

## Ecological site R048AY316CO Dry Mountain Outwash

Last updated: 3/05/2024  
Accessed: 05/17/2024

---

### 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): 048A–Southern Rocky Mountains

MLRA 48A makes up about 45,920 square miles (119,000 square kilometers) and is the southern part of the Rocky Mountains. The Southern Rocky Mountains lies east of the Colorado Plateau, south of the Wyoming Basin, west of the Great Plains, and north of the Rio Grande Rift. It is in western and central Colorado, southeastern Wyoming, eastern Utah, and northern New Mexico. The headwaters of major rivers such as the Colorado, Yampa, Arkansas, Rio Grande, North Platte and South Plate rivers are located here. This MLRA has numerous national forests, including the Medicine Bow National Forest in Wyoming; the Routt, Arapaho, Roosevelt, Pike, San Isabel, White River, Gunnison, Grand Mesa, Uncompahgre, Rio Grande, and San Juan National Forests in Colorado; the Carson National Forest and part of the Santa Fe National Forest in New Mexico. Rocky Mountain National Park also is in this MLRA.

MLRA 48A is the southern Rocky Mountains physiographic region. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. It is characterized by mountain ranges that were uplifted during the Laramide Orogeny and then had periods of glaciation. The ranges include the Sangre de Cristo Mountains, the Laramie Mountains, and the Front Range in the east and the San Juan Mountains and the Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and glaciers. Elevation typically ranges from 6,500 to 14,400 feet (1,980 to 4,390 meters) in this area. The part of this MLRA in central Colorado includes the highest point in the Rockies, Mount Elbert, which reaches an elevation of 14,433 feet (4,400 meters). More than 50 peaks in the part of the MLRA in Colorado are at an elevation of more than 14,000 feet (4,270 meters). Many small glacial lakes are in the high mountains.

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. This large MLRA can be subdivided into at least 4 large general divisions. First is the Rockies on the east side of this area are called the "Front Range," which is a fault block that has been tilted up on edge and uplifted and is largely igneous and metamorphic geology. It was tilted up on the east edge, so there is a steep front on the east and the west side is more gently sloping and in the south east there are rocks exposed in the mountains are mostly Precambrian igneous and metamorphic rocks. Second is the tertiary rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area (San Juan Mountains Area). The third division is Northwest part of the MLRA is dominantly sedimentary rock from the cretaceous/tertiary and Permian/Pennsylvanian periods. The fourth subset is the long and narrow Sangre de Cristos mountains uplifted in the Cenozoic are between the Rio Grande rift and the great plains. Many of the highest mountain ranges were reshaped by glaciation during the Pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are important sources of sand and gravel.

The average annual precipitation ranges predominantly from 12 to 63 inches. Summer rainfall commonly occurs as high-intensity, convective thunderstorms. About half of the annual precipitation occurs as snow in winter; this proportion increases with elevation. In the mountains, deep snowpacks accumulate throughout the winter and

generally persist into spring or early summer, depending on elevation. Some permanent snowfields and small glaciers are on the highest mountain peaks. In the valleys at the lower elevations, snowfall is lighter and snowpacks can be intermittent. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The freeze-free period averages 135 days and ranges from 45 to 230 days, decreasing in length with elevation. The climate of this area is strongly dependent upon elevation; precipitation is greater, and temperatures are cooler at the higher elevations. The plant communities vary with elevation, aspect and change in latitudes due to changing in precipitation kind and timing and temperature.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the area dominantly have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. Mineralogy is typically mixed, smectitic, or paramicaceous. In areas with granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on mountain slopes. Dystrocryepts (Leighcan and Mummy series) formed on mountain slopes and summits at the higher elevations. In areas of andesite and rhyolite bedrock, Dystrocryepts (Endlich and Whitecross series) formed in colluvium on mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on mountain slopes at low elevations and with low precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in colluvium on mountain slopes at high elevations.

### **Classification relationships**

#### **NRCS:**

Major Land Resource Area 48A, Southern Rocky Mountains (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

#### **USFS:**

M331F- Southern Parks and Rocky Mountain Range Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331G – South Central Highlands Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331H – North Central Highlands and Rocky Mountains Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331I – North Parks and Ranges Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M341B – Tavaputs Plateau Section M341 Nevada-Utah Mountains Semi-Desert - Coniferous Forest - Alpine Meadow (Cleland, et al., 2007).

