

## Ecological site R048AY287CO Stony Foothills

Last updated: 3/05/2024  
Accessed: 05/03/2024

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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**

Stony Foothills occurs on mountains, escarpments and hills. Slopes is between 3 to 30 percent. 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 two-needle pinyon - Utah juniper - 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.

### Associated sites

R048AY303CO	<p><b>Loamy Slopes</b></p> <p>Loamy Slopes occurs on alluvial fans, terraces, hills mountains and mountainsides. Slopes is between 25 to 65%. Soils are moderately deep to deep (20 to 60+ inches). Soils are derived from alluvium from sandstone and siltstone or sandstone; residuum or colluvium from sandstone or outwash from basalt. Soil surface texture is cobbly sandy loam or cobbly, very flaggy or channery loam with loamy-skeletal textured subsurface. It is a mountain mahogany – Indian ricegrass community. It has an aridic ustic moisture regime and frigid temperature. The effective precipitation ranges from 12 to 18 inches.</p>
R034AY298CO	<p><b>Rolling Loam</b></p> <p>Rolling loam has medium to moderately coarse textured soils. This site is a grassland - Wyoming big sagebrush site. The dominant grasses are wheatgrass (mostly likely thickspike), needleandthread, Sandberg bluegrass, bluebunch wheatgrass and Indian ricegrass. This site was originally written for MLRA 34A &amp; 48A in the 12 to 15 inch precipitation zone.</p>

### Similar sites

R048AY303CO	<p><b>Loamy Slopes</b></p> <p>Loamy Slopes occurs on alluvial fans, terraces, hills mountains and mountainsides. Slopes is between 25 to 65%. Soils are moderately deep to deep (20 to 60+ inches). Soils are derived from alluvium from sandstone and siltstone or sandstone; residuum or colluvium from sandstone or outwash from basalt. Soil surface texture is cobbly sandy loam or cobbly, very flaggy or channery loam with loamy-skeletal textured subsurface. It is a mountain mahogany – Indian ricegrass community. It has an aridic ustic moisture regime and frigid temperature. The effective precipitation ranges from 12 to 18 inches.</p>
R048AY237CO	<p><b>Stony Loam</b></p> <p>Stony Loam occurs mainly alluvial fans, mountain slopes mountains and valley sides. Slopes is between 0 to 30%. Soils are deep (60 inches or more) loamy soils derived from outwash; till; colluvium from basalt, sandstone or granite and gneiss; and/or alluvium from igneous and metamorphic rocks; or basalt. Soil surface texture are stony to extremely stony loam, cobbly loam; or cobbly to very cobbly sandy loam with loamy-skeletal subsurface. It is a Mountain Big Sagebrush - Bluebunch wheatgrass community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>

**Table 1. Dominant plant species**

Tree	(1) <i>Pinus edulis</i> (2) <i>Juniperus osteosperma</i>
Shrub	(1) <i>Artemisia tridentata ssp. wyomingensis</i>
Herbaceous	(1) <i>Pascopyrum smithii</i>

### Physiographic features

Rough rocky breaks in foothills and mesa country on steep slopes, generally between 3 to 30 percent. At higher elevations the site occupies south and west exposures. At lower elevations it occurs on north and east exposures. Elevation ranges from 6200 to 7700 feet above sea level.

**Table 2. Representative physiographic features**

Landforms	(1) Mountain (2) Escarpment (3) Hill
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None

Elevation	6,200–7,700 ft
Slope	3–30%
Aspect	W, N, S

## 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. Cool season grasses are favored and make their best growth following the spring thaw (about April) when available moisture is greatest. These plants again take advantage of late summer moisture if they are in healthy condition. 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

