

## **Ecological site R048AY307CO Shallow Slopes**

Last updated: 3/05/2024  
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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): 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**

Shallow Slopes occurs on hillsides, ridges, mountainside and canyon walls. Soils are shallow (less than 20 inches) loamy textured soils derived from residuum from sandstone and limestone. Soil surface textures are generally sandy loam or gravelly sandy loam. It is a Black sagebrush –western wheatgrass community. It has an aridic ustic

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

## Associated sites

R048AY285CO	<b>Foothill Swale</b> Foothill Swale - The site occurs in the watershed in areas that receive extra water and fine sediment from surrounding uplands. The soils are deep and loamy in texture with high water-holding capacity. Buried surface horizons and very little rock characterize the soil profile. The soil moisture regime is aridic ustic and the soil temperature regime is frigid. The aspect of this site is a valley grassland plant community with a rather sparse stand of shrubs. Basin wildrye, western and thickspike wheatgrasses, Indian ricegrass, squirreltail, and Sandburg bluegrass are the dominant grasses. Shrubs include basin big sagebrush, and rubber rabbitbrush.
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## Similar sites

R048AY307CO	<b>Shallow Slopes</b> Shallow Slopes
R048AY229CO	<b>Rocky Loam</b> Rocky Loam occurs on ridges, mountainside, mountain slopes and mountains. Soils are very shallow to shallow (less than 20 inches) loamy-skeletal soils derived from residuum from granite, gneiss, phyllite, schist, sandstone and/or limestone. Soil surface texture are generally coarse sandy loams to light clay loams. It is a Mountain Big sagebrush – western wheatgrass community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.
R048AY230CO	<b>Shallow Loam</b> Shallow Loam occurs on mountains, and hills. Soils are very shallow to shallow (less than 20 inches) loamy-skeletal soils derived from slope alluvium from trachyte, volcanic breccia, gneiss, granite and/or sandstone; residuum from weathered volcanic breccia, tuff, igneous rock, sandstone or sandstone and shale. Soils surface textures are gravelly to very gravelly loam, gravelly to very gravelly sandy loam, cobbly loam. Or very cobbly sandy loam. It is an Arizona Fescue-Mountain Muhly community with scattered mountain mahogany, snowberry and current. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Artemisia nova</i> (2) <i>Krascheninnikovia lanata</i>
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Elymus elymoides</i>

## Physiographic features

This site is generally on gently sloping benchlands and fairly steep hillsides.

The slope may range from 3 to 35 percent. The direction does not influence the site.

Elevation ranges from 6000 to 8000 feet above sea level.

**Table 2. Representative physiographic features**

Landforms	(1) Ridge (2) Hillside (3) Mountainside (4) Canyon wall
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None

Elevation	6,000–8,000 ft
Slope	3–35%
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)	28-90 days
Freeze-free period (characteristic range)	77-131 days
Precipitation total (characteristic range)	13-15 in
Frost-free period (actual range)	13-95 days
Freeze-free period (actual range)	67-141 days
Precipitation total (actual range)	13-15 in
Frost-free period (average)	58 days

