

# **Ecological site EX049X01X220**

## **Ponderosa Loam Palmer Divide Palmer Divide**

Last updated: 4/09/2025

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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): 049X–Southern Rocky Mountain Foothills

MLRA 49 is in Colorado (58 percent), Wyoming (27 percent), and New Mexico (15 percent). It makes up about 11,130 square miles (28,845 square kilometers). The major cities in or adjacent to this MLRA are Laramie, Wyoming; Fort Collins, Boulder, Denver, Colorado Springs, and Pueblo, Colorado; and Santa Fe and Las Vegas, New Mexico. Interstates 25, 70, and 80 cross the MLRA. Part of the Medicine Bow National Forest is in the northern tip of this area, in Wyoming; parts of the Roosevelt, Pike, and San Isabel National Forests are in this area in Colorado; and part of the Santa Fe National Forest is in the southern end of this area, in New Mexico. The Rocky Flats Nuclear Arsenal, Peterson Air Force Base, most of the Air Force Academy grounds, and part of the Fort Carson Military Reservation are in the part of this area in Colorado.

Almost half of this area is in the Southern Rocky Mountains and Wyoming Basin Provinces in the Rocky Mountain System. The rest is in the Colorado Pediment, Raton, and High Plains Sections of the Great Plains Province of the Interior Plains. The northern part of the MLRA consists of the Laramie Mountains. The central and southern parts generally are bounded on the east by the Great Plains and on the west by the Southern Rocky Mountains. Elevation ranges from 5,000 feet (1,525 meters) to 8,000 feet (2,440 meters) in most of the MLRA, but small mountains in the area are as high as 10,000 feet (3,050 meters). The Laramie and North Platte Rivers and their associated tributaries are the principal streams in the Wyoming portion of the MLRA. The Cache La Poudre, Big Thompson, Saint Vrain, South Platte, Arkansas, Saint Charles, Huerfano, Cucharas, and Purgatoire Rivers, Clear Creek, Fountain Creek, and their associated tributaries are the principal streams in the Colorado portion. The Vermejo, Cimarron, Pecos, and Mora Rivers and their associated tributaries are the principal streams in the New Mexico portion.

This area has been impacted by the geologic processes of uplift, folding, and faulting and by subsequent erosion and deposition. The Southern Rocky Mountains were uplifted 50 to 70 million years ago during the Laramide uplift. Most of this MLRA is adjacent to this uplift and was also affected. The uplift induced erosion of the relatively soft Late Pennsylvanian to Cretaceous sedimentary rocks from the uplands and dissected the underlying crystalline Precambrian rocks. The relief of the area was reduced by a combination of erosion of uplands and alluvial filling. Approximately 7 million years ago, a large portion of the area was uplifted again to elevations of 14,000 feet (4,270 meters) or more at the core of the Laramide uplift. Since then, precipitation occurring as both rain and snow led to the renewal of erosion and subsequent alluvial fills. The Wyoming portion of the MLRA, the Laramie Mountains, consists primarily of Precambrian plutonic rocks with Pennsylvanian and Permian sedimentary rocks folded and faulted at the margin of the range. The Colorado and New Mexico portions of the area consist primarily of remnants of the uplifted and folded Pennsylvanian through Cretaceous sedimentary rocks forming hogbacks, ridges, and hills, the ranges of which trend in a general north-south direction, parallel to the uplifted Southern Rocky Mountains. Tertiary volcanic flows filled valleys in some areas. After extensive erosion, these more resistant volcanic rocks now form prominent mesas, such as North and South Table Mountains near Golden, Colorado, and Fishers Peak Mesa near the Colorado-New Mexico border. Stream erosion from the eastern front of the Southern Rocky Mountains fostered the creation of a sequence of large alluvial fan remnants, pediments, and terrace deposits in this MLRA.

The average annual precipitation is 12 to 25 inches (305 to 635 millimeters) in most of this area, but it ranges from 10 to 35 inches (255 to 890 millimeters), generally increasing with elevation. The highest precipitation occurs in the Laramie Mountains, in Wyoming, and the lowest precipitation occurs in the Arkansas River Valley, above Salida, Colorado. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Winter precipitation occurs as snow. The average annual temperature is 36 to 54 degrees F (2 to 12 degrees C). The freeze-free period averages 140 days and ranges from 90 to 195 days, decreasing in length with elevation and from south to north.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the Colorado and New Mexico portions of the MLRA dominantly have a frigid or mesic soil temperature regime. Those in the Wyoming portion have a frigid or cryic soil temperature regime. A few of the higher peaks and some north aspects have a cryic soil temperature regime. Most of the soils in the area have an ustic soil moisture regime, but those on the higher peaks and on some north aspects have a udic soil moisture regime. The soils in the area dominantly have smectitic or mixed mineralogy. They are very shallow to very deep and are dominantly well drained. The texture is dominantly loamy in soils that formed in material weathered from igneous and metamorphic rocks and is dominantly loamy or clayey in soils that formed in material weathered from sedimentary rocks. Some of the most extensive and representative great groups are Haplustolls (Baller series), Argiustolls (Nederland, Nunn, Santa Fe, and Enmedio series), Haplustalfs (Fort Collins, Stoneham, and Dargol series), Haplustepts (Stout series), Ustorthents (Lorencito

