USDA Natural Resources Conservation Service

Ecological site R048AY309CO
Warm Alpine

Last updated: 3/05/2024
Accessed: 05/17/2024

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

48A:

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

R048AY309CO Warm Alpine occurs mountain-slopes, alluvial fan and valleys. Slopes is between 10 to 60 percent.

Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived mostly from alluvium from rhyolite, slope alluvium from rhyolite, tuff, sandstone and volcanic rocks or colluvium from rhyolite, tuff, and volcanic rocks. Soil surface texture very gravelly loam, loam or very stony sandy loam with loamy--skeletal subsurface. It is Thurber's Fescue community. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.

Associated sites

R048AY306CO	**Shrubby Alpine** R048AY306CO Shrubby Alpine occurs on cirque floors, mountains, mountain slopes and basin floor. Slopes is between 0 to 30%. Soils are greater than 60 inches in depth. Soils are derived mostly from till from conglomerate, sandstone or slope alluvium from basalt, rhyolite, andesite, tuff or volcanic breccia; or colluvium from andesite. Soil surface texture is very gravelly, cobbly, , or stony loam; or gravelly silt loam with loamy--skeletal subsurface. It is Kobresia – Tufted Hairgrass community. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.
R048AY304CO	**Alpine Slopes** R048AY304CO Alpine Slopes occurs on mountain-slopes, ridges, mountains and valleys. Slopes is between 30 to 60%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived mostly from colluvium and alluvium from volcanic, metamorphic and igneous rocks. Soil surface texture is gravelly, very gravelly, extremely gravelly, very cobbly, extremely cobbly, or very stony loam or extremely stony sandy loam with loamy--skeletal subsurface. It is Kobresia – Tufted Hairgrass community. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.
R048AY305CO	**Alpine Meadow** R048AY305CO Alpine Meadow occurs on depressions, drainageways, cirques, flood plains and steams. Slopes is between 0 to 15%. Soils are greater than 60 inches in depth. Soils are derived mostly from colluvium from Monzonite, volcanic rock; alluvium from volcanic rocks; or slope alluvium from Andesite or latite. Soil surface texture is loam, cobbly loam or silt loam. The underlying material to a depth of 60 inches or more is variable material ranging from sandy loam to clay loam with variable amounts and sizes of rock fragments. It is Kobresia – Tufted Hairgrass community. This site has a water table at 0 to 36 inches in depth. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.
R048AY308CO	**Shallow Alpine** R048AY308CO Shallow Alpine occurs mountain-slopes, ridges, mountains, basin floor, cirque floors, and valleys floors. Slopes is between 5 to 60%. Soils are shallow (7 to 20 inches). Soils are derived mostly from slope alluvium from tuff, rhyolite, andesite, basalt volcanic breccia, and other volcanic rocks; residuum from sandstone, tuff, rhyolite, volcanic breccia, basalt, andesite, and limestone; till from andesite, conglomerate or sedimentary rock; or colluvium from rhyolite, tuff, andesite, basalt, and other volcanic rocks. Soil surface texture is very gravelly, very stony, or very cobby loam; loam; very stony or very cobbly sandy loam, or very cobbly silt loam with loamy—skeletal or loamy subsurface. It is Kobresia – Tufted Hairgrass community. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.

Similar sites

R048AY308CO	**Shallow Alpine** R048AY308CO Shallow Alpine occurs mountain-slopes, ridges, mountains, basin floor, cirque floors, and valleys floors. Slopes is between 5 to 60%. Soils are shallow (7 to 20 inches). Soils are derived mostly from slope alluvium from tuff, rhyolite, andesite, basalt volcanic breccia, and other volcanic rocks; residuum from sandstone, tuff, rhyolite, volcanic breccia, basalt, andesite, and limestone; till from andesite, conglomerate or sedimentary rock; or colluvium from rhyolite, tuff, andesite, basalt, and other volcanic rocks. Soil surface texture is very gravelly, very stony, or very cobby loam; loam; very stony or very cobbly sandy loam, or very cobbly silt loam with loamy—skeletal or loamy subsurface. It is Kobresia – Tufted Hairgrass community. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.

