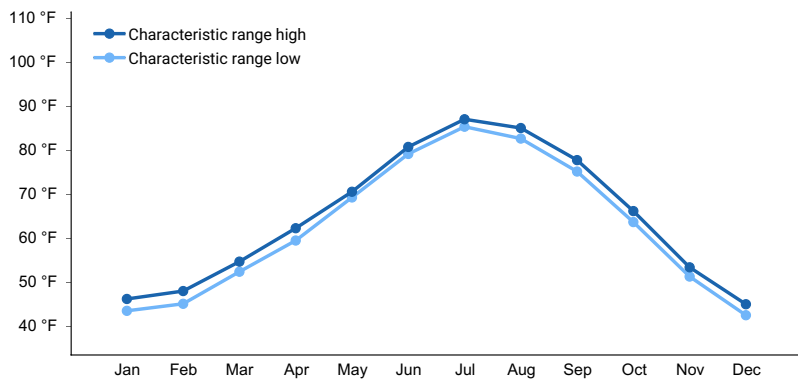


Figure 3. Monthly maximum temperature range

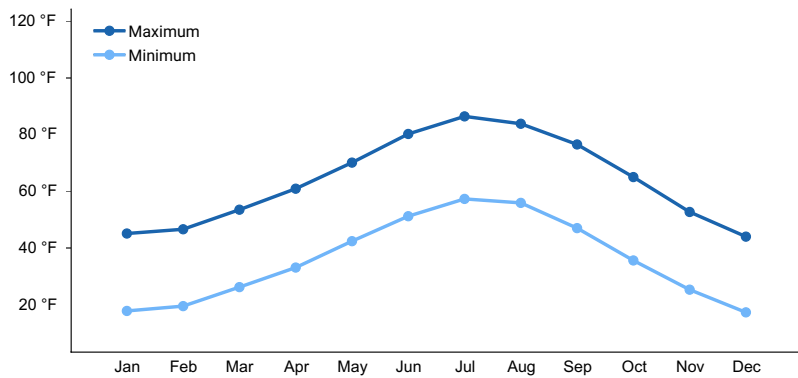


Figure 4. Monthly average minimum and maximum temperature

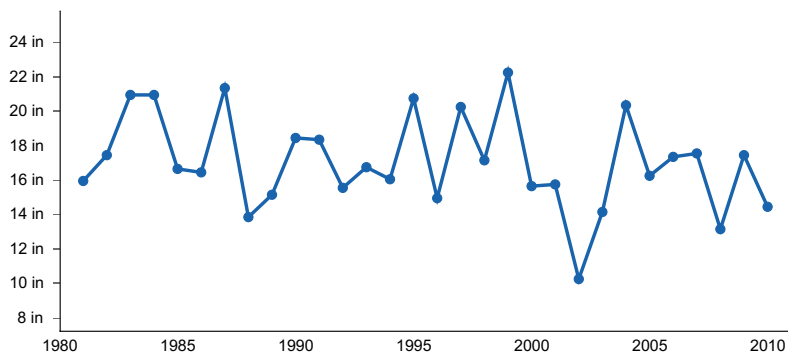


Figure 5. Annual precipitation pattern

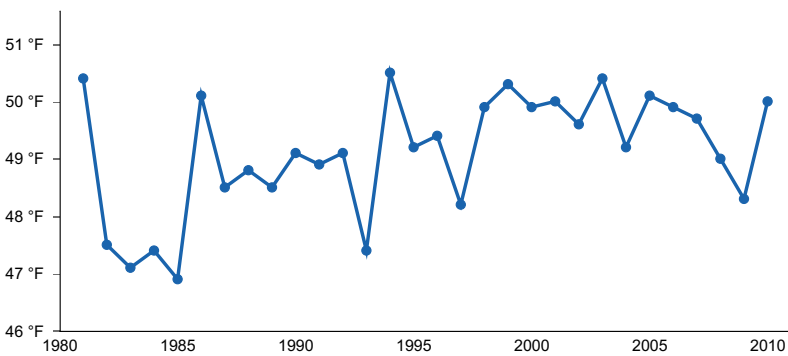


Figure 6. Annual average temperature pattern

Climate stations used

- (1) PARKER 6 E [USC00056326], Parker, CO
- (2) PARKER [USC00056323], Parker, CO
- (3) CASTLE ROCK [USC00051401], Castle Rock, CO

- (4) DENVER CENTENNIAL AP [USW00093067], Englewood, CO
- (5) KASSLER [USC00054452], Littleton, CO
- (6) RUSH 1N [USC00057287], Rush, CO
- (7) COLORADO SPRINGS MUNI AP [USW00093037], Colorado Springs, CO

Influencing water features

This site has no water table and it receives extra moisture as run-in from adjacent landscape positions. This typically happens in the months of March, April, May and June.