#### **EPA:**

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

20c – Semiarid Benchlands and Canyonlands and 20e - Escarpements < 20 Colorado Plateau < 10.1 Cold Deserts < 10 North American Deserts (Griffith, 2006).

USGS: Southern Rocky Mountain Province and the southern part of Unita Basin Section Colorado Plateaus Province

### **Ecological site concept**

Dry Mountain Outwash occurs on fan terraces and alluvial fans. Slopes are between 1 to 45 percent. Soils are deep (60+ inches). Soils are derived from alluvium or outwash. Soil surface texture is gravelly sandy loam with sandy-skeletal textured subsurface. It is a prairie junegrass – pine needlegrass community. It has an aridic ustic moisture

regime and frigid temperature regime. The effective precipitation ranges from 12 to 16 inches.

## Associated sites

R048AY272CO	<p><b>Sandy Bench</b> Sandy Bench occurs on alluvial fans, fan terrace and stream terrace. Slopes is between 0 to 10%. Soils are deep (60+ inches) in depth. Soils are derived from alluvium. Soil surface texture is sandy loam, gravelly sandy loam or gravelly loam with a coarse-loamy subsurface. It is a Wyoming big sagebrush – pine needlegrass community. It has an ustic aridic moisture regime and a frigid temperature regime. The effective precipitation ranges from 9 to 12 inches.</p>
-------------	--

## Similar sites

R048AY287CO	<p><b>Stony Foothills</b> Stony Foothills occurs on mountains, escarpments and hills. Slopes is between 3 to 30%. Soils are moderately deep to deep (20 to 60+ inches). Soils are derived from alluvium, residuum or colluvium from sandstone and shale or alluvium from basalt. Soil surface texture is gravelly, stony, or very stony sandy loam or very cobbly loam with loamy-skeletal textured subsurface. It is a Wyoming Big Sagebrush – western wheatgrass community. It has a aridic ustic moisture regime and frigid temperature regime. The effective precipitation ranges from 12 to 16 inches.</p>
R048AY311CO	<p><b>Mountain Outwash</b> R048AY311CO Mountain Outwash occurs on fan terraces, alluvial fans, and glacial moraines. Slopes are between 3 to 45%. Soils are deep (60+ inches). Soils are derived from alluvium that is coarse-textured and stony or cobbly. Soil surface texture is gravelly sandy loam or cobbly sandy loam with sandy-skeletal textured subsurface. It is an Arizona Fescue – mountain muhly community. It has a typic ustic moisture regime and frigid temperature regime. The effective precipitation ranges from 16 to 20 inches.</p>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Koeleria macrantha</i> (2) <i>Achnatherum pinetorum</i>

## Physiographic features

This range site occurs as nearly level to steep alluvial fans and terraces of built-up glacial fill materials. Slopes vary from 1 to 45 percent. The elevation is principally between 7000 and 9000 feet.

**Table 2. Representative physiographic features**

Landforms	(1) Fan terrace (2) Alluvial fan
Runoff class	Very low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	2,134–2,743 m
Slope	1–45%
Aspect	Aspect is not a significant factor

## Climatic features

Average annual precipitation is about 12 to 16 inches. Of this, approximately 45-55% falls as snow, and 45-55% falls as rain between middle of May to and the end of September. Summer moisture is mostly from thundershowers in July thru October. November to February and June is the driest period of the year with the driest month being June. August to October and March to April is the wettest period and the wettest month is usually April. The average

annual total snowfall is 64.8 inches. The snow depth usually ranges from 1 to 5 inches during October thru April. The highest winter snowfall record in this area is 131.9 inches which occurred in 1908-1909. The lowest snowfall record is 11.9 inches during the 1944-1945 winter. The frost-free period typically ranges from 90 to 130 days. The last spring frost is typically the middle of May to the second week of June. The first fall frost is usually the middle of September to the end of September. Mean daily annual air temperature ranges from about 30.7°F to 64.8°F, averaging about 25°F for the winter and 66°F in the summer. Summer high temperatures of mid-80°F to low 80°F are not unusual. The coldest winter temperature recorded was -36°F on February 8, 1933 and the warmest winter temperature recorded was 66°F on February 11, 1962. The coldest summer temperature recorded was 24°F on June 19, 1973 and the warmest was 100°F on August 2, 1902. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2018) for Collbran, Colorado Climate Station.

This zone in MLRA 48 will need to be broken up into at multiple land resources zones in future projects based on current knowledge of precipitation and temperature patterns.

