USDA Natural Resources Conservation Service

Ecological site R048AY235CO
Dry Exposure

Last updated: 3/05/2024
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): 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.

LRU notes

LRU Notes:

This site occurs around Piceance Basin, east end of the Roan Plateau, and North Park Area. It is in the 9-16" precipitation zones and is frigid in temperature. This site needs to be broken out on LRUs (Land Resources Units).

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.

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

The 48X was drafted from the existing Dry Exposure Range Site 48X (SCS, August 1975). This site occurs on steep slopes, ridges, hill tops and other exposed, tree-less areas seen from high mountain valleys and parks on very shallow to shallow soils. Soil textures are gravelly sandy loam to gravelly loam; light colored. Soils have a droughty desert pavement. It is a winterfat-fringed sagebrush-bunchgrass community. It has an ustic aridic moisture regime and frigid temperature regime. The effective precipitation ranges from 12 to 16 inches.

Associated sites

R048AY303CO	**Loamy Slopes** Loamy Slopes - Mountain Big sagbrush and mountain mahogany dominated site on moderate to steep sites in the Typic Ustic moisture regime (16-20
R048AY238CO	**Brushy Loam** Brushy Loam - Gambel's Oak dominated site on rolling hillsides in the Typic Ustic moisture regime (16-20

Similar sites

R036XY408CO	**Basin Shale** Basin Shale - very shallow to shallow soils with black sagebrush and bunchgrasses in MLRA 36 that has a mesic temperature regime.
R048AA235CO	**Dry Exposure Gunnison Basin LRU** Dry Exposure that has been developed on an LRU basis for the Gunnison Basin Area and a cryic temperature regime. This site is a Black Sagebrush-bunchgrass site with shallow to very shallow soils.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia frigida*

Herbaceous	(1) *Pseudoroegneria spicata* (2) *Hesperostipa comata*

Physiographic features

Landscape characteristics are the steep slopes, ridges, hill tops and other exposed, tree-less areas seen from high mountain valleys and parks. Slopes vary from gentle to steep rolling with exposure or direction of slope not in any consistent direction.

Table 2. Representative physiographic features

Landforms	(1) Mountainside (2) Hill (3) Ridge
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Slope	3–30%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Slope	3–50%

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 30.7ºF to 64.8ºF, averaging about 25ºF for the winter and 66ºF in the summer. Summer high temperatures of mid-80ºF to low 80ºF are not unusual. The coldest winter temperature recorded was -36ºF on February 8, 1933 and the warmest winter temperature recorded was 66ºF on February 11, 1962. The coldest summer temperature recorded was 24ºF on June 19, 1973 and the warmest was 100ºF 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.

Effectiveness annual precipitation of the moisture is sharply reduced because of slopes, soils snow removal by wind and high evaporative rates. The frost-free period of this site is extremely short with frosts occurring frequently in the "growing season". The site can warm up rapidly, however, due to the drainage of cold air off the site and becasuse of the favorable reception of sun energy. The almost incessant winds strongly influence the plant cover. They act to limit plant height growth to a few inches on most plants.

Table 4. Representative climatic features

Frost-free period (characteristic range)	90-108 days
Freeze-free period (characteristic range)	131-144 days

Precipitation total (characteristic range)	381-406 mm
Frost-free period (actual range)	87-113 days
Freeze-free period (actual range)	124-144 days
Precipitation total (actual range)	356-406 mm
Frost-free period (average)	99 days
Freeze-free period (average)	137 days
Precipitation total (average)	381 mm

