USDA Natural Resources Conservation Service

Ecological site F048AY925CO
Ponderosa Pine Forest

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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

F048AY925CO occurs on hillsides, mountain-slopes, mesas, structural benches and cuestas. Slopes are 3 to 30%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived from slope alluvium from sandstone and/or shale, colluvium from sandstone and/or shale, or residuum from sandstone and shale. Soil surface texture is

a loam, clay loam, sandy loam, fine sandy loam, very stony loam, cobbly sandy loam, or very boulder sandy loam with fine textured subsurface. It is a Ponderosa Pine - Muttongrass – squirreltail community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.

This site occurs mainly in Archuleta County, Colorado and Rio Arriba County, New Mexico in MLRA 48A.

Associated sites

R048AY238CO	**Brushy Loam** R048AY238CO Brushy Loam occurs on hills, mountains, complex landslides, and benches. Slopes is between 3 to 35%. Soils are moderately deep to deep (20 to 60+ inches), soils derived from colluvium, residuum, slope alluvium and alluvium from sandstone and shale. Soil surface texture is loam or clay loam with fine-textured subsurface. It is a Gambel's oak – slender wheatgrass community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.
R048AY257CO	**Clayey Valley** R048AY257CO Clayey Valley occurs on hillslopes, and old high terraces. Slopes is between 1 to 12%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived from slope alluvium from shale or alluvium from sandstone and shale. Soil surface texture is loam or clay loam with fine textured subsurface. It is Western wheatgrass – Arizona Fescue with scattered Ponderosa Pine. It has a Typic ustic moisture regime and frigid temperature regime. The effective precipitation ranges from 16 to 20 inches.
R048AY255CO	**Pine Grasslands** R048AY255CO Pine Grassland 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 (<20
R048AY245CO	**Mountain Swale** R048AY245CO Mountain Swale occurs flood plains, alluvial fans, swales, stream terraces, and valley floors. Slopes is between 0 to 12%. Soils are deep (60+ inches) in depth. Soils are derived from alluvium. Soil surface texture is loam, with a fine-loamy subsurface. It is a basin wildrye-western wheatgrass community. It has a typic ustic moisture. The effective precipitation ranges from 16 to 20 inches. It receives extra moisture from surrounding uplands that drain into the area. These areas are sloped themselves and drain into perennially wet areas. They have well drained soils and ephemeral streams.
R048AY222CO	**Loamy Park** R048AY222CO Loamy Park occurs on alluvial and colluvial fans, hillsides, plains, sideslopes, terraces, valley sideslopes, and valley bottoms Slopes are from 0 to 30%. Soils are moderately deep to deep (20-60 inches) loamy soils derived from residuum from igneous and metamorphic rocks; alluvium from granite, gneiss, schist, or sandstone and shale. Soil surface texture are sandy loam to loam with loam subsurface. It is an Arizona Fescue – Mountain Muhly community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.

Similar sites

R048AY255CO	**Pine Grasslands** R048AY255CO Pine Grassland 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 (<20
R048AY257CO	**Clayey Valley** R048AY257CO Clayey Valley occurs on hillslopes, and old high terraces. Slopes is between 1 to 12%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived from slope alluvium from shale or alluvium from sandstone and shale. Soil surface texture is loam or clay loam with fine textured subsurface. It is Western wheatgrass – Arizona Fescue with scattered Ponderosa Pine. It has a Typic ustic moisture regime and frigid temperature regime. The effective precipitation ranges from 16 to 20 inches.

R048AY240CO	**Shallow Pine** R048AY240CO Shallow Pine occurs on mountains and mountainsides. Slopes are 5 to 40%. Soils are shallow (10 to 20 inches). Soils are derived from slope alluvium from volcanic breccia, gneiss, granite, or sandstone and/or residuum from granite, granodiorite and/or gneiss. Soil surface texture is a gravelly to very gravelly sandy loam or very gravelly loam with loamy-skeletal subsurface. It is a Ponderosa Pine - Arizona Fescue – Mountain Muhly community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.
R048AY248CO	**Mountain Clay Loam** R048AY248CO Mountain Clay Loam occurs on alluvial fans, mesas, hills, dip slopes, and mountain slopes. Slopes is between 1 to 40%. Soils are deep to very deep (40 to 60+ inches). Soils are derived from alluvium and slope alluvium from shale; or alluvium, slope alluvium, colluvium and/or residuum from sandstone and shale. Soil surface texture is loam, silty clay loam, gravelly loam or a clay loam with fine-textured subsurface. It is Arizona Fescue – western wheatgrass – Gambel's Oak community. It has a typic ustic moisture regime and frigid temperature regime. The effective precipitation ranges from 16 to 20 inches.