and Saruche series), and Paleustolls (Flatirons series). (USDA-NRCS, 2006)

## **Classification relationships**

NRCS:

Major Land Resource Area 49, Southern Rocky Mountain Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:

M331Ib – North Front Range; M331Ic – North Laramie Mountains; M331Id – South Laramie Mountains; and M331Ii – Northern Arkansas Granitics – 39 mile Mountain M331I – Northern Parks and Ranges M331 - Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331Fb – Wet Mountains; M331Fc – Wet Mountain Valley; M331Ff – Raton Basin; M331Fg – Sangre de Cristo Mountains Woodland; and M331Fh – Sangre de Cristo Mountains Coniferous Forest M331F – Southern Parks and Rocky Mountain Range M331 - Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

331If – Arkansas Valley Tablelands; 331Ig- Arkansas Valley High Tablelands; 331Ih – Black Forest; and 331Ii – Southern Front Range Foothills < 331I – Arkansas Tablelands < 331 Great Plains – Palouse Dry Steppe

331Ha – Southern Denver-Julesburg Basin; 331Hc – Eastern Central High Plains; 331He – Northern Front Range Foothills and 331Hf – Denver-Julesburg Basin < 331H – Central High Plains < 331 Great Plains – Palouse Dry Steppe

EPA:

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

25c – Moderate Relief Plains, 25d – Flat to Rolling Plains, and 25l – Front Range Fans < 25 High Plains < 9.4 South Central Semi-Arid Prairies < 9 Great Plains (Griffith, 2006).

26e – Piedmont Plains and Tablelands, 26f- Mesa de Maya/Black Mesa, 26h- Pinyon-Juniper Woodlands and Savannas, 26i – Pine-Oak Woodlands, 26j – Foothills Grasslands, 26k – Sandsheets, and 26l – Upper Canadian Plateau < 26 Southwestern Tablelands < 9.4 South Central Semi-arid Prairies < 9 Great Plains (Griffith, 2006).

USGS:

Southern Rocky Mountain Province, Colorado Piedmont and Raton

## Ecological site concept

R049XY220CO Ponderosa Loam occurs on fans, valley sides, mountain slopes, lava plateau and drainageways. Slopes is between 1 to 35%. Soils are deep with depths of greater than 60 inches. Soils are derived from alluvium from arkose or sandstone. Soil surface texture is sandy loam, loam or stony coarse sandy loam. Family particle size is coarse-loamy or fine loamy. It is a Mountain Muhly – Arizona Fescue plant community. It has a typic ustic moisture regime. The effective precipitation ranges from 15 to 18 inches.

## Associated sites

R049XB210CO	<p><b>Sandy Foothill</b> This site occurs on gently sloping to rolling hills and uplands. Slopes is between 0 to 10%. Soils are greater than 40 inches. Soils are derived from alluvium, eolian deposits, eolian sands, and residuum primarily from arkosic sedimentary rock and sandstone. Soil surface texture is loamy sand, sandy loam or fine sandy loam. Family particle size is coarse-loamy or sandy. It is a Big Bluestem– Prairie Sandreed community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.</p>
R048AY241CO	<p><b>Mountain Meadow</b> This site occurs flood plains, stream terraces, drainageways, ephemeral streams, flood-plain step and depressions. This site has natural sub-irrigation. Slopes is between 0 to 12%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived from alluvium from sandstone and shale, sedimentary rock, igneous, metamorphic and sedimentary rock, or shale. Soil surface texture is loam, silty clay loam, clay loam, clay, sandy clay loam or sandy loam with fine-loamy or fine textured subsurface. It has a typic aquic or oxyaquic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>

## Similar sites

R048AY255CO	<p><b>Pine Grasslands</b> This site occurs on structural benches, dip slopes, hills, mesas and canyon benches. Slopes is between 0 to 30%. This site has more than one soil concept correlated to it. The concepts are shallow soils (&lt;20</p>
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**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Muhlenbergia montana</i> (2) <i>Festuca arizonica</i>

## Legacy ID

## Physiographic features

This site occurs on broad plains, valley slopes, and fans. Slopes are normally between 1 and 25 percent. Elevation ranges from 6,600 to 8,500 feet (2,012 to 2,591 meters). Elevation limits depend to some extent on exposure, but are principally affected by storm patterns and air movement.