Freeze-free period (average)	104 days
Precipitation total (average)	14 in

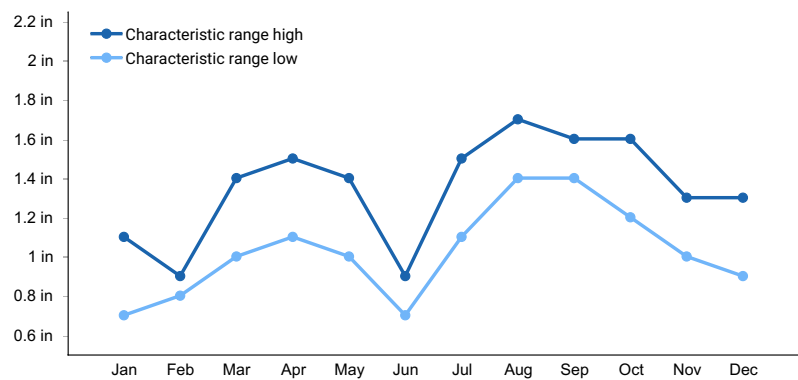


Figure 1. Monthly precipitation range

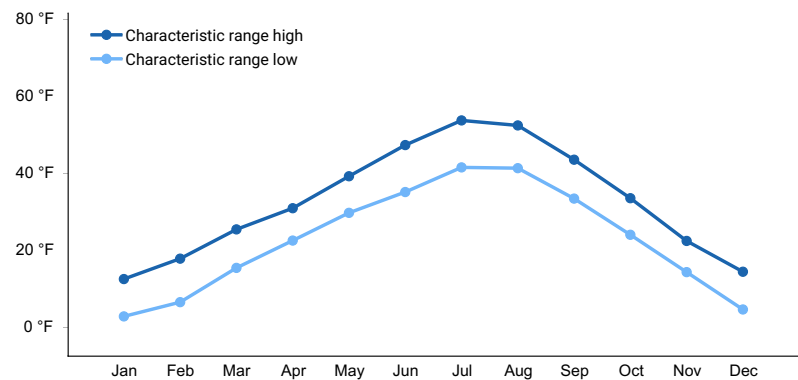


Figure 2. Monthly minimum temperature range

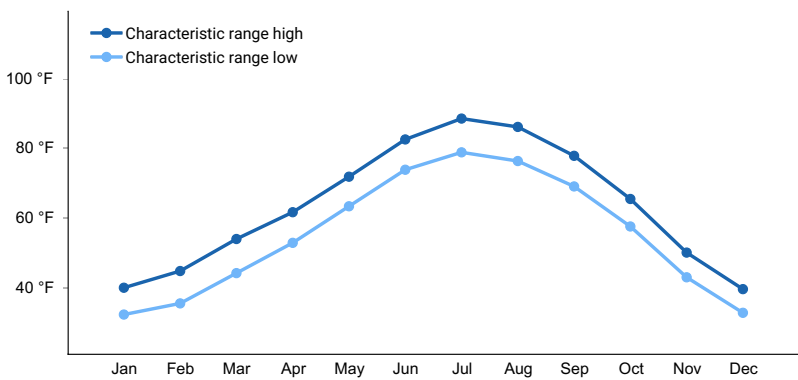


Figure 3. Monthly maximum temperature range

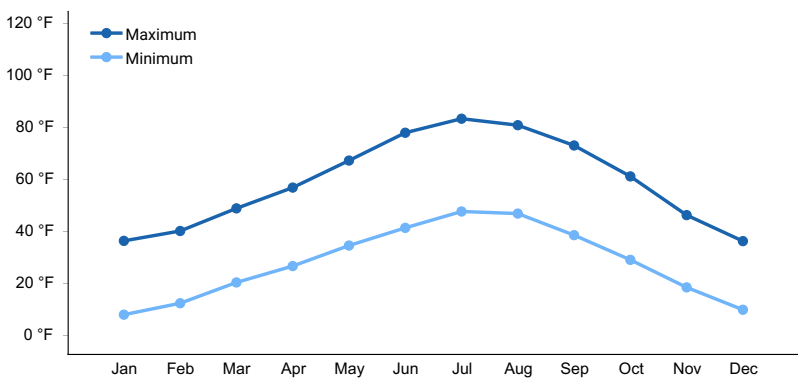


Figure 4. Monthly average minimum and maximum temperature

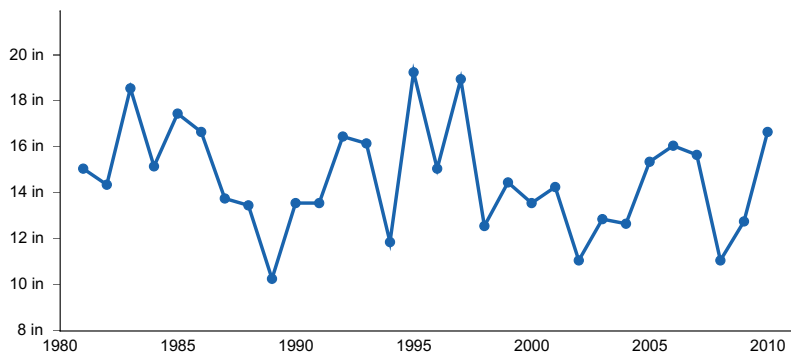


Figure 5. Annual precipitation pattern

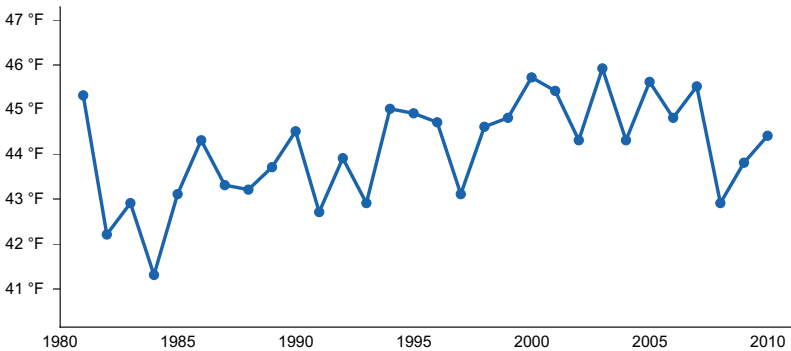


Figure 6. Annual average temperature pattern

### Climate stations used

- (1) CIMARRON [USC00051609], Cimarron, CO
- (2) COLLBRAN [USC00051741], Collbran, CO
- (3) CEDAREEDGE [USC00051440], Cedaredge, CO
- (4) LEADVILLE LAKE CO AP [USW00093009], Leadville, CO

### Influencing water features

None

### Soil features

Very stony dark brown lithosols with 70 to 80 percent fragments of mixed origin in profile. Soil is underlain by solid bedrock (limestone or sandstone at about 10 inches). Moisture holding capacity is low. In most cases there is a rock mulch on the surface.

Effective zone is limited by one of three conditions:

- 1) Extremely high concentration of lime (lime usually part of cobbly mixture).