R048AY252CO	**Subalpine Clay** R048AY252CO Subalpine Clay occurs on complex landslides, mountain slopes, mountainsides, and dip slopes. Slopes is between 0 to 40%. Soils are moderately deep to very deep (39to 60+ inches). Soils are derived from complex landslide deposits from igneous, metamorphic and sedimentary rock; colluvium from shale; colluvium and/or slide deposits over residuum weathered from igneous and sedimentary rock. Soil surface texture is loam, clay loam or silt loam with fine-textured subsurface. It is Thurber's Fescue – western wheatgrass – mountain snowberry. It has an ustic udic/typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 20 to 30 inches.
R048AY306CO	**Shrubby Alpine** R048AY306CO Shrubby Alpine occurs on cirque floors, mountains, mountain slopes and basin floor. Slopes is between 0 to 30%. Soils are greater than 60 inches in depth. Soils are derived mostly from till from conglomerate, sandstone or slope alluvium from basalt, rhyolite, andesite, tuff or volcanic breccia; or colluvium from andesite. Soil surface texture is very gravelly, cobbly, , or stony loam; or gravelly silt loam with loamy--skeletal subsurface. It is Kobresia – Tufted Hairgrass community. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.
R048AY305CO	**Alpine Meadow** R048AY305CO Alpine Meadow occurs on depressions, drainageways, cirques, flood plains and steams. Slopes is between 0 to 15%. Soils are greater than 60 inches in depth. Soils are derived mostly from colluvium from Monzonite, volcanic rock; alluvium from volcanic rocks; or slope alluvium from Andesite or latite. Soil surface texture is loam, cobbly loam or silt loam. The underlying material to a depth of 60 inches or more is variable material ranging from sandy loam to clay loam with variable amounts and sizes of rock fragments. It is Kobresia – Tufted Hairgrass community. This site has a water table at 0 to 36 inches in depth. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.
R048AY304CO	**Alpine Slopes** R048AY304CO Alpine Slopes occurs on mountain-slopes, ridges, mountains and valleys. Slopes is between 30 to 60%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived mostly from colluvium and alluvium from volcanic, metamorphic and igneous rocks. Soil surface texture is gravelly, very gravelly, extremely gravelly, very cobbly, extremely cobbly, or very stony loam or extremely stony sandy loam with loamy--skeletal subsurface. It is Kobresia – Tufted Hairgrass community. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 30 to 50 inches.
R048AY253CO	**Wet Subalpine** R048AY253CO Wet Subalpine occurs on mesa tops and swales, drainageways, glacial moraines, and alluvial fans formed by glacial action. Slopes is between 0 to 30%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived from till from basalt, andesite, or tuff; slope alluvium from andesite or tuff, alluvium from andesite or tuff; eolian deposits from basalt; or residuum from basalt. Soil surface texture is loam, or gravelly loam with fine-loamy, loamy-skeletal or clayey-skeletal textured subsurface. It is slender wheatgrass – tufted hairgrass. It has a Typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 37 to 45 inches.
R048AY250CO	**Subalpine Loam** R048AY250CO Subalpine Loam occurs on hills, mountain-slopes, and mountains. Slopes is between 1 to 30%. Soils are deep to very deep (20 to 60+ inches). Soils are derived from colluvium and alluvium from volcanic rock; complex landslide deposits from igneous, metamorphic, and sedimentary rock; and slope alluvium, colluvium, residuum, alluvium or complex landslide deposits from sandstone and shale or shale. Soil surface texture is loam with loamy textured subsurface. It is a mountain big sagebrush – Thurber's Fescue community. It has an ustic udic/typic udic moisture regime and cryic temperature regime. The effective precipitation ranges from 20 to 30 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Festuca thurberi*

Physiographic features

This site is in high mountainous country where physical and climatological conditions are extremely severe. Various phases of geological erosion are pronounced. Blowing soil particles and snow-blast injure plants; very high intensity sunlight prevails. This site is on slopes from 10 to 60 percent and has a southerly exposure. Elevation ranges from

about 11,500 to 13,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Alluvial fan (3) Valley
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	3,505–3,962 m
Slope	10–60%
Aspect	S, SW

Climatic features

The climate is harsh and cold. Due to the elevation, summers are wet and short. The plant growth period is less than 60 days. The average annual precipitation ranges from 30 to 50 inches. Of this, approximately 80-90% falls as snow, and 10-20% falls as rain between middle of June to and the middle of September 1. Summer moisture is mostly from thundershowers in July, and August. The driest period is usually from May to June; and June is normally the driest month. The average annual total snowfall is 435 inches. The snow depth usually ranges from 16 to 67 inches during November thru May. The highest winter snowfall record in this area is 807 inches which occurred in 1978-1979. The lowest snowfall record is 205 inches during the 1995-1996 winter. The frost-free period typically ranges from 54 to 96 days. The last spring frost is the middle of June to the end of June. The first fall frost is the last week of August to the middle of September. Mean daily annual air temperature is about 21.5ºF to 45.9ºF, averaging about 21.5ºF for the winter and 54.4ºF in the summer. Summer high temperatures of mid-70ºF to 80ºF are not unusual. The coldest winter temperature recorded was -40ºF on February 5, 1982 and the warmest winter temperature recorded was 63ºF on February 20, 1958. The coldest summer temperature recorded was 9ºF on June 26, 1969 and the warmest was 80 ºF on July 6, 1989. The hottest day on record is 81ºF on September 14, 1990. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2018) for Wolf Creek Pass 1 E, Colorado Climate Station. There are only 2 climate stations in the zone in the state of Colorado. Wolf Creek Pass 1 E and Wolf Creek Pass 4 W; they are at the lower precipitation end of this zone.