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa* (2) *Juniperus scopulorum*
Shrub	(1) *Quercus gambelii*
Herbaceous	(1) *Poa fendleriana* (2) *Elymus elymoides*

Physiographic features

This site is located on hillsides, mountain-slopes, mesas, structural benches and cuestas. It is gently to moderately sloping. At higher elevations and northern parts of this MLRA, this site tends to be found on south slopes and drier soils. At lower elevations and more southern locations, this site tends to be on northern slopes and in drainages. This site occurs mainly in Archuleta County, Colorado and Rio Arriba County, New Mexico.

Table 2. Representative physiographic features

Landforms	(1) Hillside (2) Mountain slope (3) Mesa (4) Structural bench (5) Cuesta
Flooding frequency	None
Ponding frequency	None
Elevation	6,000–8,700 ft
Slope	3–30%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is about 16 to 20 inches. Of this, approximately 45-55% falls as snow, and 45-55% falls as rain between middle of May to and the end of September. Summer moisture is mostly from thundershowers in July, August and September. December to February is the driest period of the year with the driest month being January. July thru September is the wettest period and the wettest month is usually August. The average annual total snowfall is 84.9 inches. The snow depth usually ranges from 1 to 5 inches during November thru March. The highest winter snowfall record in this area is 127 inches which occurred in 2007-2008. The lowest snowfall record is 46.5 inches during the 2017-2018 winter. The frost-free period typically ranges from 80 to 120 days. The last spring frost is typically the middle of June to the end of June. The first fall frost is usually the end of August to the middle of September. Mean daily annual air temperature ranges from about 25.5ºF to 60.3ºF, averaging about 24ºF for the winter and 61.8ºF in the summer. Summer high temperatures of mid-70ºF to low 80ºF are not unusual. The coldest winter temperature recorded was -36ºF on February 2, 1985 and the warmest winter temperature recorded was

65ºF on December 5, 1995. The coldest summer temperature recorded was 19ºF on June 2, 1990 and the warmest was 98ºF on July 31, 2002. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2018) for Ridgway, Colorado Climate Station.

This zone in MLRA 48 will need to be broken up into at multiple land resources zones in future projects based on current knowledge of precipitation and temperature patterns.

West Central Zone Stations: Alterbern, Aspen, Avon, Glenwood Springs #2, Shoshone, Placerville and Ridgway. This LRU zone is use in write up above. Driest month is usually January, February and June and wettest months are July, August and September.

Northwest Zone Climate Stations: Meeker and Yampa are at the low end of this LRU zone. Driest months usually are January and February. Wettest months usually are April and August.

Southwest Zone Climate Stations (Precambrian sedimentary and igneous): There are no climate stations in this LRU zone.

Southwest Volcanics: There are no climate stations in this LRU zone.

Northeast (Front Range Igneous and Metamorphic): Cabin Creek, Caribou Ranch, Dillion 1 R, Fraser, Georgetown, Grand lake 1 NW, Hourglass Reservoir, Nederland 2 NNE, Red Feathers Lakes, Red Feather Lakes 2 SE and Victor. April, May, July and August are the wettest months. February, December, November and October are the driest. The climate stations is this zone are cryic. These areas have shorter growing seasons by 20 to 40 days over the frigid stations.

Southeast (Sangre de Cristo Mtns): There are no climate stations in this zone in MLRA 48A. Closest ones are in MLRA 49. The growing season appears to be longer on the Sangre de Cristos. Driest months are December to February and the wettest are July & August.

Cryic High elevation valleys: Pitkin, Taylor River and Meredith. These areas have shorter growing seasons by 20 to 40 days over the frigid stations.

