

Ecological site R048AY226CO Mountain Loam 13-18 PZ Westcliffe Area

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

R048AY226CO Mountain Loam 13-18" PPT occurs fans and terraces. Slopes is between 0 to 15%. Soils are 40+ inches in depth. Soils are derived slopes alluvium , colluvium or eolian materials. Soil surface texture is usually a sandy loam or gravelly sandy loam. It is a Needle-and-thread – Western Wheatgrass community. It has an aridic

ustic/typic ustic moisture regime. The effective precipitation ranges from 13 to 18 inches.

Associated sites

R048AY218CO	<p>Dry Shallow Pine</p> <p>This site occurs on mountains, hills, and mountainside. Slopes is between 5 to 35%. Soils are shallow (10 to 20 inches) in depth. Soils are derived from slope alluvium from monzonite or gneiss or from residuum from granite, gneiss or granodiorite. Soil surface texture is very gravelly sandy loam with a loamy skeletal subsurface. It is a Gambel's oak – Mountain muhly community. It has an typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>
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Similar sites

R048AY231CO	<p>Dry Mountain Loam</p> <p>This site occurs on alluvial fans, valley sides, mountainsides, and terraces. Slopes are less than 30%. Soils are moderately deep to deep (20 to 60+ inches) soils derived from alluvium from sedimentary rock; colluvium from basalt; or colluvium sandstone. Soil surface texture is a loam with fine-loamy subsurface. It is a Wyoming Big Sagebrush – Needlegrass community. It has an aridic ustic moisture regime and a frigid temperature regime. The effective precipitation ranges from 12 to 16 inches.</p>
R048AY228CO	<p>Mountain Loam</p> <p>This site occurs mainly alluvial fans, mountain slopes, benches, terraces, or hills. Slopes average between 5 and 10% but can range from 0 to 30%. Soils are moderately deep to deep (20-60 inches) loamy soils derived from residuum from igneous and metamorphic rocks or sandstone and shale; slope alluvium from sandstone and shale, or igneous and metamorphic rocks; colluvium from igneous and metamorphic rocks or sandstone and shale, and/or alluvium from igneous and metamorphic rocks. Soil surface texture are loam, sandy loam or silt loam with loamy subsurface. It is a Mountain Big Sagebrush - Arizona Fescue community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>
R048AY004NM	<p>Mountain Loam</p> <p>This site is on steep to moderately steep slopes on benches within the steeper slopes of the surrounding ponderosa pine tree zone. The slope is to the southwest; south and southeast, making the site directly exposed to the dry south and southwest winds and more intensive heat from the sun. Slopes vary from 5 to 70 percent. Elevation ranges from 6,900 to 9,000 feet above sea level. The soils on this site are moderately deep to deep and well drained. The surface texture is stony/cobbly silt loam or cobbly loam. The subsurface is stony loam or cobbly loam. They have a moderate permeability. The available water-holding capacity is low. Effective rooting depth is from 20 to 40 inches. There is cobble or stone throughout the profile and on the surface.</p>

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Hesperostipa comata</i> (2) <i>Pascopyrum smithii</i>

Physiographic features

This site is on low hills, fans, terraces, and uplands in deep alluvium, colluvium, or eolian materials. Elevation ranges from 7500 to 8700 feet (2850 to 2650 meters).

Table 2. Representative physiographic features

Landforms	(1) Fan (2) Terrace
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	2,286–2,652 m

Slope	0-15%
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Climatic features

The climate is arid with precipitation averaging 13 to 18 inches (35 to 46 centimeters). The approximate growing season for the native plant community averages 85 to 110 days or from June 9 to September 1. In average years, there is sufficient moisture at the beginning of the growing season to initiate growth in such cool season grasses as western wheat, needleandthread, and bottlebrush squirreltail. Their optimum growing season is early May through July. The warm season grasses such as blue grama have their optimum growing season from July through August. About 40 percent of the annual precipitation falls in the form of rain during the frost free season. There are 2 days per year that the precipitation equals or exceeds 1.0 inches (2.5 cm), and 7 days that meets, equals or exceeds 0.5 inches (1.3 cm).