The grasses generally start growth in late June. Generally forbs start their growth about June 15, while the shrub species start growth at the end of June. Plant growth usually stops in September. The optimum growth period is generally between July and September for most of these plants. c. The average annual temperature is 26 to 34ºF. Frost can occur any day of the year during the growing season. Plant growth is seldom hampered by moisture stress but strong winds can induce drought-like conditions. Wind velocities for the area average 5 to 25 miles per hour. Strong winds during the winter and spring create snow cornices.

Table 3. Representative climatic features

Frost-free period (characteristic range)	51 days
Freeze-free period (characteristic range)	81 days
Precipitation total (characteristic range)	1,168 mm
Frost-free period (actual range)	51 days
Freeze-free period (actual range)	81 days
Precipitation total (actual range)	1,168 mm
Frost-free period (average)	51 days
Freeze-free period (average)	81 days
Precipitation total (average)	1,168 mm

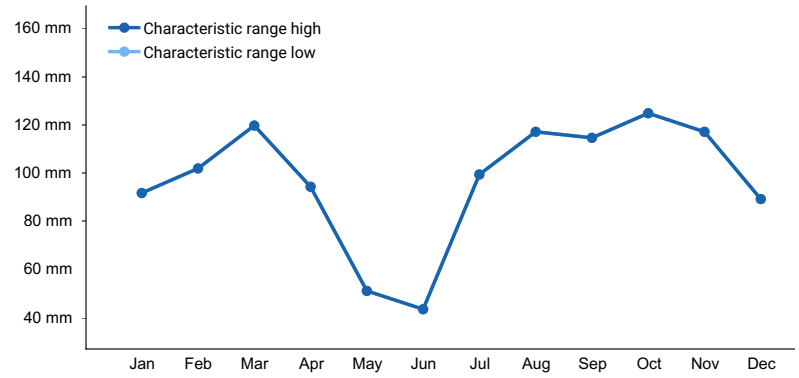


Figure 1. Monthly precipitation range

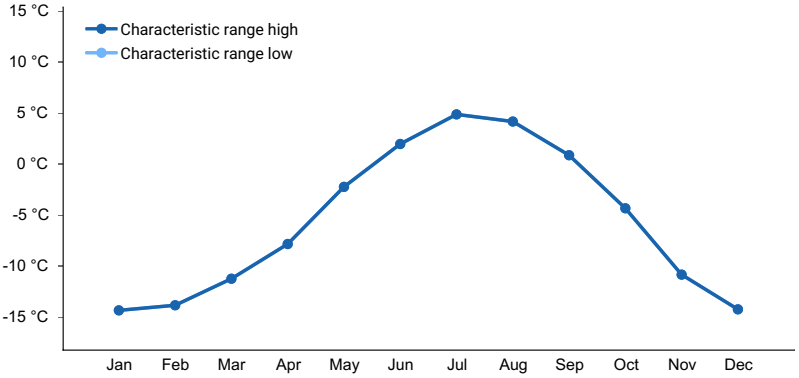


Figure 2. Monthly minimum temperature range

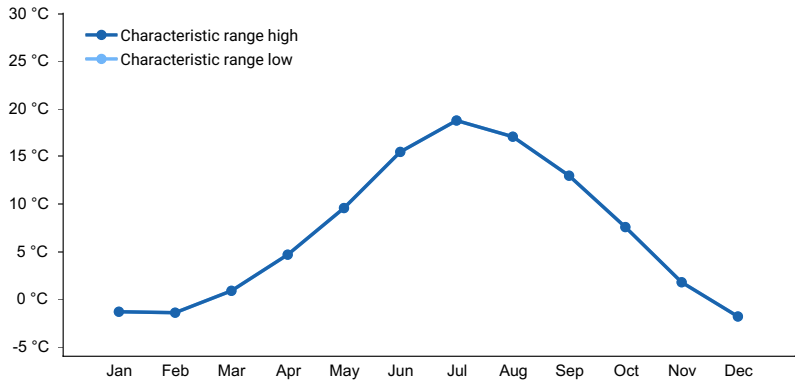


Figure 3. Monthly maximum temperature range

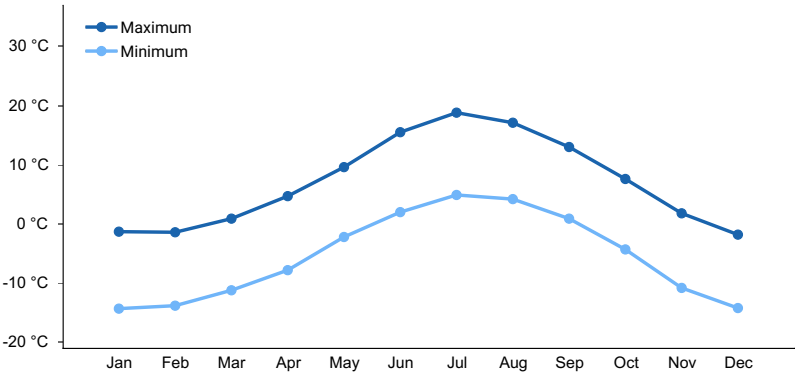


Figure 4. Monthly average minimum and maximum temperature

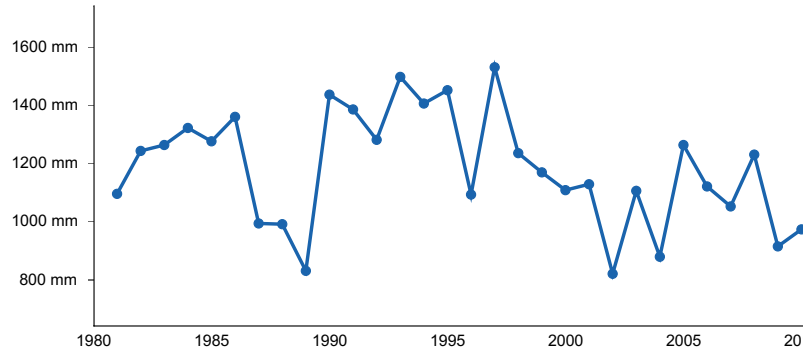