**Table 2. Representative physiographic features**

Landforms	(1) Fan (2) Valley side (3) Mountain slope (4) Lava plateau (5) Drainageway
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	2,012–2,591 m
Slope	1–25%
Aspect	Aspect is not a significant factor

## Climatic features

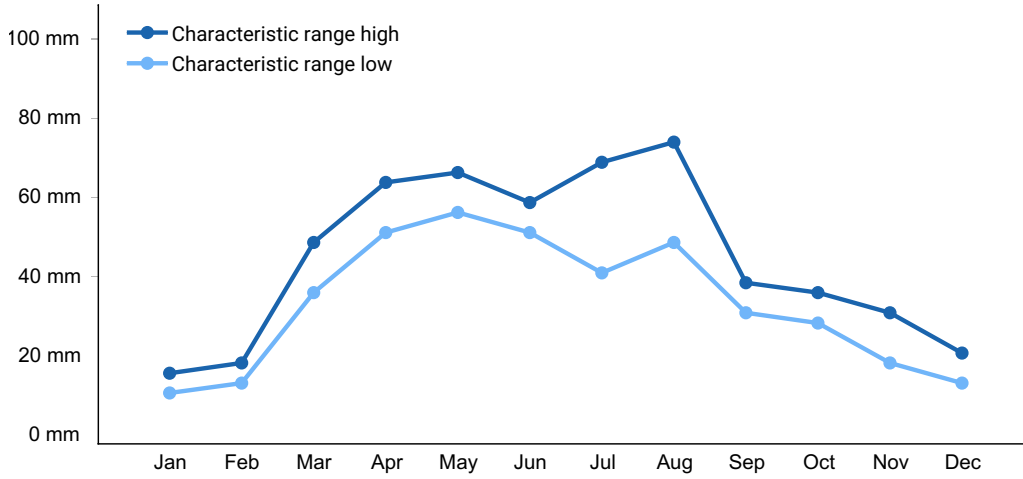
Average annual precipitation is 15 inches to 18 inches (38.1 to 45.7 cm) with 50 to 60 percent of the moisture falling between May 1 and September 1. Amount of snowfall averages 65 inches (165.1 cm) annually.

Cool-season plants dominate the site. Plant growth begins April 15 to May 15. Optimum plant growth is during May, June, and early July. The length of the growing season is 110-120 days (based on 32 degrees F threshold). The average annual temperature is 45 degrees F (7.2 degrees C).

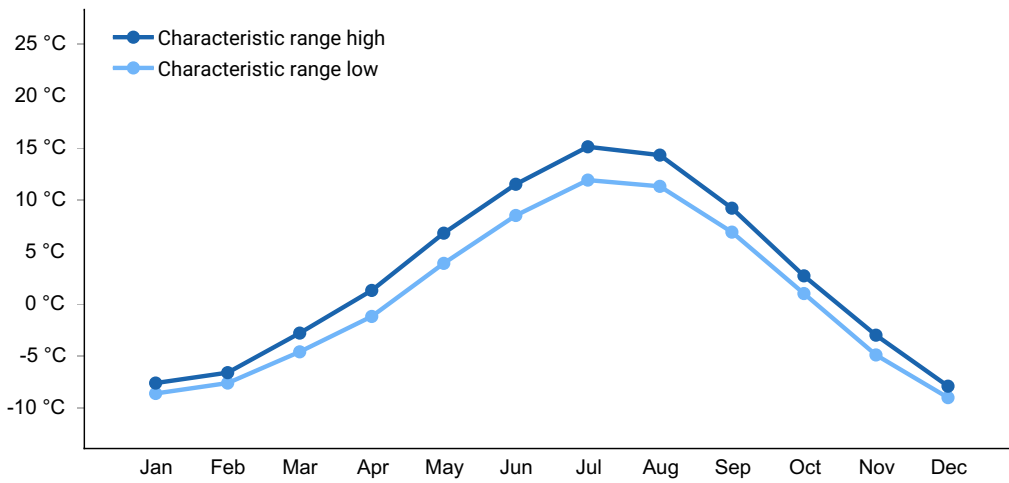
**Table 3. Representative climatic features**

Frost-free period (characteristic range)	101-120 days
Freeze-free period (characteristic range)	127-143 days
Precipitation total (characteristic range)	432-457 mm
Frost-free period (actual range)	87-120 days
Freeze-free period (actual range)	110-157 days