West Central Zone Stations: Collbran, Basalt, and Cedaredge. This LRU zone is use in write up above. November to February and June is the driest period of the year with the driest month being June. August to October and March to April is the wettest period and the wettest month is usually April. Frigid

Northwest Zone Climate Stations: Meeker#2. Driest months usually are January and February. Wettest months usually are August and September. Frigid.

Southwest Zone Climate Stations (Precambrian sedimentary and igneous): There are no climate stations in this LRU zone.

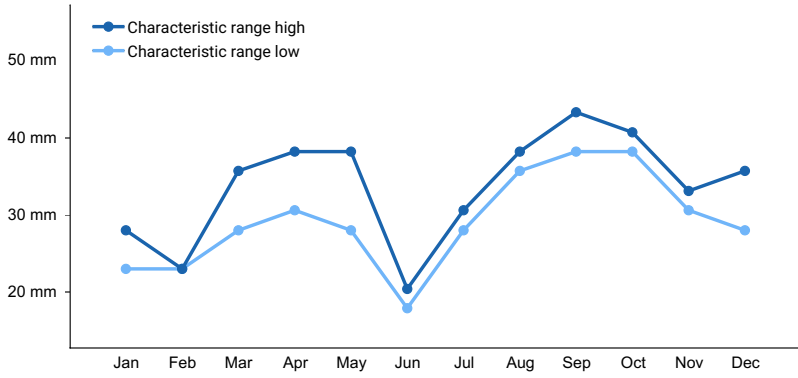
Southwest Volcanics: Lake City, Creede, and Hermit 7 ESE. These high elevation and low precipitation areas are cryic with shorter growing season days of 20 to 70 days per year. Wettest months are August and July. Driest months are December thru February.

Northeast (Front Range Igneous and Metamorphic): Grant, Estes park, Hohnholz Ranch, Leadville and Leadville 2 SW. July and August are the wettest months. January is the driest month. The climate stations is this zone are cryic. The growing seasons is 50 to 90 days.

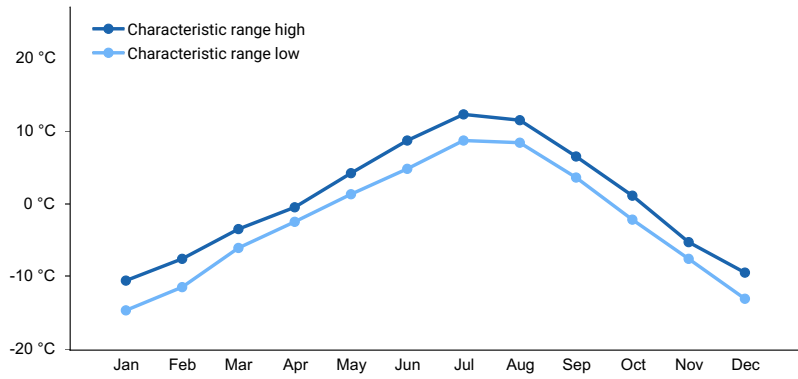
Southeast (Sangre de Cristo Mtns): Westcliffe. Red Wing 1 WSW and Sheep Mountain. The growing season is 90 to 140 days. Driest months are December to February and the wettest are July & August. Frigid.

**Table 3. Representative climatic features**

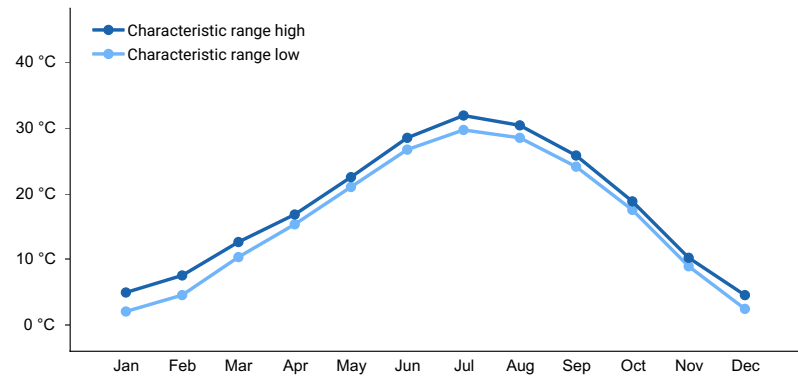
Frost-free period (characteristic range)	60-93 days
Freeze-free period (characteristic range)	101-135 days
Precipitation total (characteristic range)	356-381 mm
Frost-free period (actual range)	46-96 days
Freeze-free period (actual range)	91-142 days
Precipitation total (actual range)	356-406 mm
Frost-free period (average)	75 days
Freeze-free period (average)	118 days
Precipitation total (average)	381 mm