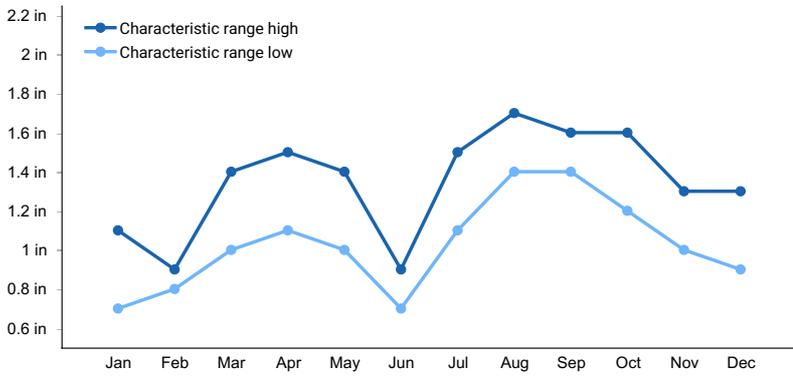


Figure 1. Monthly precipitation range

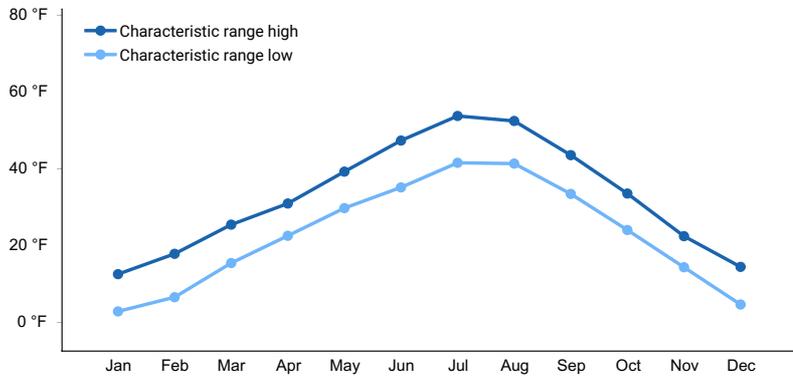


Figure 2. Monthly minimum temperature range

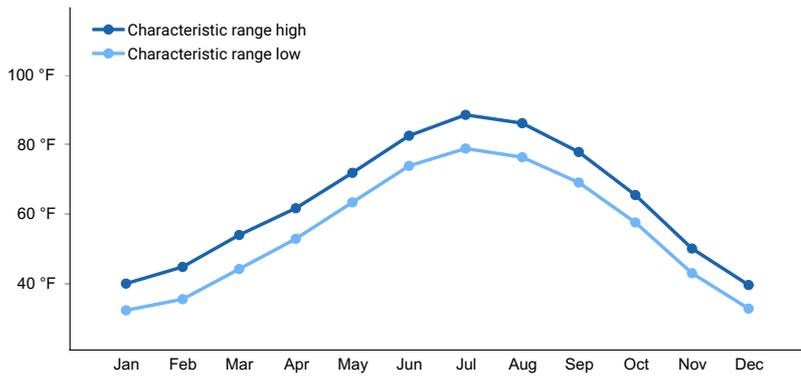
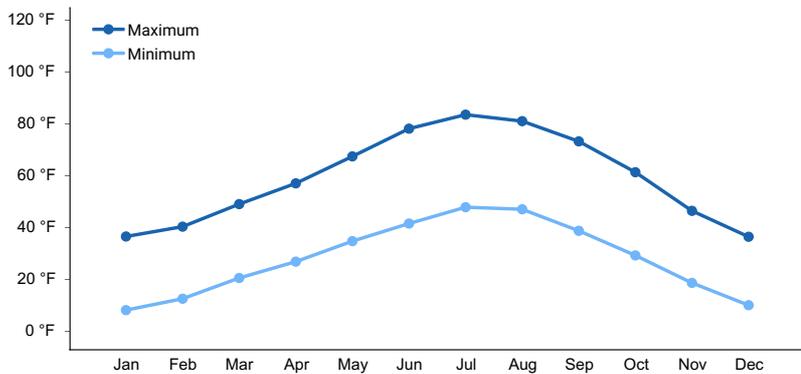
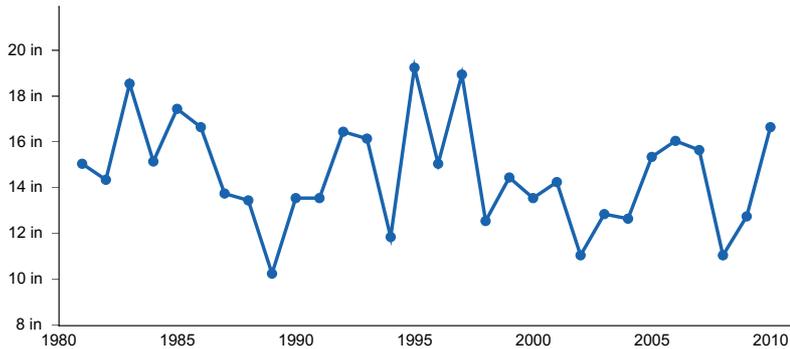


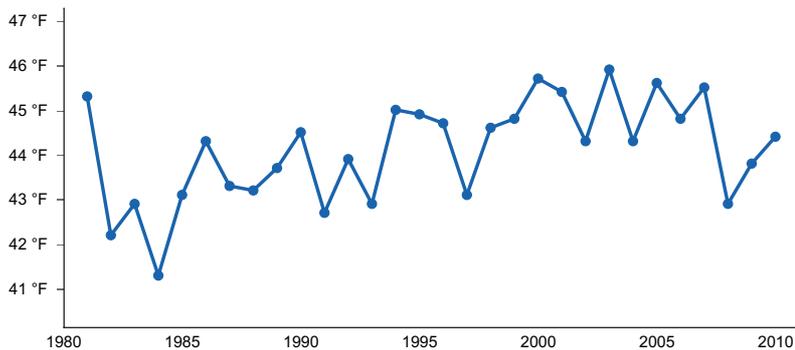
Figure 3. Monthly maximum temperature range



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



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

### Climate stations used

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

### Influencing water features

No water features are associated with this site.