Figure 5. Annual precipitation pattern

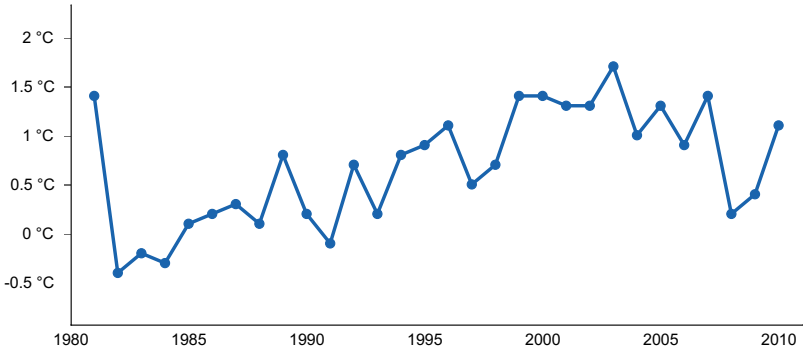


Figure 6. Annual average temperature pattern

Climate stations used

- (1) WOLF CREEK PASS 1 E [USC00059181], Creede, CO

Influencing water features

None

Soil features

The soils in this site are shallow to deep, well drained soils that formed in slope alluvium and colluvium from volcanic and sedimentary rocks. Typically the surface is loam or very gravelly loam. Permeability of the soil is moderate. Available water capacity is low to very low. Effective rooting depth is 20 inches or more. Runoff is medium to high, and the hazard of water erosion is moderate to high. Content of rock fragments is 35 t percent or greater in the soil profile.

Soil Series associated with this site:

Henson and Whitecross.

Table 4. Representative soil features

Parent material	(1) Alluvium–rhyolite (2) Colluvium–rhyolite (3) Slope alluvium–rhyolite (4) Colluvium–tuff (5) Slope alluvium–tuff (6) Colluvium–volcanic rock (7) Slope alluvium–volcanic rock (8) Slope alluvium–sandstone

Surface texture	(1) Very gravelly loam (2) Loam (3) Very stony sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	51–254 cm
Surface fragment cover <=3"	1–10%
Surface fragment cover >3"	0–5%
Available water capacity (Depth not specified)	2.54–8.89 cm
Soil reaction (1:1 water) (Depth not specified)	4.5–6
Subsurface fragment volume <=3" (Depth not specified)	15–35%
Subsurface fragment volume >3" (Depth not specified)	5–50%