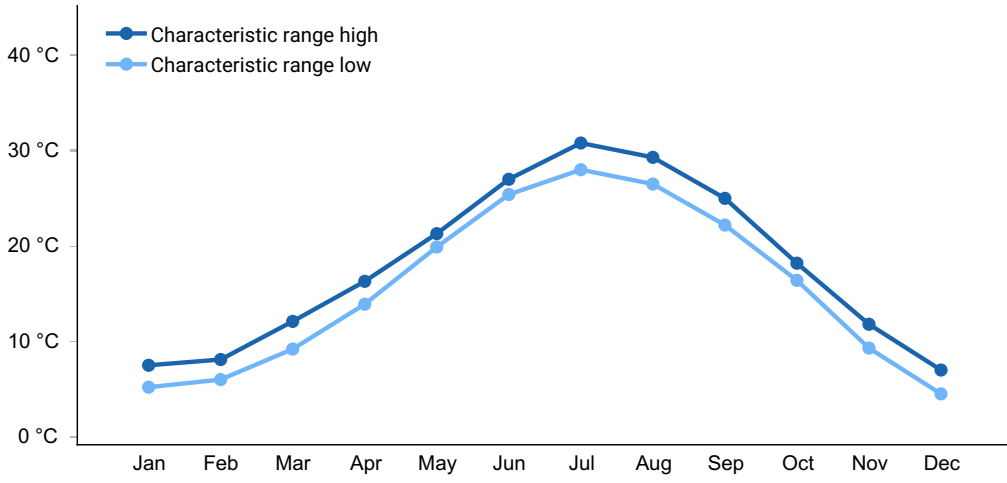
Precipitation total (actual range)	381-457 mm
Frost-free period (average)	109 days
Freeze-free period (average)	134 days
Precipitation total (average)	457 mm



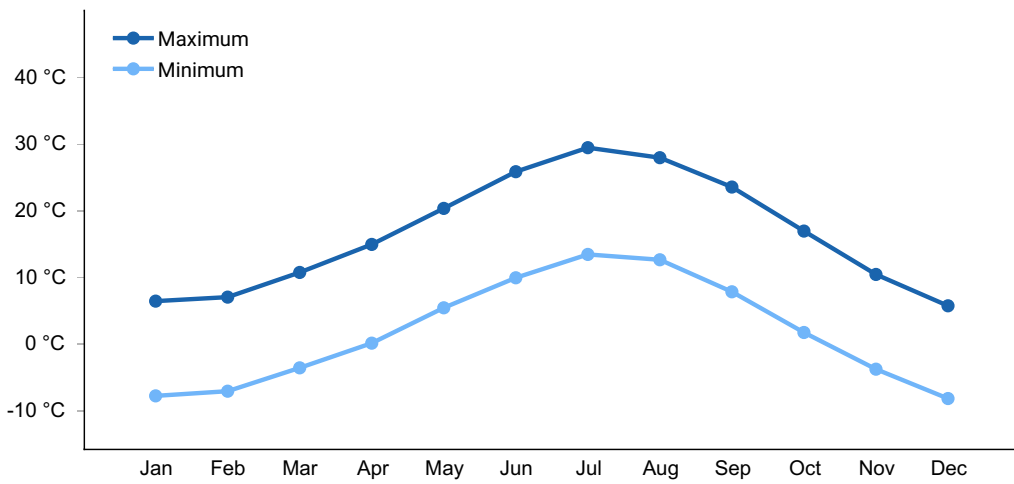
**Figure 1. Monthly precipitation range**



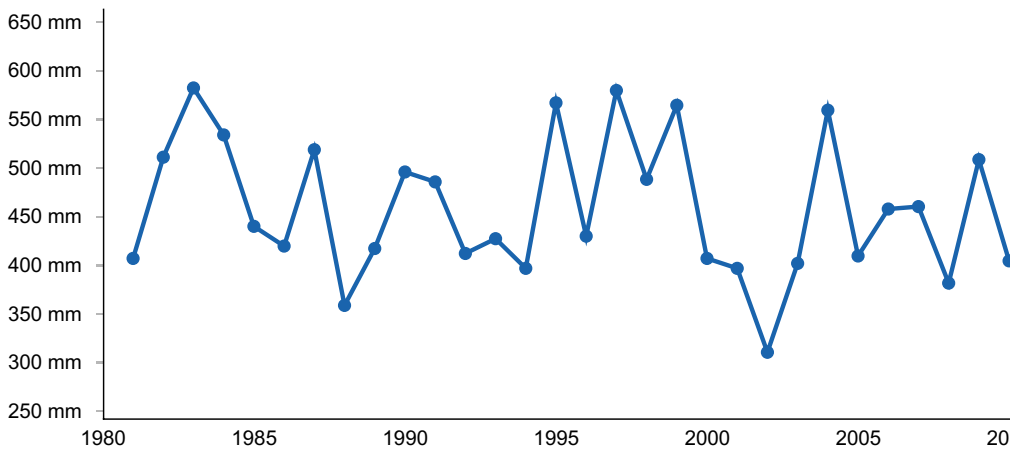
**Figure 2. Monthly minimum temperature range**