The average annual temperature is 42 degrees F. (6 degrees C). With one day higher than 90 degrees F (32 degrees C) and 35 days lower than 0 degrees F (-18 degrees C). Temperatures fall below the freezing mark much of the time in September through March. The last killing frosts may occur as late as June 10.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	330-457 mm
Frost-free period (actual range)	
Freeze-free period (actual range)	
Precipitation total (actual range)	330-457 mm
Frost-free period (average)	54 days
Freeze-free period (average)	91 days
Precipitation total (average)	381 mm

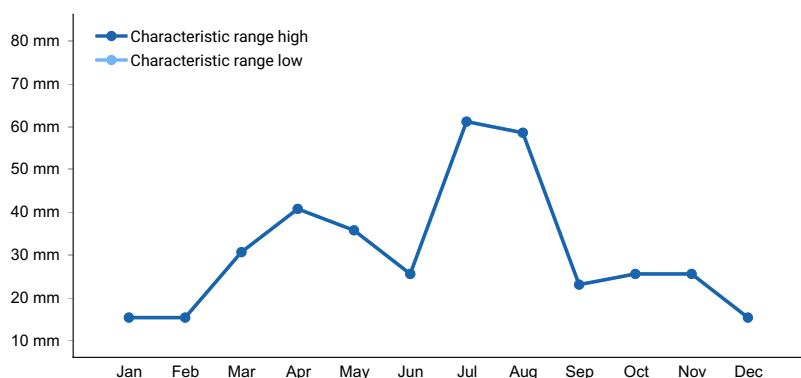


Figure 1. Monthly precipitation range

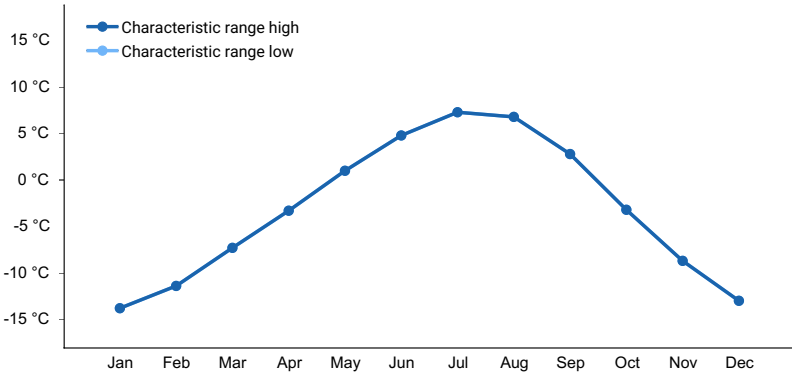


Figure 2. Monthly minimum temperature range

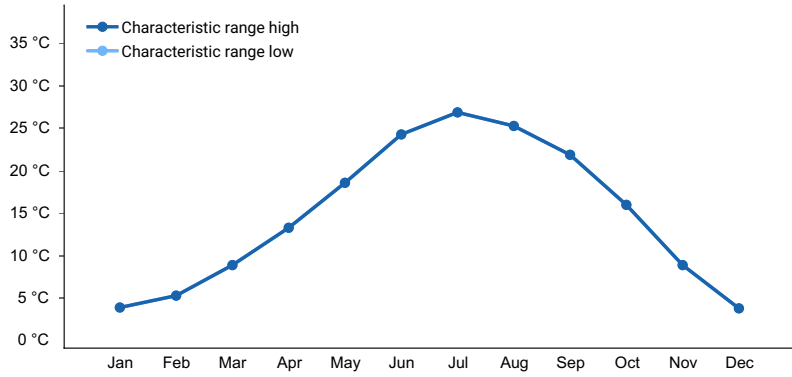


Figure 3. Monthly maximum temperature range

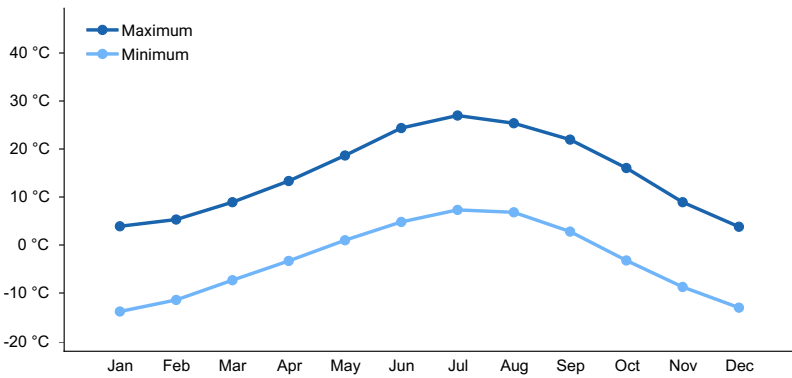


Figure 4. Monthly average minimum and maximum temperature

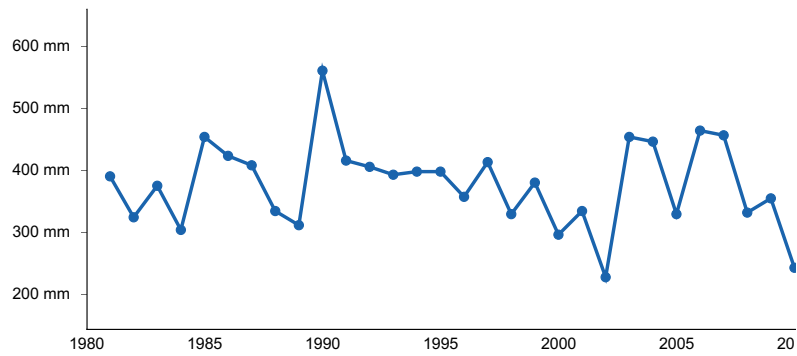


Figure 5. Annual precipitation pattern

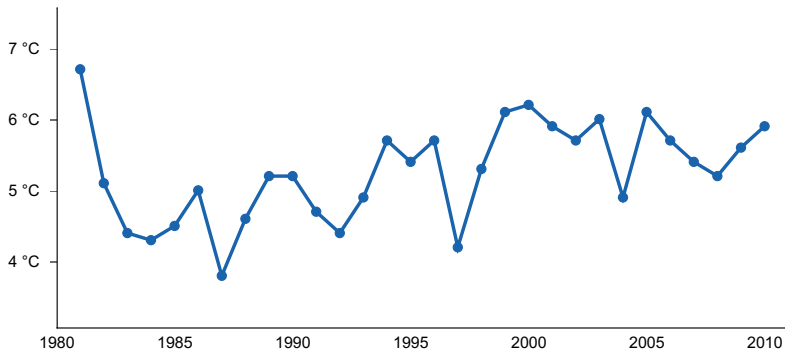


Figure 6. Annual average temperature pattern

Climate stations used

- (1) WESTCLIFFE [USC00058931], Westcliffe, CO

Influencing water features

None

Soil features

Soils comprising this site are well drained soils which occur on low hills, fans, terraces, and uplands in alluvium, colluvium and eolian materials. Typically the surface soils are sandy loam or gravelly sandy loam. Gravel content normally does not exceed 15 percent. Subsoil include sandy, gravelly, or cobbly sandy loam and sandy clay loam. Substratum are channery and gravelly or very gravelly sandy loam.

Permeability is moderate to moderately rapid. Erosion hazard is high. Rooting depth is generally over 40 to 60 inches, but available water holding capacity is low.

Major soil associated with this site: Buena Vista, Feltonia, Martinsdale, Silvercliff

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Colluvium (3) Eolian deposits
Surface texture	(1) Sandy loam (2) Gravelly sandy loam
Family particle size	(1) Fine-loamy
Soil depth	102–152 cm
Surface fragment cover <=3"	0–15%

Ecological dynamics

If ecological retrogression is cattle or elk induced, desirable grasses decrease. Under continuous early spring grazing, western wheatgrass and mountain muhly, and needleandthread will decrease relatively fast. Bottlebrush squirreltail, and blue grama will initially increase, but with continued retrogression long grazing, these too will decline giving room for an increase in ring muhly and invasion by sleepy grass.

With regression, winterfat quickly declines and disappears. Other shrubs and half shrubs, such as rubber rabbitbrush, and gray horsebrush increase along with forbs such as Oregon fleabane, pingue hymenoxys, Nebraska lupine, Drummond's milkvetch, shorts milkvetch, senecio species, and sulfur buckwheat.

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states”

(aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates and intensities of fire, herbicide treatment, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram.

