

# **Ecological site R049XY004CO**

## **Loamy Plains**

Last updated: 4/09/2025

Accessed: 04/04/2026

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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): 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 M331 - 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 M331 - 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

R049XY004CO Loamy Plains 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.

## Associated sites

R049XY036CO	<p><b>Overflow</b></p> <p>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.</p>
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## Similar sites

R049XY214CO	<p><b>Gravelly Foothill</b></p> <p>This site occurs on gently rolling and sloping uplands. Slopes is between 0 to 35%. Soils are deep and greater than 60 inches in depth. Soils are derived from slopes alluvium, alluvium and colluvium from arkose or igneous and metamorphic rocks. Soil surface texture is gravelly, sandy loam, cobbly sandy loam, gravelly loam or very gravelly loam. Family particle size is sandy-skeletal, loamy-skeletal or fine-loamy over sandy-skeletal. It is a Little Bluestem – Needle-and-Thread community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.</p>
R049XB208CO	<p><b>Clayey Foothill</b></p> <p>This site occurs on undulating hills to gently sloping uplands. Slopes is between 0 to 15%. Soils are moderately deep to deep (20 to 60 inches). Soils are derived from alluvium from basalt, and/or calcareous shale; or residuum from clayey shale, sandstone, calcareous shale and/or shale. Soil surface texture is clay loam or silty clay loam and it may or may not have cobbles, stone, or gravels (up to 15%). Family particle size is fine. It is a Western Wheatgrass – Green Needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 17 inches.</p>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Bouteloua gracilis</i> (2) <i>Pascopyrum smithii</i>

## Physiographic features

Topography is nearly level to gently rolling. Slopes are not oriented in any definable direction and are generally less than ten percent but may go slightly steeper. Elevation ranges from 5200 to 6000 ft (1585 to 1829 m).

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Fan (3) Terrace
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,585–1,829 m
Slope	0–10%
Aspect	Aspect is not a significant factor

## Climatic features

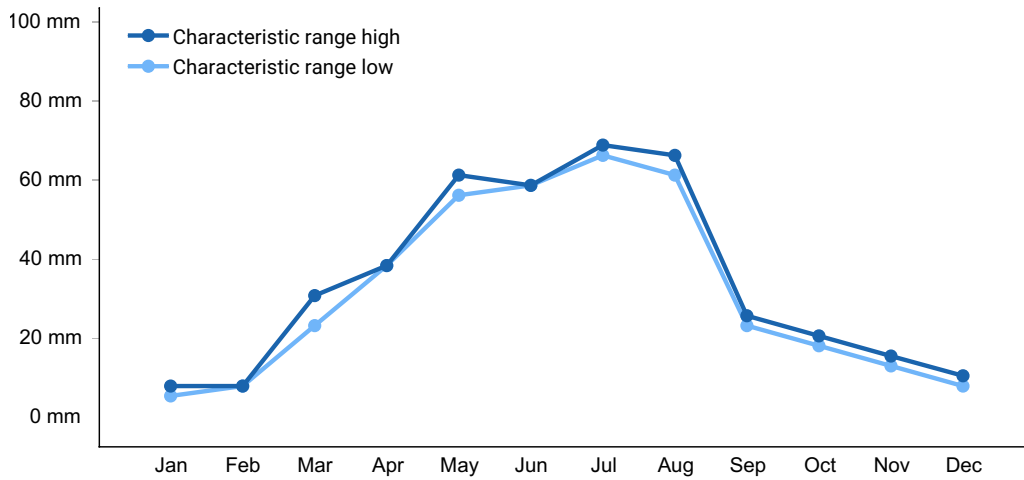
Precipitation averages 14 to 16 inches (36 to 41 cm) annually, with 25 to 50% of it coming as snow or early spring rains. Amount of snowfall averages 54 inches (137 cm).

Optimum growing season of native plants is April 15 to May for cool season plants and May for warm season plants. High intensity summer storms followed by hot dry windy periods are a common occurrence. The average annual temperature is 52 degrees F (11 degrees C) with highest temperatures occurring during June, July and August. Length of growing season is 159-181 days with average frost dates occurring May 9 and October 8. There are 27 days that exceed 90 degrees F (32 degrees C) and 140 days that are below 32 degrees F (0 degrees C).