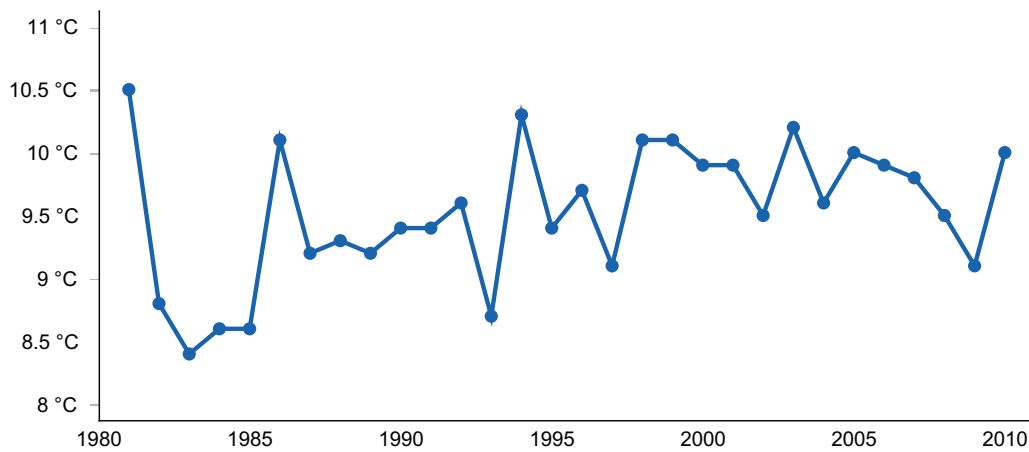
**Figure 3. Monthly maximum temperature range**



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



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) COLORADO SPRINGS MUNI AP [USW00093037], Colorado Springs, CO
- (2) WATERDALE [USC00058839], Loveland, CO
- (3) VIRGINIA DALE 7 ENE [USC00058690], Livermore, CO
- (4) KASSLER [USC00054452], Littleton, CO
- (5) RALSTON RSVR [USC00056816], Arvada, CO
- (6) CASTLE ROCK [USC00051401], Castle Rock, CO
- (7) MONUMENT [USC00055734], Monument, CO

## Influencing water features

None

## Soil features

The soils of this site are deep and well drained with a dark grayish-brown surface layer. These soils are on upland ridges, broad plains, valley slopes, and terraces. They are formed from calcareous and arkosic reworked alluvium; arkosic alluvium; igneous, metamorphic sedimentary and calcareous residual; and calcareous eolian.

Intake rates are moderate to slow. Available water capacity is high. Roots penetrate the soil readily. On the flatter slopes the runoff is slow and the erosion hazard is slight. On steeper slopes the runoff is moderate to high and the erosion hazard increases to moderate.

Major soils associated with this area:

Soil Unit & % Slope

Breece sandy loam 5-15

Brussett loam 1-3

Jarre loam 5-25

## Goldvale stony coarse sandy loam 9-55

**Table 4. Representative soil features**

Parent material	(1) Alluvium–arkose (2) Alluvium–sandstone (3) Alluvium
Surface texture	(1) Sandy loam (2) Loam (3) Stony coarse sandy loam
Family particle size	(1) Coarse-loamy (2) Fine-loamy (3) Fine-silty (4) Fine
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	152–254 cm
Surface fragment cover ≤3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (Depth not specified)	8.64–18.8 cm
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.6–7.3
Subsurface fragment volume ≤3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0–20%

## Ecological dynamics

If ecological retrogression is cattle induced, desirable grasses will decrease. However, if retrogression is sheep induced, desirable forbs, shrubs, and grasses may be reduced. Deterioration of the site will decrease mountain muhly, Arizona fescue, Parry oatgrass, and western wheatgrass. Deterioration of the site will increase blue grama, prairie junegrass, sedges, and native forbs and shrubs. Plant species likely to invade the site and become a

part of the plant community when the range is in a deteriorated condition are annual forbs, curlycup gumweed, sleepy grass, flannel mullein, slimstem muhly, and cheatgrass.