Soil features

These soils are usually deep or underlain by clean sand or gravel. The sandy textures with its faster intake, deeper penetration and more ready release of moisture than heavier soils, is the principal factor affecting plant growth. However, extra moisture allows significantly higher production than other sandy sites and offsets to some extent the moderate to low water holding capacity.

Soils typical of this site is: Ellicott

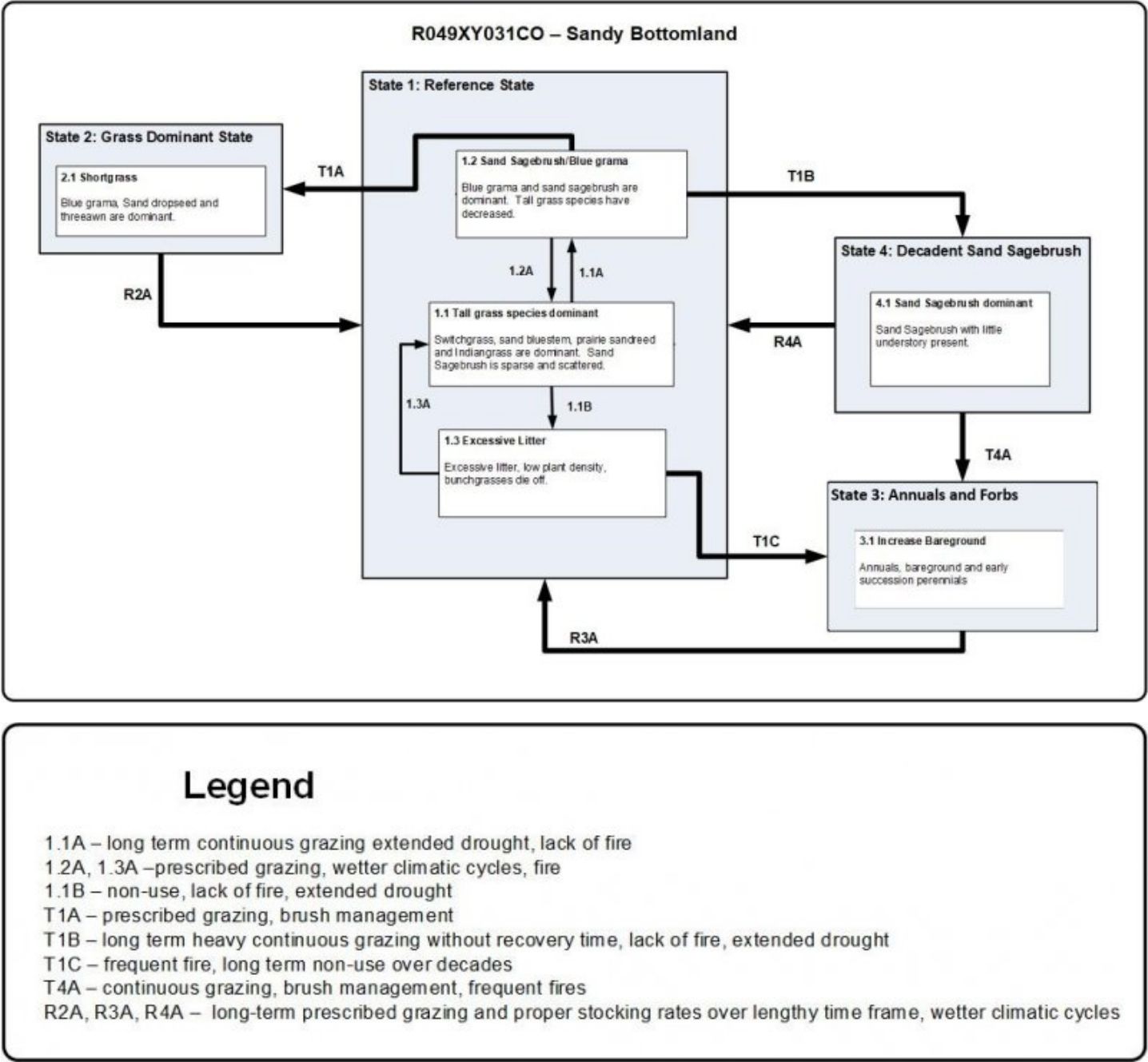
Table 4. Representative soil features

Parent material	(1) Alluvium—arkose
Surface texture	(1) Loamy coarse sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Rapid
Soil depth	60 in
Surface fragment cover <=3"	5–15%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	2–3.1 in
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–15%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The vegetation is a mixture of tall and mid-grasses with the tall grasses typical of slightly more moist locations predominating. The native plant community of plants and grasses that will immediately decrease as a result of ecological changes that take place or as a result of range deterioration will be: Indiangrass, switchgrass, sand bluestem and prairie sandreed. The mid-grasses may increase for a while but with serious deterioration of the range resource, these will be replaced by sand sagebrush, three-awn, and inland saltgrass. These plants with further deterioration, will be replaced with noxious forbs, low-producing perennials and annuals. Plants that are most likely to increase when the range deteriorates are: kochia, Russian thistle, tamarisk, and other annuals.

State and transition model



State 1
Reference State

Community 1.1
Reference Plant Community

The vegetation has a definite tall grass appearance, dominated by switchgrass, indiangrass, prairie sandreed, and sand bluestem, with smaller amounts of various midgrasses such as sideoats grama, little bluestem, needle-and-thread, and Canada wildrye are scattered throughout. Tall dropseed, sand dropseed, sedges, inland saltgrass, perennial forbs, and western wheatgrass may make up about 20% of the vegetative composition. The ground cover is about 40%. Litter is abundant in and between the plants with several inches of the topsoil darkened by organic matter.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	720	1080	1350
Forb	80	120	150
Total	800	1200	1500

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				800–1300	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	240–360	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	120–240	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	84–180	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	60–180	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	36–72	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	36–72	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	36–72	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	36–72	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	16–48	–
	saltgrass	DISP	<i>Distichlis spicata</i>	16–48	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	16–48	–