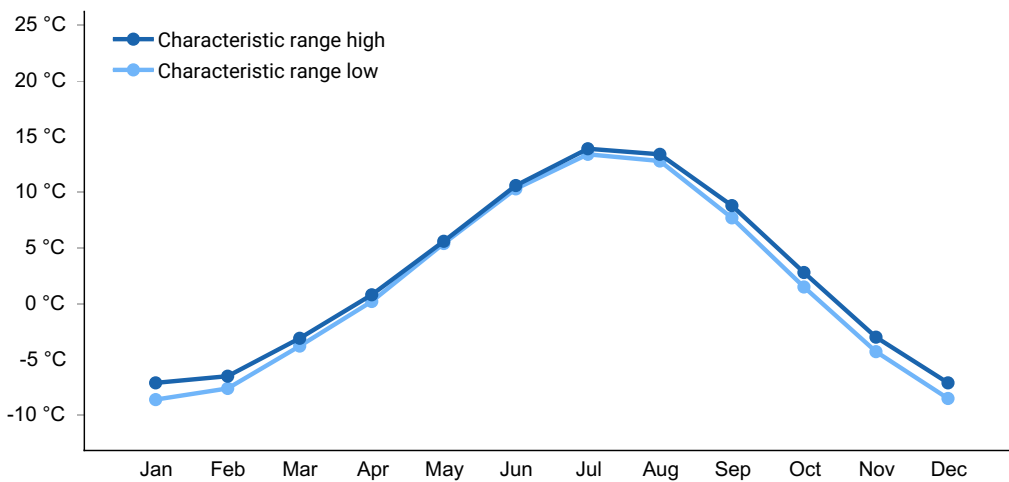
**Table 3. Representative climatic features**

Frost-free period (characteristic range)	108-112 days
Freeze-free period (characteristic range)	134-136 days
Precipitation total (characteristic range)	381-406 mm
Frost-free period (actual range)	107-159 days
Freeze-free period (actual range)	134-181 days
Precipitation total (actual range)	356-406 mm
Frost-free period (average)	110 days

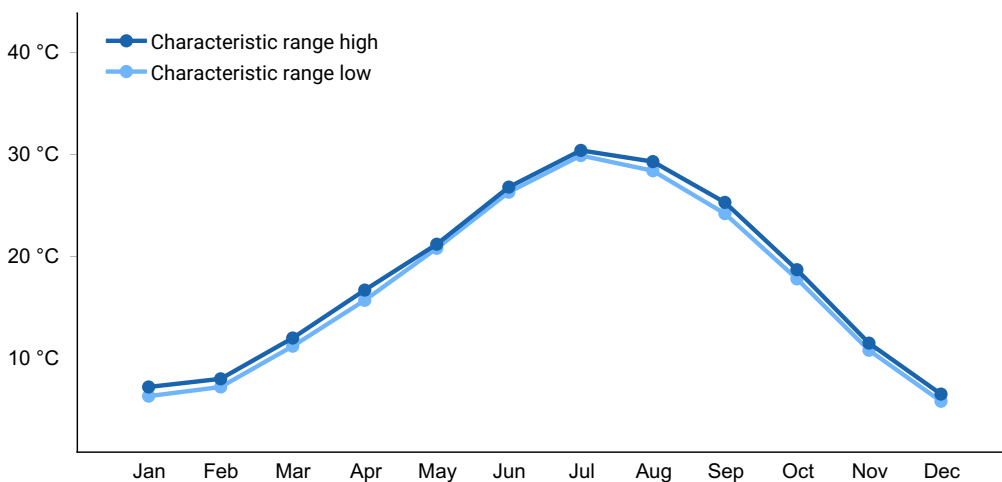
Freeze-free period (average)	135 days
Precipitation total (average)	381 mm