Ecological dynamics

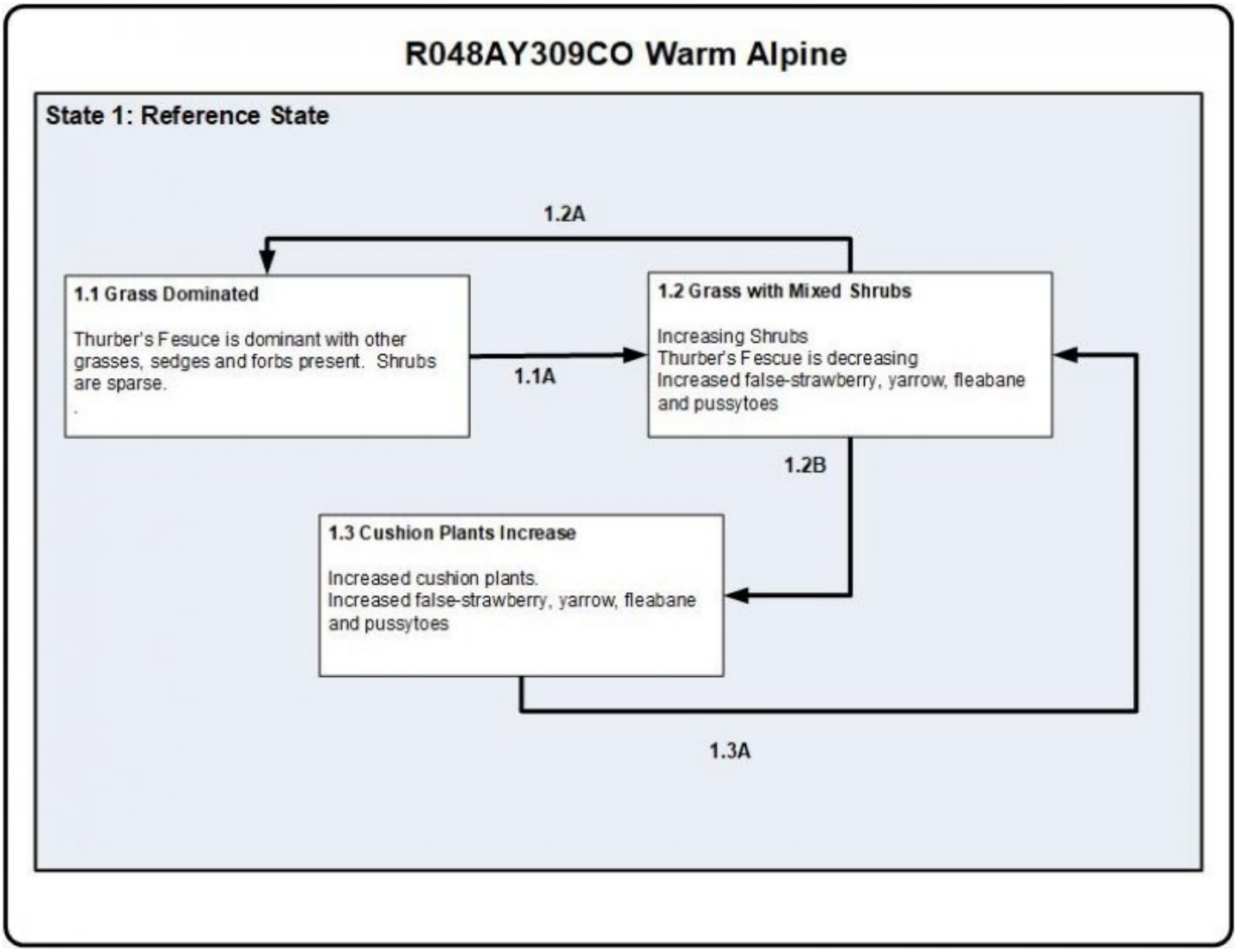
The plant community is about 50 to 60 percent grasses, 5 to 15 percent sedges, 20 to 25 percent forbs and 3 to 5 percent shrubs air dry weight. Thurber fescue, alpine wheatgrass, alpine fescue, alpine bluegrass, and arctic bluegrass dominate the plant species, making up from 60 to 70 percent.