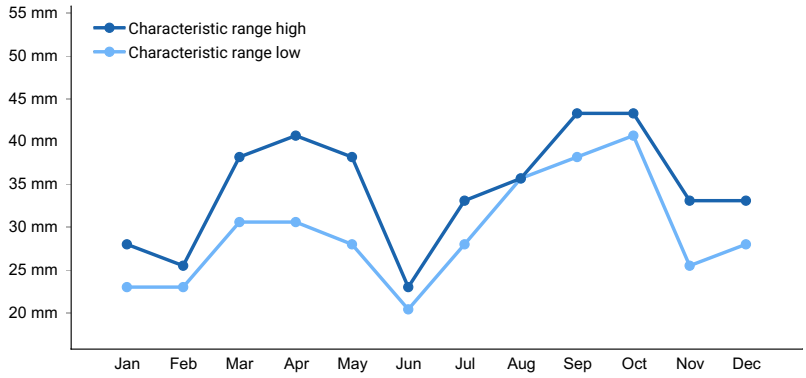


Figure 1. Monthly precipitation range

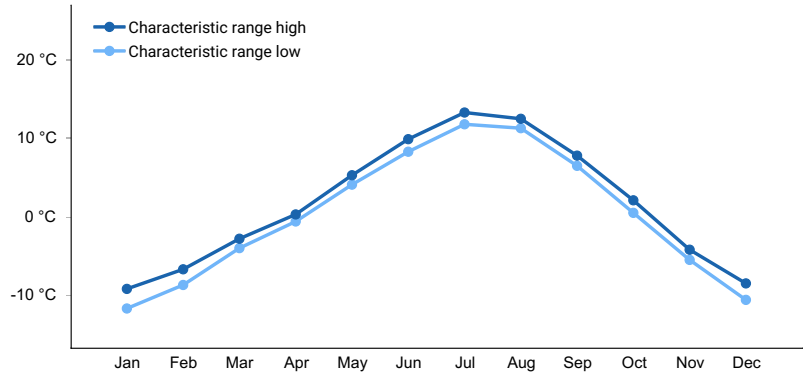


Figure 2. Monthly minimum temperature range

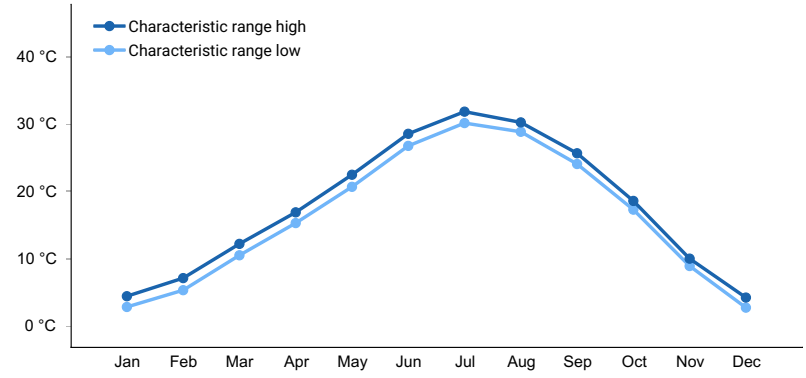


Figure 3. Monthly maximum temperature range

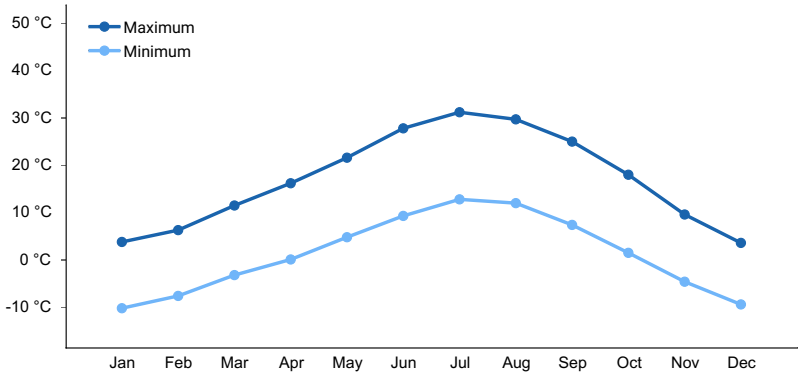


Figure 4. Monthly average minimum and maximum temperature

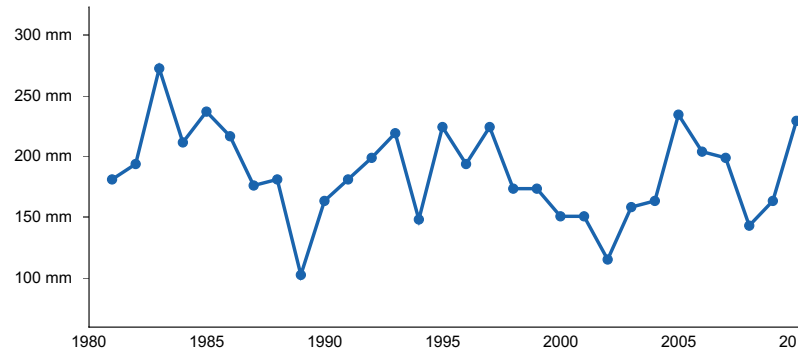


Figure 5. Annual precipitation pattern

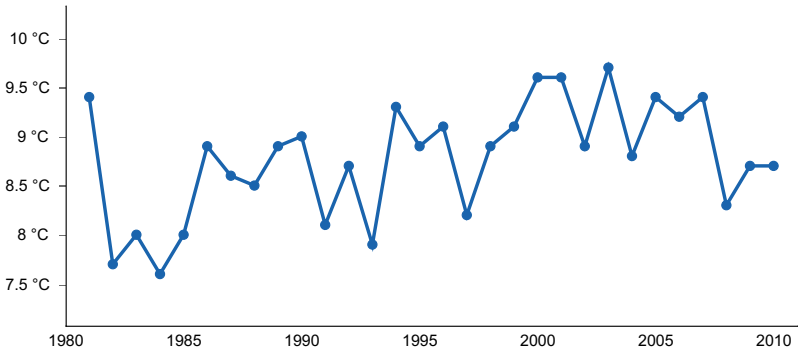


Figure 6. Annual average temperature pattern

Climate stations used

- (1) CEDAREDGE 3 E [USC00051443], Cedaredge, CO
- (2) COLLBRAN [USC00051741], Collbran, CO
- (3) CEDAREDGE [USC00051440], Cedaredge, CO
- (4) COLLBRAN 2SW [USC00051743], Collbran, CO

Influencing water features

There are no water features associated with this site.

Soil features

Gravelly sandy loams to gravelly loams; light colored. Soils have a droughty desert pavement. Fine to medium gravel to cobble on the surface. Topsoil is thin; subsoil is moderately to rapidly permeable. Low in fertility. All conditions contribute to restricted plant growth.

Soils in this site are:
Loamy Family Particle Size:

Carbol
Marburn

Loamy-Skeletal Family Particle Size:
Irigul
Starman

Clayey Family Particle Size:
Waybe

Table 5. Representative soil features

Parent material	(1) Colluvium–sandstone and shale (2) Residuum–sandstone and shale (3) Slope alluvium–sandstone and shale (4) Residuum–sandstone (5) Residuum–shale
Surface texture	(1) Channery, very channery loam (2) Flaggy clay loam (3) Channery silty clay loam (4) Sandy loam (5) Gravelly coarse sandy loam
Family particle size	(1) Loamy (2) Loamy-skeletal (3) Clayey
Drainage class	Well drained
Permeability class	Slow to moderate
Depth to restrictive layer	8–51 cm
Soil depth	8–51 cm
Surface fragment cover <=3"	8–30%
Surface fragment cover >3"	0–20%
Available water capacity (Depth not specified)	1.27–5.08 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Clay content (0-10.2cm)	18–35%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	10–35%
Subsurface fragment volume >3" (Depth not specified)	2–15%