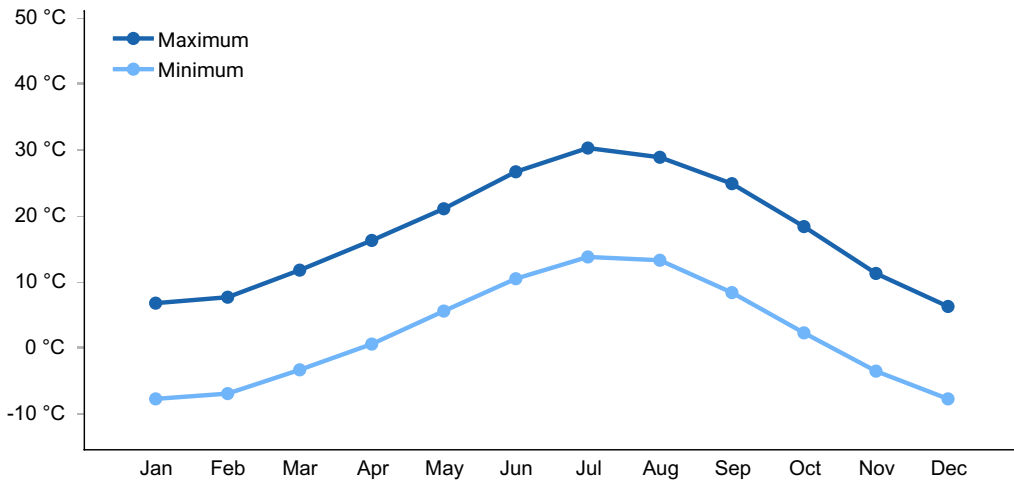
**Figure 1. Monthly precipitation range**



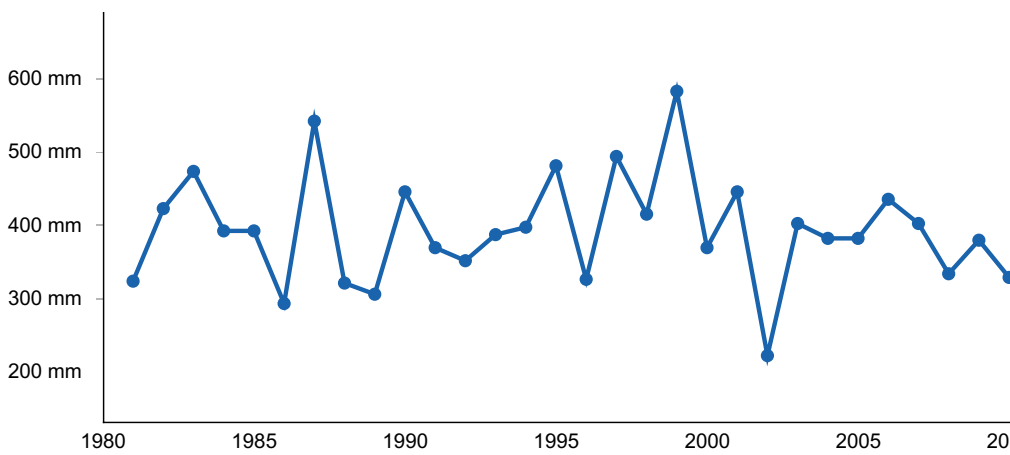
**Figure 2. Monthly minimum temperature range**



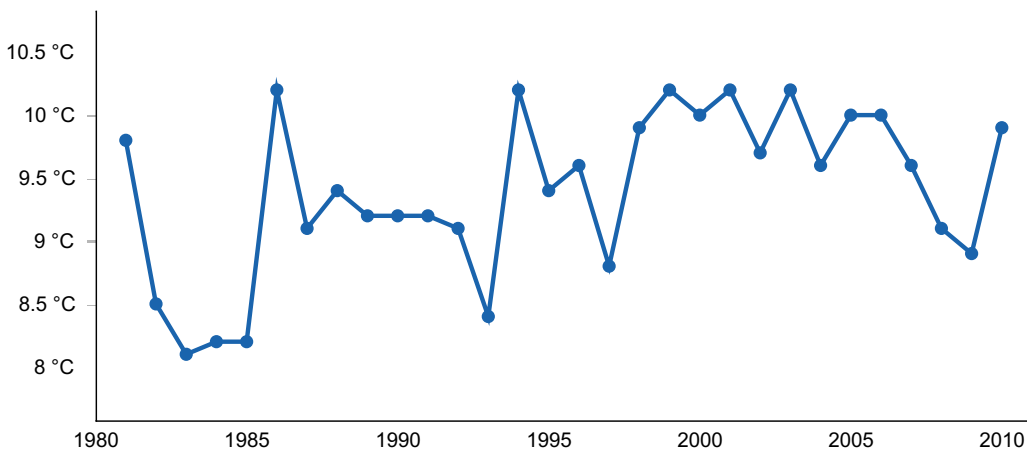
**Figure 3. Monthly maximum temperature range**