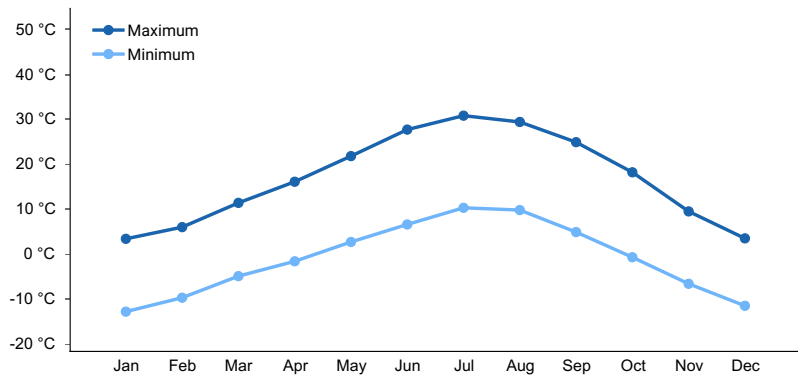
**Figure 1. Monthly precipitation range**



**Figure 2. Monthly minimum temperature range**



**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**

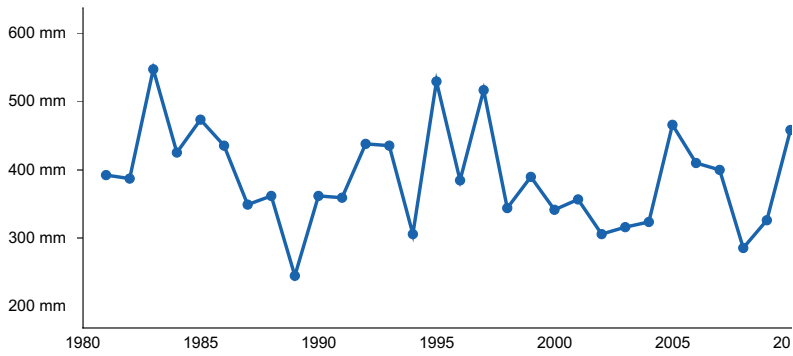


Figure 5. Annual precipitation pattern

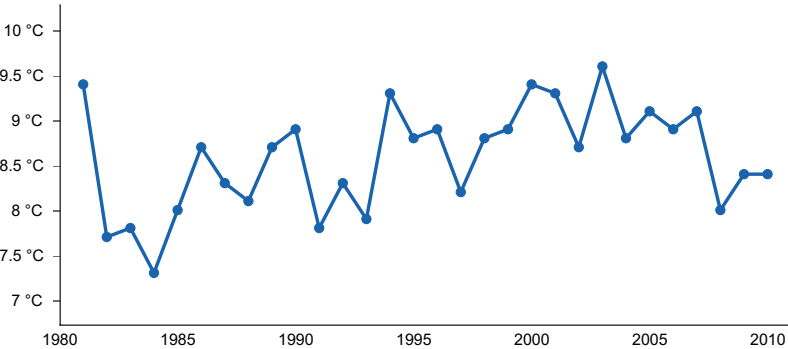


Figure 6. Annual average temperature pattern

### Climate stations used

- (1) CEDAREGE [USC00051440], Cedaredge, CO
- (2) COLLBRAN [USC00051741], Collbran, CO
- (3) CIMARRON [USC00051609], Cimarron, CO

### Influencing water features

None

### Soil features

These are excessively drained soils on alluvial fans and terraces. They consist mostly of medium to coarse textured gravelly and cobbly sandy loams. The soils are deep and skeletal. Permeability in these soils is rapid and the available water storage capacity is low. Soil moisture is readily available for use by the plants. Surface runoff on the steeper slopes is rapid and erosion hazard is severe.