Ecological dynamics

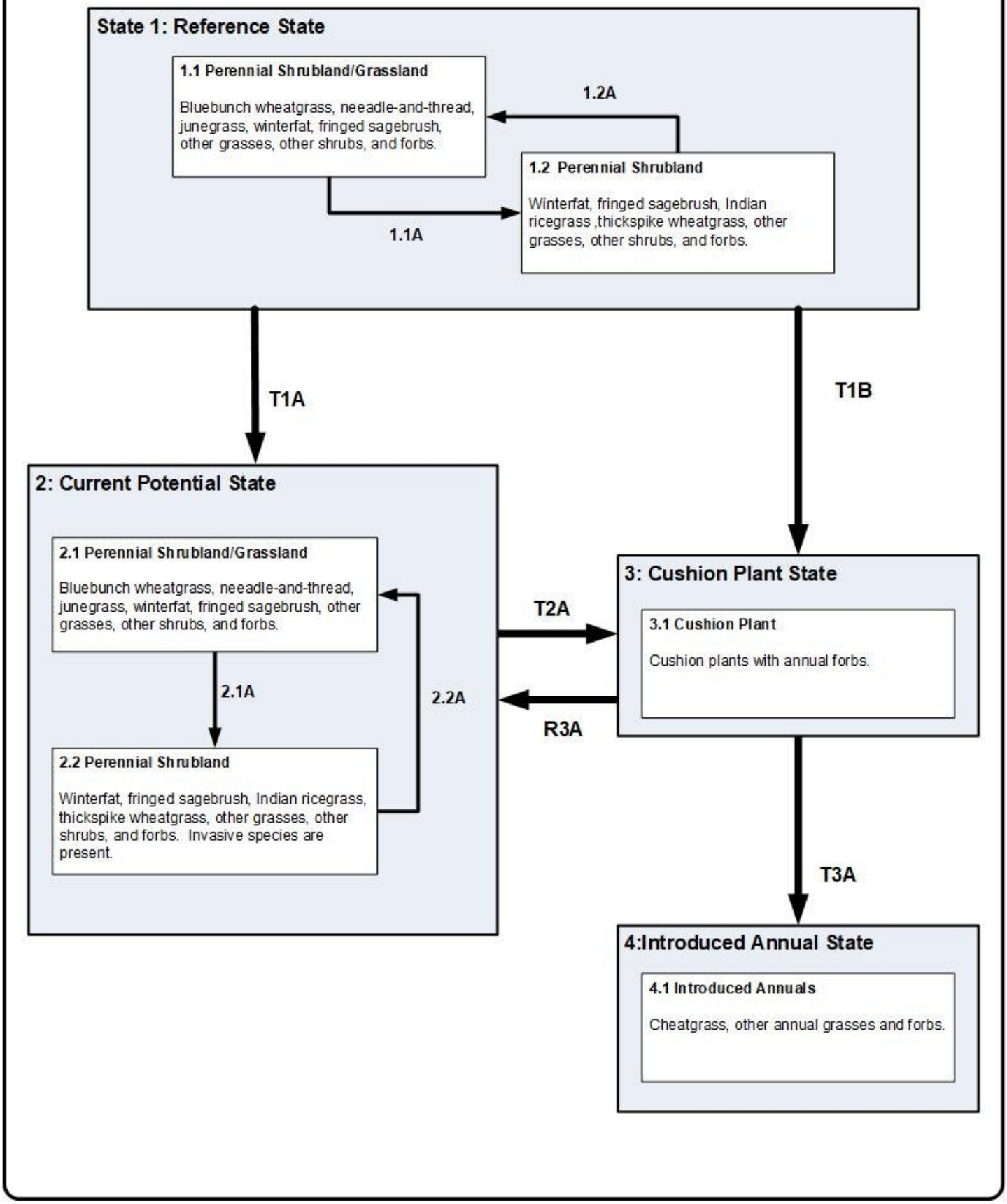
The "bald" appearance of this range site is because of the absence of large shrubs. Grasses and cushion type forbs characterize the aspect. Important grasses are bluebunch and streambank wheatgrass, needle-and-thread, Junegrass, Indian ricegrass and blue grama. Cushion type and mat forming forbs and shrubs include fringed sage, low rabbitbrush, buckwheat, daisy, phlox, globemallow, pussytoes, nailwort and loco are prominent.

Percent ground cover for the plant community is approximately 25%.

Few species invade this site and it is sparsely vegetated to nearly barren following prolonged overgrazing or other severe disturbances.