- 2) Shallow two to six inches to bedrock.
- 3) High concentrations of cobble, gravel, and stones---tightly fitted together.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone (2) Residuum–sandstone
Surface texture	(1) Sandy loam (2) Gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained

Permeability class	Moderate
Depth to restrictive layer	2–20 in
Soil depth	2–20 in
Surface fragment cover <=3"	0–30%
Available water capacity (Depth not specified)	2.5–3.9 in
Clay content (Depth not specified)	15–26%
Subsurface fragment volume <=3" (Depth not specified)	5–34%
Subsurface fragment volume >3" (Depth not specified)	0–2%

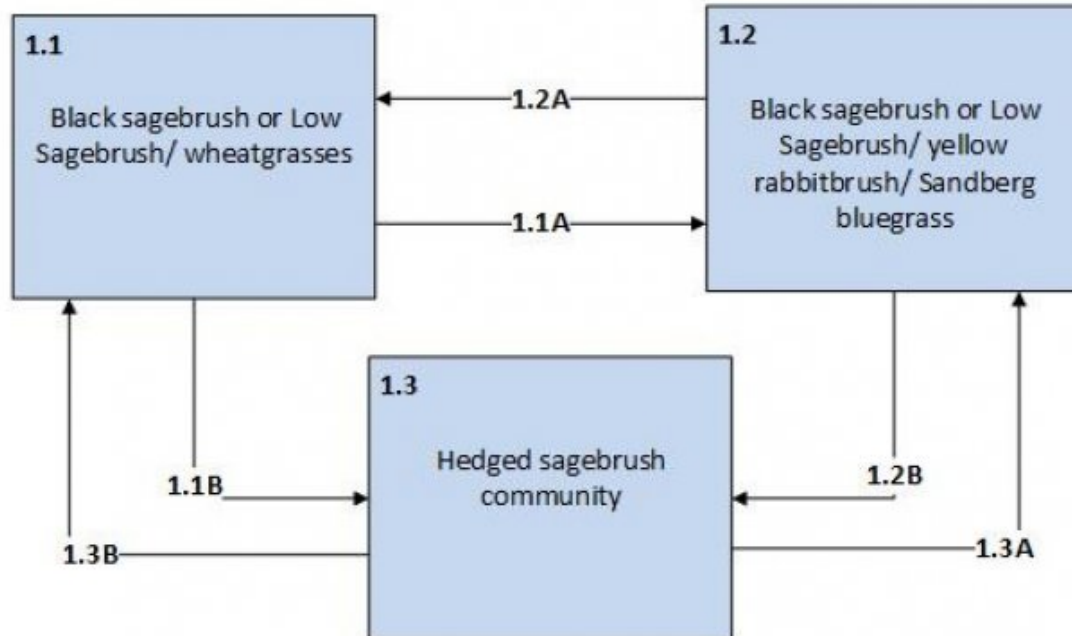
## Ecological dynamics

This particular site is a relatively low producing community for this climatic zone (due to poor soil moisture-plant relationship either because of highly calcareous materials or stony profile shallow to bedrock or both). Soil conditions create a low growing stunted aspect of grasses, shrubs, and cushion-type forbs. Black sage and/or low sage are dominant shrubs. Muttongrass, needleandthread, Junegrass, bluebunch wheatgrass, Sandberg bluegrass, and western wheatgrass are slightly dominant over the shrubs.