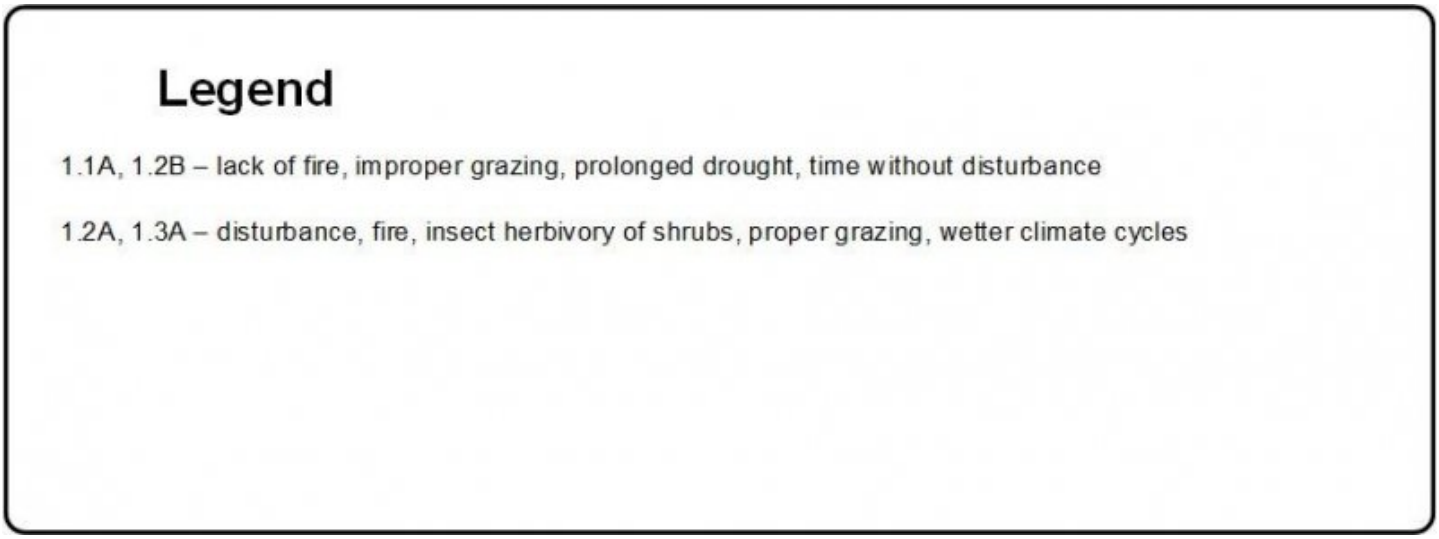
The Warm Alpine climax community is represented by an association of grasses, sedges, forbs, and a few shrubs in which Thurber fescue is dominant. The Thurber fescue on this site and elevation gives aid to the recognition of the warm alpine range site. The southerly exposure creates extra soil warmth in which the normally lower elevation species can survive on the site.

Many other grasses and numerous forbs enhance the wildlife habitat, add color to the site, and variety to the diet of grazing animals.

The state and transition model was added to fill the provisional ecological site instruction. It is a very general model. More field work and research is needed to make this model specific for each LRU (Land Resource Unit).

State and transition model





State 1
Reference State

Community 1.1
Reference State

If retrogression is caused by sheep, desirable grasses and forbs will be reduced. Deterioration will decrease Thurber fescue. The impact of over grazing shifts the climax community to less palatable forbs. Further retrogression of the site will remove fescue entirely and allow shrubby species to invade the site. As in other alpine

sites, an increase of cushion plants, sandwort phlox, and dwarf or alpine clover will occur. Plant species likely to invade this site and become a part of the plant community when the range is in a degenerated condition are sibbaldia (false-strawberry), yarrow, fleabane, low seedy cinquefoil, and pussytoes. Basal area (the area of ground surface covered by the perennial vegetation measured one inch above the soil) is approximately 35-45 percent. Annual Production: If the range is in excellent condition, the approximate total annual production (air-dry) ranges are: Favorable years 3200 lb/ac Normal years 2800 lb/ac Unfavorable years 2500 lb/ac Of this production, 10-15 percent will likely be unpalatable or out of reach of grazing animals.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1961	2197	2511
Forb	701	785	897
Shrub/Vine	140	157	179
Total	**2802**	**3139**	**3587**