Annual Production:

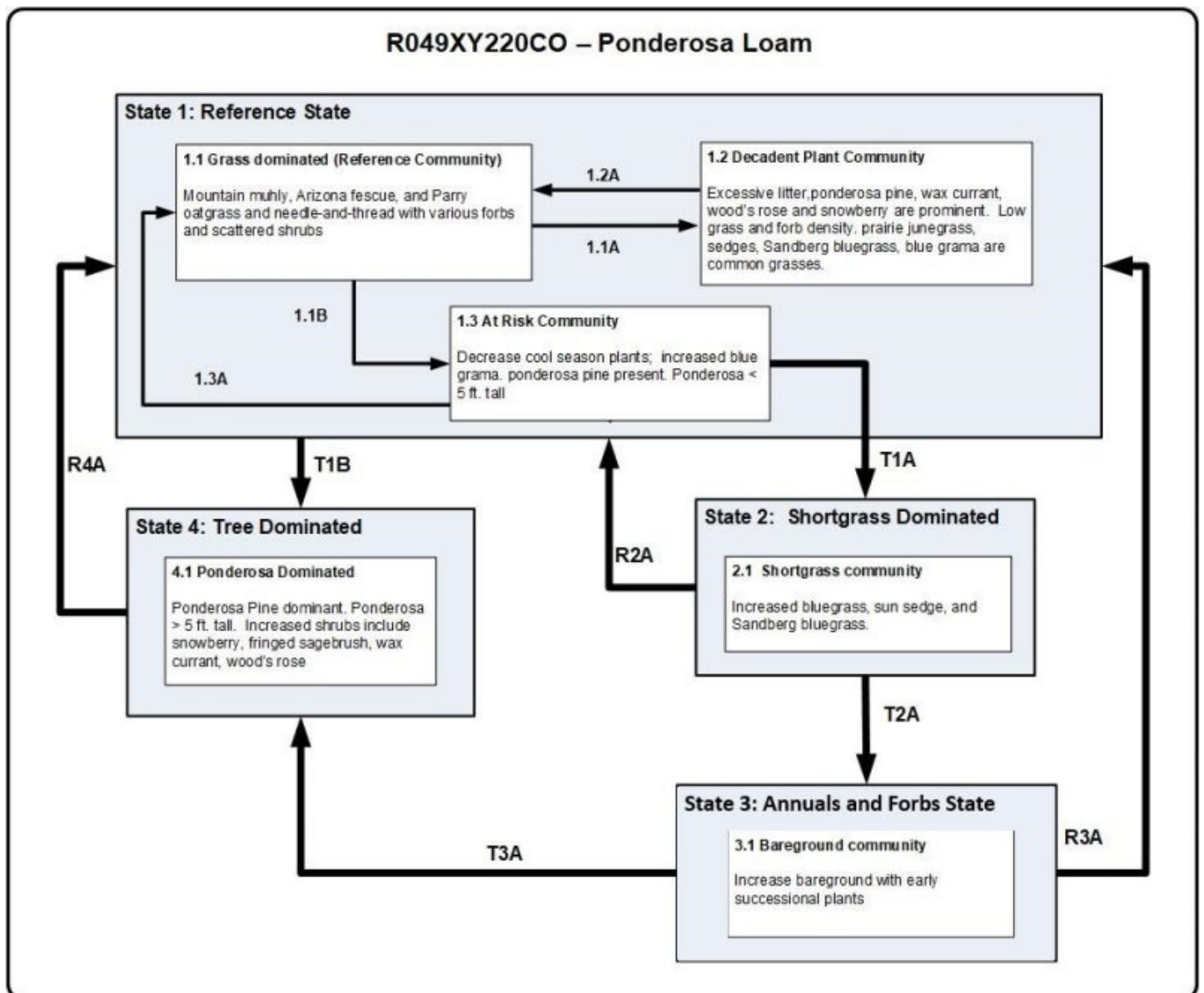
favorable years 1700 lbs/ac 1928 kg/ha

normal years 1200 lbs/ac 1360 kg/ha

unfavorable years 600 lbs/ac 680 kg/ha

Of this production 10 to 15% will likely be unpalatable or out of reach to grazing animals.