Table 3. Representative climatic features

Frost-free period (characteristic range)	23-78 days
Freeze-free period (characteristic range)	75-111 days
Precipitation total (characteristic range)	17-18 in
Frost-free period (actual range)	5-101 days
Freeze-free period (actual range)	43-134 days
Precipitation total (actual range)	17-19 in
Frost-free period (average)	54 days
Freeze-free period (average)	92 days
Precipitation total (average)	18 in

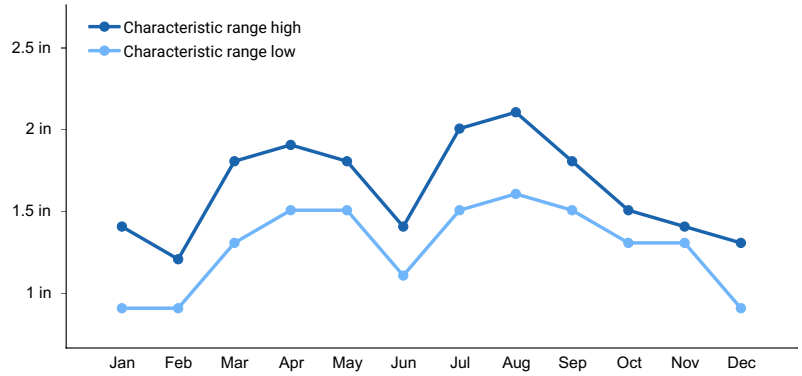


Figure 1. Monthly precipitation range

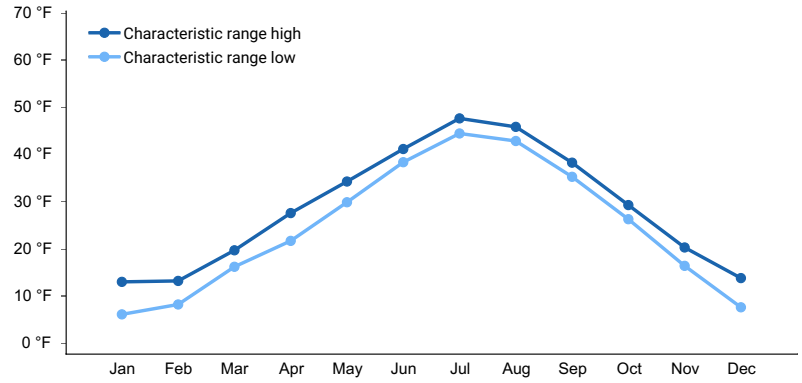


Figure 2. Monthly minimum temperature range

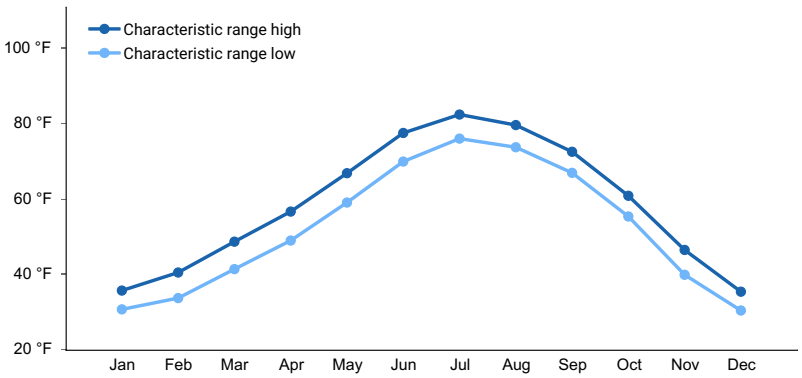


Figure 3. Monthly maximum temperature range

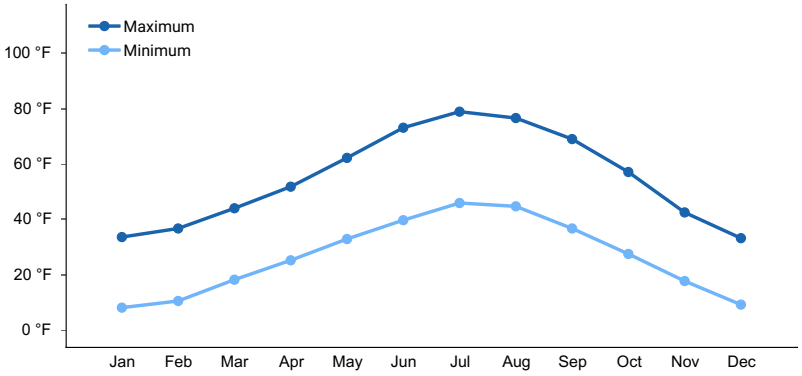


Figure 4. Monthly average minimum and maximum temperature

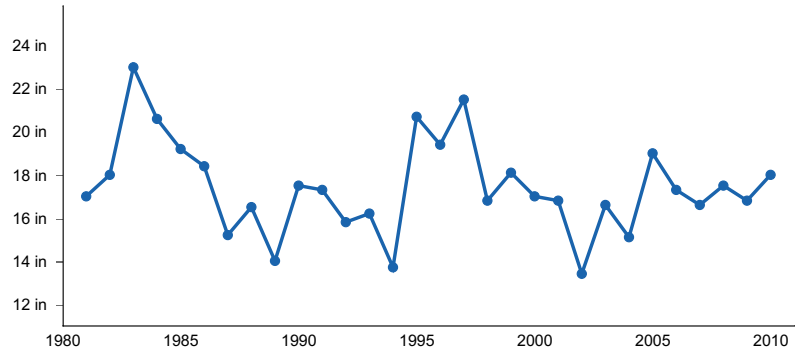


Figure 5. Annual precipitation pattern

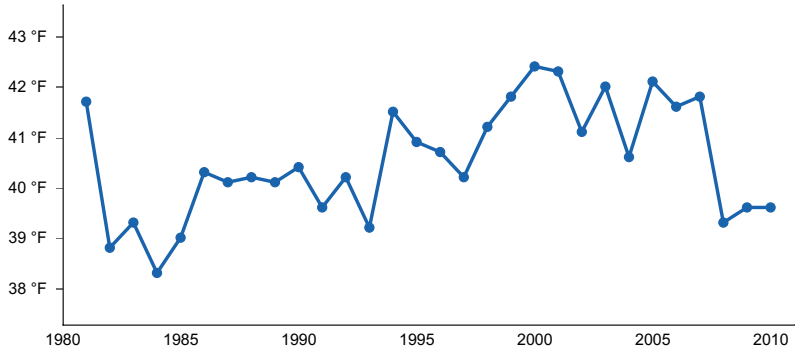


Figure 6. Annual average temperature pattern

Climate stations used

- (1) FRASER [USC00053116], Fraser, CO
- (2) ASPEN PITKIN CO AP [USW00093073], Aspen, CO
- (3) GEORGETOWN [USC00053261], Idaho Springs, CO
- (4) GLENWOOD SPGS #2 [USC00053359], Glenwood Springs, CO
- (5) HOURGLASS RSVR [USC00054135], Bellvue, CO
- (6) RIDGWAY [USC00057020], Ridgway, CO
- (7) YAMPA [USC00059265], Toponas, CO

Influencing water features

There are no water features associated with this site.

Soil features