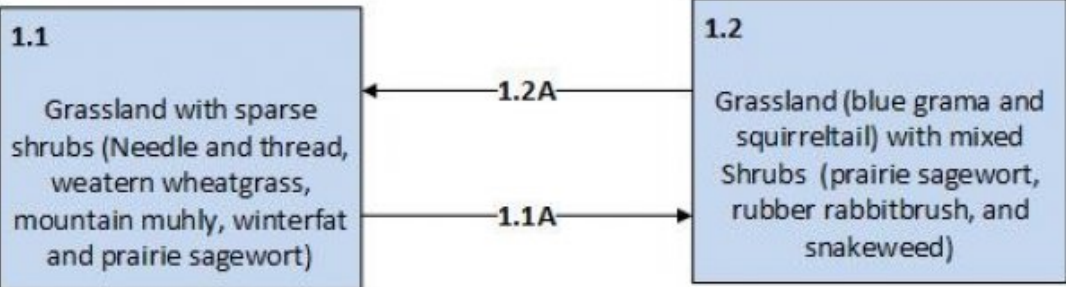
The plant communities shown in this State and Transition Model may not represent every possibility but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added.

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

State and transition model

R048AY226CO Mountain Loam

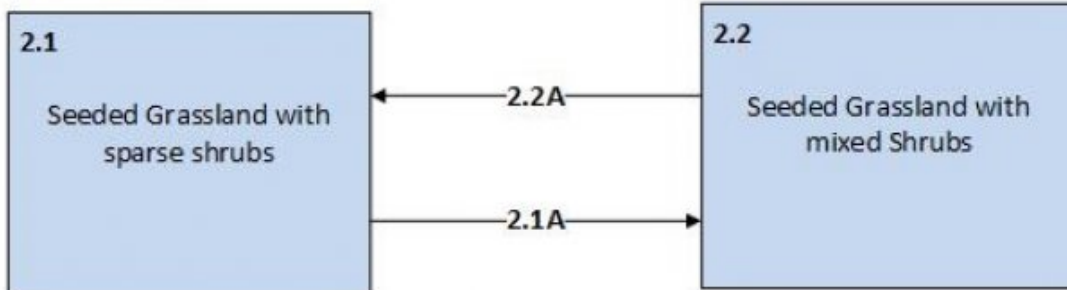
1. Reference State



R2A

T1A

2. Seeded State



Legend

1.1A, 2.1A – lack of fire, time without disturbance and improper grazing

1.2A, 2.2A – fire, insect herbivory, browsing of shrubs, and/or drought

T1A – Seeding

R2A – natives reestablished over extended time periods

State 1

Reference State

c. If ecological retrogression is cattle or elk induced, desirable grasses decrease. Under continuous early spring grazing, western wheatgrass and mountain muhly, and needleandthread will decrease relatively fast. Bottlebrush squirreltail, and blue grama will initially increase, but with continued retrogression long grazing, these too will decline giving room for an increase in ring muhly and invasion by sleepy grass. With regression, winterfat quickly declines and disappears. Other shrubs and half shrubs, such as rubber rabbitbrush, and gray horsebrush increase along with forbs such as Oregon fleabane, pingue hymenoxys, Nebraska lupine, Drummond's milkvetch, shorts milkvetch, senecio species, and sulfur buckwheat.

Community 1.1

Reference State

The plant community is about 80 percent grass, 5 percent forbs, and 10 percent half shrubs, air dry weight. Dominant grasses are needleandthread, western wheatgrass, and mountain muhly. Less abundant grasses include blue grama and Arizona fescue and ring muhly. Forbs present in the plant community include Oregon fleabane, sulfur buckwheat, Nebraska lupine, shorts milkvetch, Drummond milkvetch, wholeleaf paintedcup, pingue hymenoxys, and tufted evening primrose. Shrubs and half shrubs that occur on this site are dominated by fringed sagebrush, broom snakeweed, winterfat, and rubber rabbitbrush. Other half shrubs include spreading erigonum, gray horsebrush, small soapweed (yucca), plains prickly pear, and snowball cactus. An occasional stunted pinon pile is common

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	577	762	970
Shrub/Vine	67	90	123
Forb	28	45	84
Total	672	897	1177