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	**Grass/Grasslike**			1883–2668	
	Thurber's fescue	FETH	*Festuca thurberi*	1412–1726	–
	alpine bluegrass	POAL2	*Poa alpina*	95–219	–
	arctic bluegrass	POAR2	*Poa arctica*	95–219	–
	spike trisetum	TRSP2	*Trisetum spicatum*	62–157	–
	timber oatgrass	DAIN	*Danthonia intermedia*	62–157	–
	slender wheatgrass	ELTRS	*Elymus trachycaulus ssp. subsecundus*	95–157	–
	alpine fescue	FEBR	*Festuca brachyphylla*	62–157	–
	blackandwhite sedge	CAAL6	*Carex albonigra*	62–95	–
	sheep sedge	CAIL	*Carex illota*	62–95	–
	black sedge	CANO3	*Carex nova*	62–95	–
	Drummond's sedge	CARUD	*Carex rupestris var. drummondiana*	62–95	–
	southwestern showy sedge	CABE3	*Carex bella*	62–95	–
Forb					
2	**Forbs**			628–785	
	American bistort	POBI6	*Polygonum bistortoides*	34–157	–
	alpine sagebrush	ARSC	*Artemisia scopulorum*	34–157	–
	sticky polemonium	POVI	*Polemonium viscosum*	62–157	–
	Colorado ragwort	SESO	*Senecio soldanella*	34–157	–
	graylocks four-nerve daisy	TEGR3	*Tetraneuris grandiflora*	62–157	–
	alpine clover	TRDA2	*Trifolium dasyphyllum*	62–157	–
	snow cinquefoil	PONI2	*Potentilla nivea*	62–123	–
	Austrian draba	DRFL	*Draba fladnizensis*	34–95	–
	western Indian	CAOC4	*Castilleja occidentalis*	34–95	–

	paintbrush				
	alpine springbeauty	CLME	*Claytonia megarhiza*	34–95	–
	Parry's geranium	GECAP2	*Geranium caespitosum var. parryi*	0–62	–
	Bering chickweed	CEBE2	*Cerastium beeringianum*	0–62	–
	alpine dustymaiden	CHDOA2	*Chaenactis douglasii var. alpina*	0–62	–
	Rocky Mountain snowlover	CHJA	*Chionophila jamesii*	0–62	–
	common yarrow	ACMI2	*Achillea millefolium*	34–62	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	34–62	–
	hairy arnica	ARMO4	*Arnica mollis*	0–62	–
	showy draba	DRSP	*Draba spectabilis*	34–62	–
	sulphur-flower buckwheat	ERUMM	*Eriogonum umbellatum var. majus*	0–62	–
	Colorado tansyaster	MACO13	*Machaeranthera coloradoensis*	0–62	–
	sulphur cinquefoil	PORE5	*Potentilla recta*	0–62	–
	arctic alpine forget-me-not	ERNAE	*Eritrichium nanum var. elongatum*	0–34	–
	splitleaf Indian paintbrush	CARH4	*Castilleja rhexiifolia*	0–34	–
Shrub/Vine					
3	**Shrubs**			157–471	
	Hooker's mountain-avens	DROCH	*Dryas octopetala ssp. hookeriana*	95–157	–

Animal community

This site provides excellent summer and fall forage for domestic sheep, bighorn sheep, and elk. The animal forage preference generally changes as the season progresses into summer and fall. The dominant grasses, Thurber fescue, alpine fescue, alpine bluegrass, and artic bluegrass, are desirable the entire grazing season along with the excellent variety of forbs which this site provides.

Since sheep grazing occurs during the time of flowering and seed setting, a heavily grazed range may be marked by a scarcity of alpine forbs especially the upright and relatively succulent species. Grasses, because of their higher palatability at this elevation, also may be thinned out. On such a range various alpine sedges and less palatable grasses are frequently the dominant vegetation. However, the natural succession is toward Thurber fescue, alpine bluegrass, artic bluegrass, and alpine fescue.

The date when alpine ranges are ready to graze varies with elevation, exposure, and seasonal climatic conditions. Generally speaking most of these ranges should not be grazed before July 15 except for minor local areas in the subalpine area. In some places where snowbanks are prevalent, grazing may need to be deferred until as late as August 15. Grazing should not begin until the major feed areas are firm and free from excessive snowmelt water. Flower heads on alpine fescue, alpine bluegrass, and artic bluegrass should be well developed.

Grazing after September 15 is hazardous because of the suddenness of fall storms. Because of these conditions, sheep allotments should be so designed that they will have one or more camps in suitable areas below timberline for grazing before July 15 and after September 1. If this is not feasible, the grazing season should be adjusted accordingly.

Areas of any size containing patches of forage on very steep slopes and on developing soil on talus slopes should not be included in the estimate of grazing capacity. The damage resulting from trailing to and from such areas and along excessively steep slopes is not commensurate with the value of the forage. This point cannot be overemphasized.

Generally alpine areas suitable for sheep grazing should represent more or less continuous or connected areas of forage sufficient for a band of 600 to 1000 ewes with lambs for the prevailing season, including low range in the allotment. Because feed areas are often small and discontinuous, small bands are usually best. Permanent sheep allotments should be considered only where prevailing slopes are generally moderate.