## State and transition model

# Shallow Slopes R048AY307CO

## 1. Reference State



T1A

R2A

## 2. Mature Sagebrush

2.1 Mature sagebrush/sparse understory – cushion plants

Figure 7. State and Transition Model



## Legend

- 1.1A – improper grazing, lack of fire, extended drought, and/or insect-pathogen outbreaks
- 1.1B – proper grazing, and heavy browsing of shrubs
- 1.2A – fire, prolonged drought, and /or disease/insect outbreak
- 1.2B – heavy browsing of shrubs, proper grazing of herbaceous understory
- 1.3A – fire, low to moderate browsing of shrubs
- 1.3B – fire and improper grazing of herbaceous understory.
- T1A – Improper grazing for extended periods, lack of fire, and/or lack of insect/pathogen outbreak
- R2A – Proper grazing, wet climate cycle, fire after understory seed set, and/or small insect/pathogen outbreak

Figure 8. Legend

### State 1

#### Reference State

#### Community 1.1

##### Reference State

This site is treeless. Optimum ground cover is 25 percent. Invaders on this site are any introduced plant species.  
Total Annual Production: Favorable years 800 pounds/Ac (Air dry) Median years 650 pounds/Ac (Air dry)  
Unfavorable years 500 pounds/Ac (Air dry)

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	310	390	465
Shrub/Vine	95	145	200
Forb	95	115	135
<b>Total</b>	<b>500</b>	<b>650</b>	<b>800</b>

### Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Grasses</b>			325–455	
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	260–325	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	260–325	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	65–100	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	35–65	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	50–65	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	5–35	–
	muttongrass	POFE	<i>Poa fendleriana</i>	5–35	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	5–35	–
	sedge	CAREX	<i>Carex</i>	5–35	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	5–20	–
<b>Forb</b>					
2	<b>Forbs</b>			100–130	
	phlox	PHLOX	<i>Phlox</i>	35–50	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	5–35	–
	pussytoes	ANTEN	<i>Antennaria</i>	5–35	–
	mariposa lily	CALOC	<i>Calochortus</i>	5–35	–
	streamside fleabane	ERGLP	<i>Erigeron glabellus</i> var. <i>pubescens</i>	5–35	–
	buckwheat	ERIOG	<i>Eriogonum</i>	5–35	–
	mat penstemon	PECA4	<i>Penstemon caespitosus</i>	5–35	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	5–20	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			100–195	
	little sagebrush	ARAR8	<i>Artemisia arbuscula</i>	5–35	–
	black sagebrush	ARNO4	<i>Artemisia nova</i>	5–35	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	5–35	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	5–35	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	5–35	–

## Animal community

### INTERPRETATIONS FOR GRAZING ANIMALS:

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

### INTERPRETATIONS FOR GRAZING WILDLIFE:

The site provides a medium value rating for antelope, cottontail, jackrabbit, and upland game birds. It provides a low rating for deer, elk, and waterfowl.

## Hydrological functions

The site provides a medium value rating for watershed.

## Recreational uses

### RECREATION AND NATURAL BEAUTY:

The site provides a medium value rating for recreation and natural beauty.

## Wood products

No wood products are produced on this site.

## Other information

Field offices where the site occurs are Craig and Eagle.

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

## Type locality

Location 1: Moffat County, CO	
General legal description	North of Irish Canyon (Buckly Ranch). Northwest Moffat County.
Location 2: Eagle County, CO	
General legal description	Five to ten miles east of Burns Rodeo Arena.

## Other references

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## Contributors

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## Approval

Kirt Walstad, 3/05/2024

## Acknowledgments

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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	05/02/2024
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):**

- 
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:
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17. **Perennial plant reproductive capability:**
-