Soils associated with this site:

Dominson gravelly sandy loam

St Elmo gravelly sandy loam

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Outwash
Surface texture	(1) Gravelly sandy loam
Family particle size	(1) Sandy-skeletal
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid

Soil depth	152 cm
Surface fragment cover <=3"	20–30%
Surface fragment cover >3"	5–10%
Available water capacity (Depth not specified)	3.81–6.1 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	30–40%
Subsurface fragment volume >3" (Depth not specified)	10–20%

## Ecological dynamics

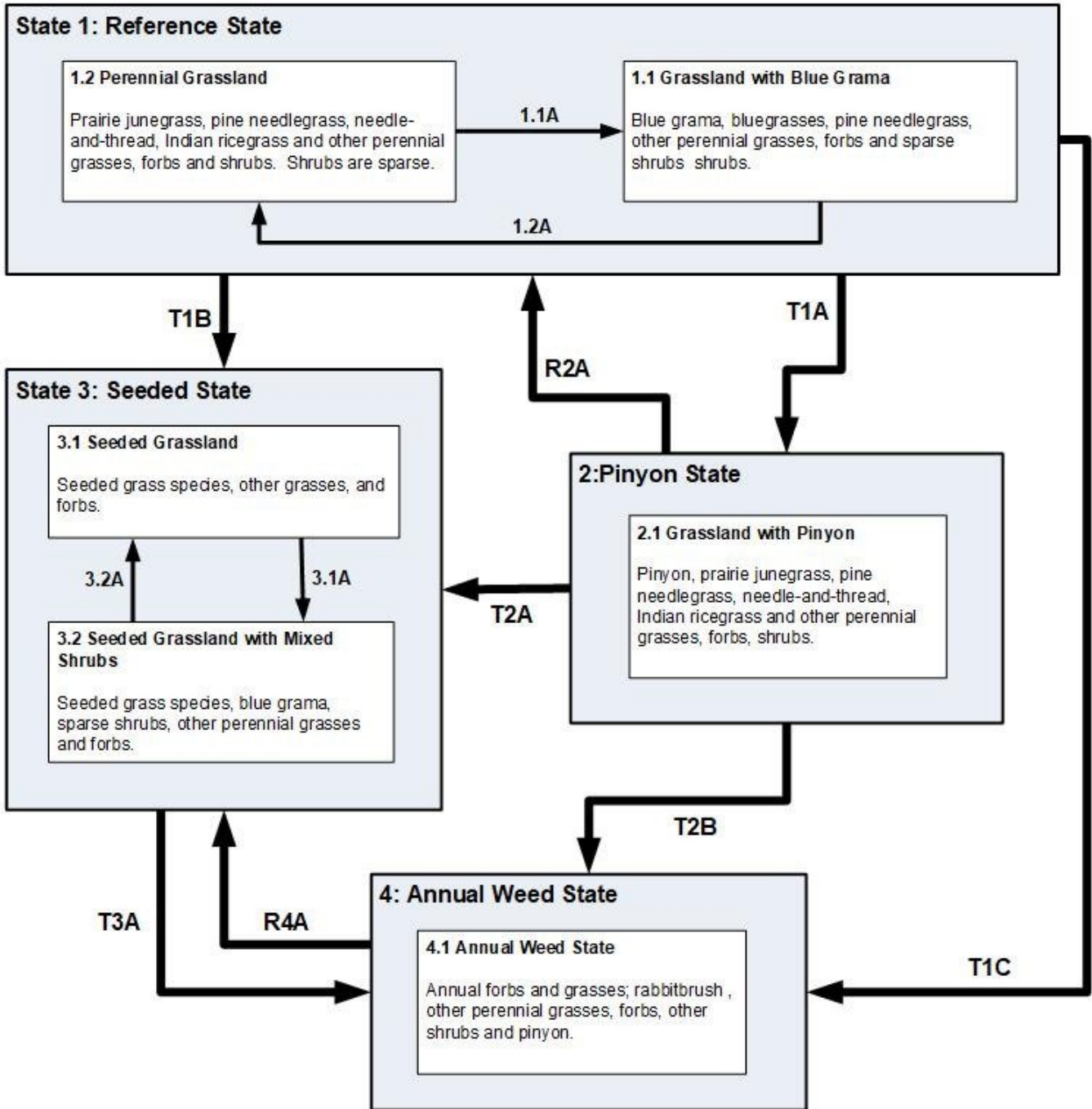
The native plant community is mostly grass, with isolated and scattered forbs and brush present in small amounts. The dominant grasses are native bluegrasses, Junegrass, western wheatgrass, Indian ricegrass, pine needlegrass, needle and thread, and blue grama. Lesser amounts of sand dropseed, slimstem muhly, threeawn, and squirreltail will also be present. Forbs and brush plants found in the community include fringed sagebrush buckwheat, tall rabbitbrush, yucca, prickly pear cactus, and wax current.