	sedge	CAREX	<i>Carex</i>	16–48	–
	Grass, native	2GN	<i>Grass, native</i>	16–48	–
Forb					
2				50–150	
	Forb, native	2FN	<i>Forb, native</i>	16–72	–
	common starlily	LEMO4	<i>Leucocrinum montanum</i>	0–16	–
	meadow deathcamas	ZIVE	<i>Zigadenus venenosus</i>	0–16	–
	broadbeard beardtongue	PEAN4	<i>Penstemon angustifolius</i>	0–16	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0–16	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–16	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–16	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–16	–
	purple prairie clover	DAPUP	<i>Dalea purpurea</i> var. <i>purpurea</i>	0–16	–
	stiff sunflower	HEPAP2	<i>Helianthus pauciflorus</i> ssp. <i>pauciflorus</i>	0–16	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–16	–

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.

Inventory data references

Located in Elbert County.

Other references

Chapman, S.S., G.E. Griffith, J.M. Omernik, A.B. Price, J. Freeouf, and D.L. Schrupp. 2006. Ecoregions of Colorado. (2-sided color poster with map, descriptive text, summary tables, and photographs). U.S. Geological Survey, Reston, VA. Scale 1:1,200,000.

Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington, DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored.

Soil Conservation Service (SCS). August 1975. Range Site Description for Sandy Bottomland #031. : USDA, Denver Colorado.

United States Department 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. U.S. Department of Agriculture Handbook 296.

Contributors

Ben Berlinger
Suzanne Mayne-Kinney

Approval

Kirt Walstad, 9/07/2023

Acknowledgments

Project Staff:

Suzanne Mayne-Kinney, Ecological Site Specialist, NRCS MLRA, Grand Junction SSO

Chris Fabian, MLRA Soil Survey Leader, NRCS MLRA Fort Collins SSO

Alan Stuebe, MLRA Soil Survey Leader, NRCS MLRA Alamosa SSO

Program Support:

Ben Berlinger, Retired CO Rangeland Management Specialist, Rocky Ford

Rachel Murph, NRCS CO State Rangeland Management Specialist, Denver

Scott Woodhall, NRCS MLRA Ecological Site Specialist-QA Phoenix, AZ

Eva Muller, Regional Director, Rocky Mountain Regional Soil Survey Office, Bozeman, MT

B.J. Shoup, CO State Soil Scientist, Denver

Eugene Backhaus, CO State Resource Conservationist, Denver

--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data are required to refine the Plant Production and Annual Production tables for this

ecological site. The extent of MLRA 49 must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

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)	
Contact for lead author	
Date	05/11/2025
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**
-
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:
- Sub-dominant:
- Other:
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
-
14. **Average percent litter cover (%) and depth (in):**
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
-
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:**
-
17. **Perennial plant reproductive capability:**
-