**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) RUSH 1N [USC00057287], Rush, CO

## Influencing water features

None

## Soil features

The soils of this site are deep, well drained and occur on uplands. The surface soils are clay loam. Permeability is slow with a high available water capacity. Soils are better than 60 inches (1.5 m) deep. The parent material is calcareous clayey alluvium.

Major soils associated with this site are:

Manzanola Clay Loam 3-9%

**Table 4. Representative soil features**

Parent material	(1) Alluvium
Surface texture	(1) Clay loam
Family particle size	(1) Fine
Drainage class	Well drained
Permeability class	Slow
Soil depth	152–305 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	14.48–19.81 cm
Calcium carbonate equivalent (Depth not specified)	1–5%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume ≤3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

If ecological regression is cattle induced, grasses such as western wheatgrass, sideoats grama, New Mexico feathergrass, needleandthread and Indian ricegrass will disappear from the plant community. Galleta, blue grama will increase. If regression is sheep induced heath aster, scarlet globemallow, fourwing saltbush, fringed sagebrush, winterfat, green plume rabbitbrush would be reduced. With further deterioration of this site, galleta and blue grama will disappear and will be replaced by ring muhly, sand dropseed and red threeawn. These grasses with continued destructive grazing practices will be invaded with little barley, tumblegrass, cheatgrass, and hairy tridens. The brush species that increase as range conditions deteriorate are broom snakeweed, fringed sagebrush, walkingstick cholla, plains pricklypear, curlycup gumweed. Matrimonyvine is an introduced species that occurs in swales where extra water is available from runoff of adjacent terrain.

Annual Production:

Favorable years 1600 lbs/ac 1814 kg/ha

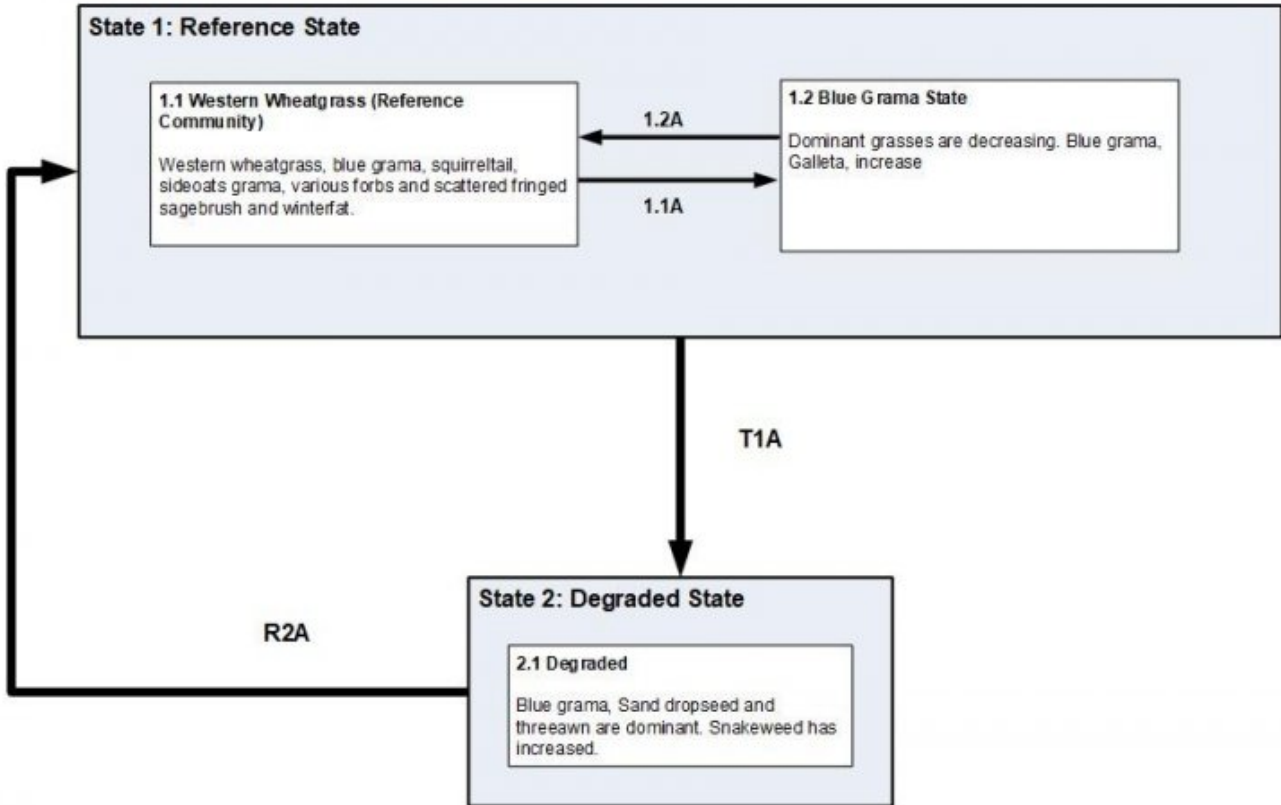
Normal years 1200 lbs/ac 1360 kg/ha

Unfavorable years 600 lbs/ac 680 kg/ha

Of this production 0 to 5% will likely be unpalatable to livestock.

## **State and transition model**

## R049XY004CO – Loamy Plains



## Legend

- 1.1A – Moderate to heavy continuous grazing without adequate recovery, extended drought, lack of fire
- 1.2A – proper grazing with proper stocking rates, wetter climatic cycles, fire
- T1A – continuous grazing and/or high stocking rates without adequate recovery time
- R2A – long-term prescribed grazing and proper stocking rates over lengthy time frame, wetter climatic cycles

## State 1 Reference

The plant community is about 90-95% grasses, 5 to 10% forbs and 5 to 10% shrubs. Blue grama, western wheatgrass, bottlebrush squirreltail, galleta, Junegrass and sideoats grama, make up most of the plant community which total 60 to 80%. Grasses such as buffalograss, threeawn, New Mexico needlegrass, wolftail, needleandthread, sand dropseed and shrubs such as winterfat and fringed sage are secondary in the community. Small amounts of ring muhly, plains pricklypear, Missouri ball cactus, slimflower scurfpea,

heath aster, dotted gayfeather, silky sophora, silver bluestem, scarlet globemallow, curlycup gumweed, ironplant goldenweed, upright prairieclover, and wavyleaf thistle grow in small amounts in scattered distribution. Other shrubs such as small soapweed, green plume rabbitbrush, walkingstick cholla, broom snakeweed, and fourwing saltbush, occur in the community. An occasional oneseed juniper may occupy this site is adjacent to a break site.

## Community 1.1 Reference State

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	605	1211	1614
Forb	34	67	90
Shrub/Vine	34	67	90
<b>Total</b>	<b>673</b>	<b>1345</b>	<b>1794</b>

## Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Grasses and Grasslike Plants</b>			605–1704	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	538–605	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	471–605	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	67–135	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	67–135	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	11–67	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	11–67	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	11–67	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	11–67	–
	ring muhly	MUTO2	<i>Muhlenbergia torreyi</i>	0–27	–
	silver bluestem	BOSA	<i>Bothriochloa saccharoides</i>	0–27	–

	common wolfstail	LYPH	<i>Lycurus phleoides</i>	0–11	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–11	–
<b>Forb</b>					
2	<b>Forbs</b>			34–179	
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	11–67	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	11–27	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	11–27	–
	lacy tansyaster	MAPIP4	<i>Machaeranthera pinnatifida</i> ssp. <i>pinnatifida</i> var. <i>pinnatifida</i>	11–27	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–11	–
	narrowleaf milkvetch	ASPE5	<i>Astragalus pectinatus</i>	0–11	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–11	–
	silky sophora	SONU	<i>Sophora nuttalliana</i>	0–11	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			34–179	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	27–67	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	27–67	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–54	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	11–39	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–27	–
	Missouri foxtail cactus	ESMI3	<i>Escobaria missouriensis</i>	0–11	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	–

## Animal community

Grazing:

This site provides excellent forage for cattle and horses at any time during the year but is

especially good during the growing season. It also provides good forage for sheep and antelope and small mammals.