## State and transition model



## Legend

- 1.1A – lack of native herbivory, time without disturbance, lack of fire
- 1.2A – increase fire return interval, increased native herbivory
- 1.3A – lack of native herbivory, time without disturbance, wetter climate period
- 1.1B – drought, reduced fire frequency, repeated herbivory without recovery time, tree encroachment
- T1A – continuous grazing and/or high stocking rates
- R2A, R3A – long-term prescribed grazing and proper stocking rates over lengthy time frame, wetter climatic cycles
- T2A – heavy continuous grazing, long-term non-use, long term continuous grazing
- T1B – heavy continuous grazing, lack of fire, tree encroachment
- R4A – fire, insect/disease, vegetation manipulation (brush management, seeding), long-term prescribed grazing
- T3A – lack of fire, juniper encroachment

## State 1 Reference

The native plant community is approximately 80 to 90% (air-dry weight) grasses, 10 to 15% forbs and 2 to 5% shrubs. Three major bunch grasses dominate the plant community; mountain muhly, Arizona fescue, and Parry oatgrass. These three comprise 70% of the total annual production of this site. Grasses making up lesser percentages are western wheatgrass, prairie junegrass, needleandthread, and blue grama. A small amount of other grasses, a variety of forbs, and a few shrubs comprise the rest of the total annual production. Trees are normally absent from the native plant community but an occasional ponderosa pine may invade the site from adjacent woodland.

## Community 1.1 Reference State

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	572	1143	1620
Forb	67	135	191
Shrub/Vine	34	67	95
<b>Total</b>	<b>673</b>	<b>1345</b>	<b>1906</b>

## Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Grasses and Grasslike Plant</b>			538–1715	

	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	336–471	–
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	336–404	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	202–269	–
	Parry's oatgrass	DAPA2	<i>Danthonia parryi</i>	135–202	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	67–135	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	67–135	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	11–67	–
	Grass, native	2GN	<i>Grass, native</i>	1–67	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	11–40	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	11–40	–
	Geyer's sedge	CAGE2	<i>Carex geyeri</i>	11–27	–
	muttongrass	POFE	<i>Poa fendleriana</i>	11–27	–
<b>Forb</b>					
2	<b>Forbs</b>			56–224	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–67	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	2–27	–
	Drummond's milkvetch	ASDR3	<i>Astragalus drummondii</i>	2–27	–
	Missouri milkvetch	ASMI10	<i>Astragalus missouriensis</i>	2–27	–
	Wyoming Indian paintbrush	CALI4	<i>Castilleja linariifolia</i>	2–27	–
	hairy clematis	CLHI	<i>Clematis hirsutissima</i>	2–27	–
	twolobe larkspur	DENU2	<i>Delphinium nuttallianum</i>	2–27	–
	trailing fleabane	ERFL	<i>Erigeron flagellaris</i>	2–27	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	2–27	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	2–27	–
	silvery lupine	LUAR3	<i>Lupinus argenteus</i>	2–27	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	2–27	–
	Torrey's penstemon	PEBAT	<i>Penstemon barbatus</i> <i>ssp. torreyi</i>	2–27	–
	sidebells penstemon	PESE11	<i>Penstemon secundiflorus</i>	2–27	–
	Rocky Mountain	DEST2	<i>Penstemon strictus</i>	2–27	–

	Rocky mountain penstemon	PEST2	<i>Penstemon strictus</i>	2-27	-
	upright blue beardtongue	PEVI4	<i>Penstemon virgatus</i>	2-27	-
	cutleaf anemone	PUPAM	<i>Pulsatilla patens ssp. multifida</i>	2-27	-
	mountain goldenbanner	THMOM3	<i>Thermopsis montana var. montana</i>	2-27	-
	foothill deathcamas	ZIPA2	<i>Zigadenus paniculatus</i>	2-27	-
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			28-101	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0-67	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	1-40	-
	wax currant	RICE	<i>Ribes cereum</i>	1-27	-
	Woods' rose	ROWO	<i>Rosa woodsii</i>	1-27	-
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	1-27	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	1-17	-

## Animal community

### Grazing:

This site provides excellent spring and early summer forage for cattle, horses, sheep, mule deer, antelope, and small mammals.

The animal forage preference changes as the spring season progresses into summer, fall, and winter. All of the grasses except blue grama are most desirable in the spring and early summer. Blue grama is more desirable in the summer and fall. Good management on this site necessitates that proper grazing use and planned deferment be followed so that these grasses are not grazed out and replaced by less desirable species.

Vegetative palatability will influence proper grazing use considerations. Relative palatability for each species will vary depending on the season of use, kind of grazing animal, past grazing use, and the associated plant species.

### Wildlife:

This site has a high potential for wildlife habitat because of the great variety and abundance of desirable grasses and forbs produced. This site provides habitat for mule deer, antelope, nongame birds, coyote, and small mammals.

### Threatened and Endangered Plants and Animals:

*Gaura neomexicana coloradensis* or Colorado butterfly weed has been reported as

endangered and has been reported in Douglas, Weld, and Lamar Counties. However its occurrence on this range site has not been proven.