Tree species are normally not a part of the natural plant community; however, an occasional pinyon pine may be found. Approximate ground cover is about 40%.

The state and transition model was added to fill the provisional ecological site instruction. It is a very general model.

## State and transition model

# R048AY316CO Dry Mountain Outwash





## Legend

1.1A, 3.1A – lack of fire, time without disturbance, extended drought and/or improper grazing  
 1.2A, 3.2A – fire, wetter climatic cycles, and/or proper grazing

T1A - fire suppression, time without disturbance, lack of insect herbivory/pathogen outbreaks, extended droughts, and/or tree encroachment

T1B – seeding and land treatments

T1C, T2B, T3A – invasive species establishment, improper grazing, fire, surface disturbances, and/or extended droughts.

R2A – fire, vegetation treatments, insect herbivory, pathogen outbreaks, wetter climatic cycles, and/or tree encroachment removal

T2A – Seeding and removal of tree encroachment

R4A – treat invasive species, and seeding; intensive energy and time investment needed; and/or wetter climatic cycles

### State 1

#### Reference State

#### Community 1.1

#### Reference State

Species most likely to invade this site or increase drastically from the amounts shown in the plant list are annual weeds, sleepy grass, ring muhly, broom snakeweed, prickly pear cactus, pinyon pine, blue grama, tall and low rabbitbrush, pingue, sand dropseed, three awn, and slimstem muhly. As range condition deteriorates, the plant cover may decline to a solid stand of low-vigor blue grama. Total Annual Production: Favorable years 600 lbs/ac air dry Unfavorable years 400 lbs/ac air dry Median years 500 lbs/ac air dry

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	347	392	432
Shrub/Vine	78	129	179
Forb	22	45	62
<b>Total</b>	<b>447</b>	<b>566</b>	<b>673</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</b>			336–448	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	56–84	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	28–56	–
	muttongrass	POFE	<i>Poa fendleriana</i>	28–56	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	28–56	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	28–56	–
	pine needlegrass	ACPI2	<i>Achnatherum pinetorum</i>	28–56	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	28–56	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	11–28	–
<b>Forb</b>					
2	<b>Forbs</b>			28–56	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	6–28	–
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	6–28	–
	lupine	LUPIN	<i>Lupinus</i>	6–11	–
	milkvetch	ASTRA	<i>Astragalus</i>	6–11	–
	Indian paintbrush	CASTI2	<i>Castilleja</i>	6–11	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			84–174	
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	6–28	–
	wax currant	RICE	<i>Ribes cereum</i>	6–28	–

## Animal community

### INTERPRETATIONS FOR LIVESTOCK:

This site provides a high value rating for cattle, sheep, and horses.

Total Annual Production:

Favorable years 600 pounds/Ac

Median years 500 pounds/Ac

Unfavorable years 400 pounds/Ac

### INTERPRETATIONS FOR WILDLIFE

This site provides a high value rating for antelope, elk, and cottontail. It is rated as medium for deer and jackrabbits. It only provides a low rating for upland game birds and isn't applicable for waterfowl.

## Hydrological functions

The site provides a high value rating for watershed.

## Recreational uses

The site is rated as high for recreation and natural beauty.

## Wood products

The site provides a low value for wood products.

## Other information

Rare, Threatened, or Endangered Plants and Animals:  
(To be added when known)

This site occurs in the Salida Field office.

## Type locality

Location 1: Chaffee County, CO	
General legal description	On broad fan below Mt Princeton about 6 miles south of Buena Vista on Cogan Ranch.

## 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 Dry Mountain Outwash #316. : 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.

Western Regional Climate Center. Retrieved from <http://www.wrcc.dri.edu/summary/Climsmco.html> on December 10, 2018

## Contributors

Suzanne Mayne-Kinney

## Approval

Kirt Walstad, 3/05/2024

## Acknowledgments

Project Staff:

Suzanne Mayne-Kinney, Ecological Site Specialist, NRCS MLRA, Grand Junction SSO  
Chuck Peacock, MLRA Soil Survey Leader, NRCS MLRA Grand Junction SSO

Program Support:

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

Those involved in developing earlier versions of this site description include: Bob Rayer, retired NRCS Soil

Scientist; Herman Garcia, retired CO State RMS and NRCS MLRA Ecological Site Specialist-QA Phoenix, AZ.

--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 is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 48A 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	05/17/2024
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:**

---