State and transition model

R048AY235CO Dry Exposure



Legend

1.2A, 2.1A – Fire, proper grazing, wet climatic cycles, vegetative treatments, and/or small scale insect/pathogen outbreaks

1.1A, 2.1A – Extended improper grazing, lack of fire, extended drought, time without disturbance, and/or lack of insect/pathogen outbreaks

T1A – Establishment of invasive species

R3A – Vegetative treatments and seeding, wet climatic cycles, and/or proper grazing

T3A – repeated fire in short time spans

T1B,T2A – Disturbance (human, mechanic and/or animal), continuous grazing of perennial grasses and shrubs

State 1
Reference State

Community 1.1
Perennial Shrubland/Grassland

The "bald" appearance of this range site due to the absence of large shrubs. Grasses and cushion type forbs characterize the site. This plant community is long-lived, stable and rarely experiences natural large scale disturbance. This plant community is represented by small scale disturbances which has removed patches of mature vegetation. Initially, disturbed areas are dominated by grasses and forbs. The grasses and forbs benefits from reduced competition from the absence of shrubs. Percent ground cover for the plant community is approximately 25%. Few species invade this site and it is sparsely vegetated to nearly barren following prolonged overgrazing or other severe disturbances. Total Annual Production: Favorable years 500 lbs/ac air dry Unfavorable years 200 lbs/ac air dry Median years 400 lbs/ac air dry

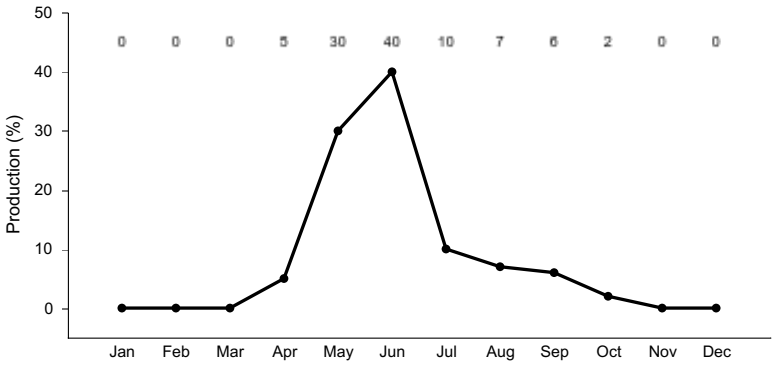


Figure 8. Plant community growth curve (percent production by month). CO0104, MLRA 48A & 34A - Foothill Frigid. MLRA 48A & 34A.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses**			126–314	
	needle and thread	HECO26	*Hesperostipa comata*	22–112	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	22–112	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	22–112	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	22–67	–
	blue grama	BOGR2	*Bouteloua gracilis*	11–34	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	11–34	–
	Grass, native	2GN	*Grass, native*	6–22	–
Forb					
2	**Forbs**			54–135	
	Forb, native	2FN	*Forb, native*	2–22	–
	pussytoes	ANTEN	*Antennaria*	2–22	–
	milkvetch	ASTRA	*Astragalus*	2–22	–
	buckwheat	ERIOG	*Eriogonum*	2–22	–
	nailwort	PARON	*Paronychia*	2–22	–
	spiny phlox	PHHO	*Phlox hoodii*	2–22	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	2–22	–
Shrub/Vine					
3	**Shrubs**			27–67	
	prairie sagewort	ARFR4	*Artemisia frigida*	11–34	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	11–34	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	11–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	1–11	–

Animal community

INTERPRETATIONS FOR GRAZING ANIMALS:
This site provides low value ratings for cattle, sheep and horses.

INTERPRETATIONS FOR GRAZING WILDLIFE:
It provides a high value rating for antelope and elk. The site has a medium value rating for bison and deer and is not applicable for cottontail, jackrabbit, upland game birds and waterfowl.

Hydrological functions

This site has a low value rating for watershed features.

Recreational uses

This site has a medium value rating for recreation and natural beauty.

Wood products

Not applicable

Other information

Rare, Threatened or Endagered Plants and Animals:
To be added when known

Field offices in Colorado where the site occurs:
Gunnison
Kremmling
Walden
Meeker

Other references

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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.

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Approval

Kirt Walstad, 3/05/2024

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 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	05/11/2025
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):**

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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:**