#### Major Poisonous Plants to Livestock:

##### Common Name - Scientific Name - Season Dangerous - Animals Affected

foothills deathcamas - *Zigadenus paniculatus* - spring and early summer when fresh leaves, stems, flowers and other green forage is not available, most toxic at maturity - usually sheep but can affect cattle & horses

##### Effect and Symptoms -

Poisoning is cumulative. One-half pound will poison sheep. Symptoms are salivation, nausea, vomiting, lowered temperature, weakness shown by staggering or complete prostration, rapid breathing, and sometimes coma followed by death. Animals may lie for hours or even days before death.

Nuttall larkspur - *Delphinium nuttallianum* - spring and early summer when other green forage is not available - cattle, horses, rarely are sheep poisoned

##### Effect and symptoms -

Poisoning is cumulative. Symptoms include loss of appetite, salivation, muscular twitching, general uneasiness, and staggering gait. In advanced cases the animal falls and lies with feet extended more or less rigidly. Poisoned animals are constipated and severe cases are nauseated and bloating may occur.

silvery lupine - *Lupinus argenteus* - when other forage is scarce and if hay contains immature lupine pods (especially dangerous during seed stage) - all livestock are occasionally poisoned

##### Effect and symptoms -

Lupine seeds are toxic to sheep when .25 to 1.5% of the animal's body weight is consumed in one feeding. 150 to 175 gm (.33-.38 lbs) per day has been lethal to sheep. The toxic substance is a non-cumulative alkaloid. Small amounts ingested over a period of time create no difficulties.

*Lupinus sericeus* will cause crooked leg disease in calves during the 40th to 70th day of gestation and will cause other congenital deformities. The most characteristic symptom is labored breathing. Animals may vary from depression and coma to extreme activity. Animals may butt objects and other animals or may stand with lowered head pressing against a solid object. Death from respiratory paralysis follows a short period of convulsions.

Poisoning of cattle show dry nose, stilted walk, lethargy, depression, hard dry feces, rough

dry hair, coat, quivering, extreme body weakness, irregular heart beat, prostration, coma, and convulsions. Moving the animal exaggerates these symptoms.

broom snakeweed - *Xanthocephalum sarothrae* - when forage is scarce - cattle, sheep

Effects and symptoms -

Poisoning is not common but will occur on overgrazed ranges. Causes abortion in cattle and may produce weak underweight calves. Losses are sporadic and will occur when 10 to 20% of the body weight of green material is consumed in 1/2 to 20 weeks.

Lambert crazyweed - *Oxytropis lambertii* - all, especially spring - all

Effects and symptoms -

Poisoning is cumulative. Signs of poisoning appear after 2 to 3 weeks of continuous grazing. With acute poisoning in cows and ewes, abortion and congenital skeletal malformations frequently occur. Animals must eat large amounts for 2 to 5 weeks before death occurs. Constipation, incoordination of muscles and peculiar gait, crazed actions, loss of flesh, loss of sense of direction, and nervousness are the visible signs.

## Hydrological functions

The soils in this site are grouped into "B" and "C" hydrologic groups as outlined in the "Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings 1979" handbook. Field investigations are needed to determine hydrologic curve numbers. For group B and C the hydrologic curve numbers are about 61 and 74 respectively, when hydrologic conditions are good, as shown in the "Peak Flows in Colorado" handbook.

Refer to NRCS National Engineering Handbook, section 4, to determine runoff quantities from the curves.

## Recreational uses

This site has many forbs and some shrubs that bloom from early spring to early summer and are aesthetically pleasing. Hunting for mule deer and antelope is generally good to excellent on this site.

## Inventory data references

Location of Typical Examples of this site:

- a. Top of True Mountain sixteen miles south of Castle Rock, Colorado
- b. Table Mountain near Rye, Colorado

## 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.

Gay, Charles W. and Don D. Dwyer, Poisonous Range Plants. Cooperative Extension Service, Circular 391, New Mexico State University, pp. 1-21, June 1967.

James, L. F. and et al. Plants Poisonous to Livestock in the Western States. Agriculture Information Bulletin No. 415, pp. 1-90, November 1980.

Durrell, L. W., Rue Jensen, Bruno Klinger. Poisonous and Injurious Plants in Colorado. Bulletin 412-A, pp. 1-88, June 1952.

Soil Conservation Service (SCS). July 1984. Range Site Description for Ponderosa Loam #220. : USDA, Denver Colorado.

United States Department of Agriculture. 22 Plants Poisonous to Livestock in the Western States. Agriculture Information No. 327, pp. 1-64, April 1968.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

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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 are required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 49 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	11/08/2024
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:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
- 

14. **Average percent litter cover (%) and depth ( in):**
- 

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
- 

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**
- 

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