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			616–897	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	179–269	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	135–179	–
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	90–135	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	45–90	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–56	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	27–45	–
	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	0–45	–
	ring muhly	MUTO2	<i>Muhlenbergia torreyi</i>	9–18	–
Forb					
2	Forbs			28–84	
	aspen fleabane	ERSP4	<i>Erigeron speciosus</i>	18–27	–
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	9–18	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–17	–
	Nebraska lupine	LUPL	<i>Lupinus plattensis</i>	0–9	–
	Short's milkvetch	ASSH3	<i>Astragalus shortianus</i>	0–9	–
	wholeleaf Indian paintbrush	CAIN14	<i>Castilleja integra</i>	0–9	–
	pingue rubberweed	HYRI	<i>Hymenoxys richardsonii</i>	0–9	–
	Drummond's milkvetch	ASDR3	<i>Astragalus drummondii</i>	0–9	–
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0–9	–
Shrub/Vine					
3	Shrubs			56–112	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	27–45	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	18–45	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	27–45	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–28	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	18–27	–
	spreading buckwheat	EREF	<i>Eriogonum effusum</i>	9–27	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	9–18	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	0–18	–
	wax currant	RICE	<i>Ribes cereum</i>	0–9	–
	mountain ball cactus	PESIM	<i>Pediocactus simpsonii var. minor</i>	0–9	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–9	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–9	–

Animal community

This range site provides habitat for a resident animal community that is characterized by small mammals, birds, mule, deer, and pronghorn antelope. This site provides valuable winter forage for both deer and elk.

Livestock Grazing:

This site provides excellent grazing value for livestock where adequate livestock. Needle-and-thread and western wheat provide good early summer grazing for this high altitude rangeland. Heavy, continuous grazing during spring months by cattle, however, will cause these two species to decline and be replaced by less productive warm season grasses such as blue grama and poor quality forbs and shrubs and half shrubs. Grazing systems should be designed to limit grazing periods during the spring months, and provide the deferment through July once every three or four years.

When in low fair or poor ecological condition, this site can be successfully reseeded to a western wheatgrass and crested wheatgrass mixture.

Wildlife Values

Include habitat values for specific resident animals. Discuss changes in wildlife values due to retrogression, and possible methods of improving values through brush management, prescribed burning, etc.

Hydrological functions

Soils in this site are grouped into "B" hydrologic group, as outlined in the "Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings 1983" handbook. Field investigations are needed to determine hydrologic cover conditions and hydrologic curve numbers. Refer to SCS National Engineering Handbook, Section 4 and Peak Flows in Colorado handbook for more information.

Recreational uses

Recreational activities include antelope and elk hunting. Forbs which bloom in May add to the sites limited natural beauty.

Wood products

None

Inventory data references

North of Westcliffe, Colorado along the Copper Gulch road in Custer and Fremont Counties.

This site is located in Fremont County and surrounding area.

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)	Kim Diller
Contact for lead author	
Date	07/31/2006
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** None to minimal on gentle slopes. Flow paths should be disconnected, irregular in appearance with obstructions altering flow path.

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5% or less bare ground, with bare patches generally less than 3 inches in diameter. Extended drought can cause bare ground to increase upwards to 10 inches in diameter.

5. **Number of gullies and erosion associated with gullies:** None

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

7. **Amount of litter movement (describe size and distance expected to travel):** Minimal and short. Litter movement is associated with water flow patterns.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class rating anticipated to be 5-6 at soil surface. Soil surface is stabilized by decomposing organic matter.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil organic matter ranges from 2-4%. Soils are deep and well drained. Surface texture is a sandy loam. A-horizon ranges from 0-15 inches in depth with dark brown, grayish brown, or dark grayish brown color and has a weak to moderate/fine to coarse granular structure.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Cover from sod forming grasses, bunchgrasses, forbs, and shrubs reduce bare ground. Raindrop impact is reduced as well as overland flow, providing increased time for infiltration to occur. Extended drought may reduce short/mid bunchgrass basal cover resulting in decreased infiltration and increased runoff following intense storms.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

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: None

Sub-dominant: cool season mid bunchgrasses > cool season mid rhizomatous grass warm season bunch short grasses shrubs grasslikes

Other: forbs > leguminous forbs

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Expect slightly more bunchgrass mortality during and following drought. Lack of disturbance will increase occurrence of decadence.

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14. **Average percent litter cover (%) and depth (in):** 30-40% litter cover at .25 inches in depth. Litter cover during and following extended drought decreases to 15-25%
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 600 lbs.lac. low precipitation years; 800 lbs.lac. average precipitation years; 1,050 lbs.lac. above average precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 300-500 lbs.lac. or more.
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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:** Invasive plants should not occur in the reference plant community. Annuals may temporarily occupy the site following extended drought or fire if a seed source is available.
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17. **Perennial plant reproductive capability:** The only limitations are weather-related, wildfire, natural disease, and insects that; temporarily reduce reproductive capability.
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