Guide to Initial Stocking Rates:
Stocking rates given below are based on continuous use for the entire growing season, and are intended only as an initial guide. Forage needs are calculated on the basis of 900 lbs of air-dry forage per animal unit month (AUM). To maintain proper use and allow for forage that disappears through trampling, small herbivore use, weathering, etc., 35 percent of the palatable forage produced is considered available for grazing by large herbivores.

Condition Percent Climax
Class Vegetation AUM/Ac Ac/AUM
Excellent 76-100 1.10 .9
Good 51-75 .83 1.2
Fair 26-50 .55 1.8
Poor 0-25 .27 3.7

Adjustments to the initial stocking rates should be made as needed to obtain proper use. With specialized grazing systems, large livestock breeds, uncontrolled big game herbivores, inaccessibility, dormant season use, presence of introduced species, etc., stocking rate adjustments will be required.

Annual Production:
If the range is in excellent condition, the approximate total annual production (air-dry) ranges are:
Favorable Years 3200 lb/Ac
Normal Years 2800 lb/Ac
Unfavorable Years 2500 lb/Ac

Of this production, 10-15 percent will likely be unpalatable or out of reach of grazing animals.

Native Animal Community Associated with the Potential Plant Community:
This site is part of the normal habitat for Rocky Mountain goats and ptarmigan. Elk and bighorn sheep remain year round in some areas. More frequently these animals along with deer remain in this area only during the summer. Snowshoe rabbits, blue grouse, pica, songbirds, and other animals depend on this site for their needs for at least part of the year.

Wildlife Values:
As forage quality declines from overuse and excessive trailing, big game animals such as elk, deer, bighorn sheep, and Rocky Mountain goats are the most affected species. Poor nutrition will result in declines of Rocky Mountain goats and bighorn sheep. Elk and deer will move to other accessible forage if available in the vicinity. Ptarmigan, blue grouse, and snowshoe rabbits will also decline in numbers as range conditions deteriorates. Pica, songbirds, and small mammals are the least affected by a reduction of the potential plant community.

Hydrological functions

Soils in this site are grouped into the “B” hydrologic group, as outlined in the Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings 1979 Handbook. Field investigations are needed to determine hydrologic cover conditions and hydrologic curve numbers. Refer to NRCS National Engineering Handbook, Section 4, and Peak Flows in Colorado Handbook for more information.

Recreational uses

Recreation and Natural Beauty:
In the field of recreation, the alpine type has appeal and is a source of inspiration to many people through its attractions as an area for mountain climbing, photography, pack trips, and fishing in high elevation lakes. Overgrazing and other uses that destroy the vegetation will impinge on recreational values including use of alpine flower fields, strategic pastures for horse feed, and denudation of camp sites and lake shoes. Hunting for ptarmigan and snowshoe rabbits is generally good to excellent on this site.

Wood products

No potential production on this range site.

Other information

Major Poisonous Plants to Livestock:
No poisonous plants are present on this site when vegetation is at or near its potential.

Endangered Plants and Animals:
No endangered or threatened species have been identified. Species names to be included as reliable information becomes available.

This range site occurs in the Alamosa, Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Custer, Delta, Delores, Eagle, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Lake, La Plata, Larimer, Mesa, Mineral, Montrose, Ouray, Park, Pitkin, Pueblo, Rio Blanco, Rio Grande, Routt, Saguache, San Juan, San Miguel, Summit, and Teller Counties.

Type locality

Location 1: Ouray County, CO	
General legal description	1/2 mile east of top of Red Mountain Pass.
Location 2: Hinsdale County, CO	
General legal description	East side of Engineer Pass 3/4 mile down east side of Pass.

Other references

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.

Soil Conservation Service (SCS). May 1987. Range Site Description for Warm Alpine #309. : USDA, Denver Colorado.

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.

Western Regional Climate Center. Retrieved from http://www.wrcc.dri.edu/summary/Climsmco.html on December 10, 2018

Contributors

Suzanne Mayne-Kinney

Approval

Kirt Walstad, 3/05/2024

Acknowledgments

Project Staff:
Suzanne Mayne-Kinney, Ecological Site Specialist, NRCS MLRA, Grand Junction SSO
Chuck Peacock, MLRA Soil Survey Leader, NRCS MLRA Grand Junction SSO

Program Support:
Rachel Murph, NRCS CO State Rangeland Management Specialist, Denver
Scott Woodhall, NRCS MLRA Ecological Site Specialist-QA Phoenix, AZ
Eva Muller, Regional Director, Rocky Mountain Regional Soil Survey Office, Bozeman, MT
B.J. Shoup, CO State Soil Scientist, Denver
Eugene Backhaus, CO State Resource Conservationist, Denver

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	05/17/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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:**

---

17. **Perennial plant reproductive capability:**