The animal forage preference changes as the growing season progresses. Western wheatgrass is very nutritious during the early spring. It is important that planned deferment and rotation be scheduled so western wheatgrass is not grazed out and replaced by less desirable plants. Other grasses that need spring deferment are the needle grasses, Indian ricegrass and bottlebrush squirreltail.

The warm season grasses such as blue grama and sideoats grama will be benefitted by deferment from grazing during the late spring and early summer months and maintain their nutritious value well after maturing and therefore make excellent winter forage.

Vegetative palatability will influence proper use considerations. The season of use, kind of grazing animal, past grazing use and the plant composition will directly influence the animal preference and performance.

#### Wildlife:

This site has a fair potential for wildlife habitat. It supports a good population of antelope and jackrabbit.

#### Threatened and Endangered Plants and Animals:

Blackfooted Ferret

Peregrine Falcon

#### Major Poisonous Plants to Livestock:

##### Common Name - Scientific Name - Dangerous Season - Animals Affected

threadleaf groundsel - *Senecio longilobus* - early spring when forage is short or on overgrazed ranges - cattle & horses. Normally will not affect sheep.

Effects Upon Animals - Symptoms are progressive and effects are cumulative ("Cumulative" poisoning effect increases in severity by successive additions of the poisonous plant. Symptoms appear weeks or months after poisonous plants are first eaten). Losses are sporadic. Degeneration of the liver results. Depression, weakness, diarrhea, darkly stained urine may be observed. Animals may die quickly or wander aimlessly.

broom snakeweed - *Gutierrezia sarothrae* - when forage is scarce - cattle & sheep

Effect Upon Animals - Poisoning is not common but will occur on overgrazed ranges. Causes abortion in cattle or may produce weak underweight calves. Losses are sporadic and will occur when 10 to 20% of the body weight of green material is consumed in 1/2 to 20 weeks.

Other plants that may cause poisoning but are not usually eaten are silky sophora which the seeds contain poisonous alkaloids and matrimonyvine which contains an alkaloid like hyoscyamine.

Narrowleaf poison vetch - *Astragalus pectinatus* - early in spring when forage is scarce - cattle

Effect Upon Animal - Poisoning is associated with selenium poisoning. When plants are crushed in the hand, a sulfurous odor is given off. Poisoning can cause alkali disease (the chronic disease) which develops from eating small amounts of selenium bearing vegetation over an extensive period of time or poisoning can cause blind staggers (the acute disease) which results from feeding on relatively large amounts of selenium in a short time. In acute cases of selenium poisoning, animals walk aimlessly into objects. "Blind staggers" or alkali disease are names given for the disease. Hoofs grow abnormally with the formation of deep rings. The hair falls out--especially the mane and tail of horses. Recovery of animals affected may take several months or years, even after being placed on good forage.

## **Hydrological functions**

Soils in this site are grouped into "B" and "C" hydrologic groups, as outlined in the "Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings 1979" handbook. Field investigations are needed to determine hydrological cover conditions and hydrologic curve numbers. The hydrologic curve number for group B soils are about 61 and group C is about 74, when the hydrologic conditions are good, as shown in "Peak Flows in Colorado" handbook.

Refer to NRCS National Engineering Handbook, Section 4, to determine runoff quantities from the curves.

## **Recreational uses**

This site has fair to poor aesthetic appeal and natural beauty. During exceptional rainfall years, a profusion of flowering plants appear.

## **Inventory data references**

Location of Typical Example of This Site:

- a. Charles Strasia Ranch, Trinchera
- b. Chase Ranch, Rattlesnake Butte
- c. Siloam West of Pueblo, Colorado

Field Offices in Colorado Where the Site Occurs:  
Pueblo, Springfield, Trinidad and Walsenburg

## **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). July 1981. Range Site Description for Loamy Plainsl #004. : 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**

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## **Acknowledgments**

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--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	04/09/2025
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

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

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

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

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

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

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

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

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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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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):**

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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:

Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are**

expected to show mortality or decadence):

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14. **Average percent litter cover (%) and depth ( in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**

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