### Soil features

Medium texture, rocky, and stony soils of moderately deep to very deep depths. The "rock" litter enhances the soil moisture plant growth relationships. There can be heavy runoff during intense rains, but there is only slight erosion taking place because of the rock armored surface.

Soils associated with this site are:

Brownsto

**Table 4. Representative soil features**

Parent material	(1) Alluvium–calcareous sandstone (2) Alluvium–basalt (3) Alluvium–sandstone (4) Alluvium–sandstone and shale (5) Residuum–sandstone and shale (6) Colluvium–sandstone and shale
Surface texture	(1) Stony sandy loam (2) Gravelly sandy loam (3) Very cobbly loam (4) Very stony sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderate
Soil depth	20–60 in
Surface fragment cover <=3"	5–25%
Surface fragment cover >3"	5–40%
Available water capacity (Depth not specified)	1–3.3 in
Calcium carbonate equivalent (Depth not specified)	0–10%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–35%
Subsurface fragment volume >3" (Depth not specified)	5–60%

## Ecological dynamics

This site is a mixed plant community with consistin of pinyon pine, Utah juniper, and shrubs. Grasses present are as Indian ricegrass, bluegrasses, needle-and-thread, blue grama, prairie Junegrass, squirreltail, and wheatgrasses. Browse plants include big sagebrush, mountain mahogany, serviceberry, Mormon tea, and bitterbrush. Many of the forbs such as daisies, asters, eriogonums, stemless goldenweed, phlox, penstemon, and herbaceous sage are associated in the composition.

Tree species native to this site are two needle pinyon and Utah juniper.

Optimum ground cover is 25 percent.

Invaders of this site are gumweed, and annual plants.

Total Annual Production:

Favorable years 800 lbs/ac air dry

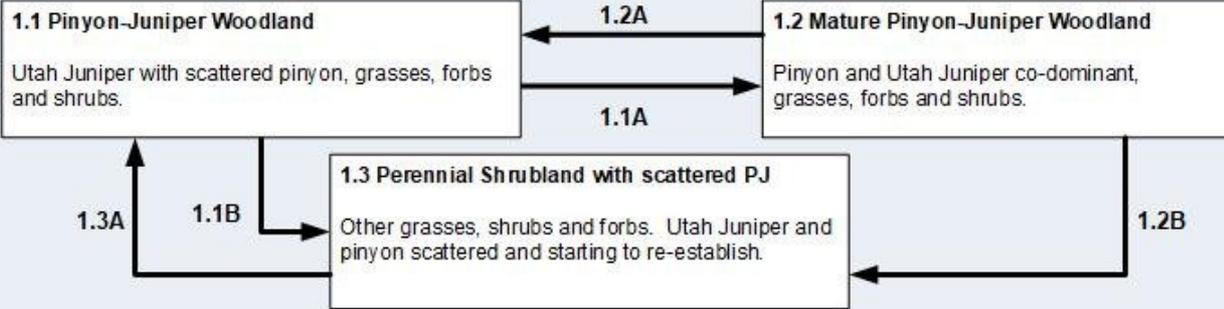
Unfavorable years 400 lbs/ac air dry

Median years 600 lbs/ac air dry

## State and transition model

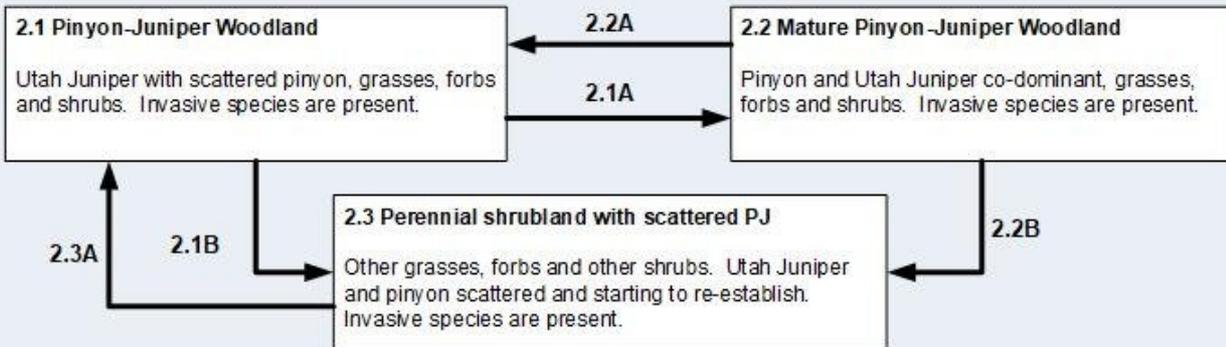
# R048AY287CO – Stony Foothills

## State 1: Reference State



T1A

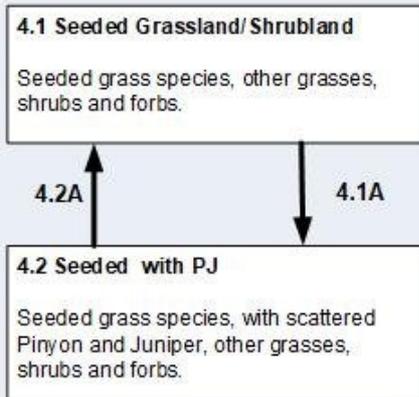
## State 2: Current Potential State



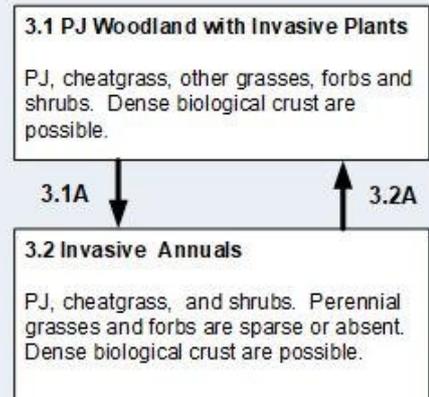
T2B

T2A

## State 4: Seeded State



## 3: Pinyon-Juniper Invasive State



T3A

T4A

# Legend

- 1.1A, 2.1A, 1.3A, 2.3A – wetter climate period, time without disturbance
- 1.1B, 2.1B, 1.2B, 2.2B – Fire
- 1.2A, 2.2A – Insect and pathogen outbreaks, drought, small scale fires
- T1A – Establishment of non-native invasive plants
- T2A, T4A – reduced fire return interval, increase in invasive plants in understory, extended drought
- T2B, T3A – Vegetation manipulation
- 3.1A – drought, reduced fire return interval
- 3.2A, 4.1A – time without disturbance
- 4.2A – vegetation manipulation, insect or pathogen outbreaks, drought

## State 1

### Reference State

## Community 1.1

### Reference State

Optimum ground cover is 25%. Invaders of this site are gumweed, and annual plants. Total Annual Production: Favorable years 800 lbs/ac air dry Unfavorable years 400 lbs/ac air dry Median years 600 lbs/ac air dry

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	295	390	475
Shrub/Vine	55	105	165
Forb	25	60	95
Tree	25	45	65
<b>Total</b>	<b>400</b>	<b>600</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>			300–450	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	60–120	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–90	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	30–60	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	10–30	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	10–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	10–30	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	10–30	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	10–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	10–30	–
<b>Forb</b>					
2	<b>Forbs</b>			30–90	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	5–10	–
	aster	ASTER	<i>Aster</i>	5–10	–
	buckwheat	ERIOG	<i>Eriogonum</i>	5–10	–
	beardtongue	PENST	<i>Penstemon</i>	5–10	–
	phlox	PHLOX	<i>Phlox</i>	0–10	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	5–10	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			90–180	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	60–120	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	60–120	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	20–50	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	20–30	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	20–30	–
	silver mountain mahogany	CEMOA	<i>Cercocarpus montanus var. argenteus</i>	5–20	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	5–20	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	0–5	–
<b>Tree</b>					
4	<b>Trees</b>			30–60	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	5–30	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	5–30	–

## Animal community

### WILDLIFE INTERPRETATIONS:

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

### GRAZING INTERPRETATIONS:

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

## Hydrological functions

Medium value rating.

## Recreational uses

Medium value rating.

## Wood products

Low value rating.

## Inventory data references

Field offices where this site is located: Craig, Delta, Eagle, Glenwood Springs, Grand Junction, Kremmling, Meeker, Montrose, Norwood, Steamboat Springs.

## 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.

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## Contributors

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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	05/03/2024
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):**

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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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