This site tends to be on moderately deep to very deep soils. The soil surface ranges from usually 15-30% clay content. This site is fine in the particle control section with range of 35-50% clay at 20" in depth. This soil can have rock fragments but it is not skeletal. The soils this site is on are well drained.

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone and shale (2) Residuum–sandstone and shale (3) Slope alluvium–sandstone and shale (4) Slope alluvium–shale (5) Colluvium–shale

Surface texture	(1) Loam (2) Clay loam (3) Very stony loam (4) Sandy loam (5) Cobbly, very bouldery sandy loam (6) Fine sandy loam
Family particle size	(1) Fine
Drainage class	Well drained
Permeability class	Very slow to moderately slow
Soil depth	20–100 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–30%
Available water capacity (Depth not specified)	3–7 in
Soil reaction (1:1 water) (Depth not specified)	6.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

The ponderosa pine forest is the lowest of the true forest zones. The elevation for this forest ecological site ranges between 6,000 - 8,700 feet. This forest is found in areas of moderate moisture. The forest may consist of widely scattered individuals or grow in park like stands on dry hillsides or plateaus.

On cooler northern slopes stands of ponderosa pine are thicker and may include Douglas-fir. On the lower elevation and more southern aspects of this site, ponderosa pine may grade into pinyon-juniper sites.

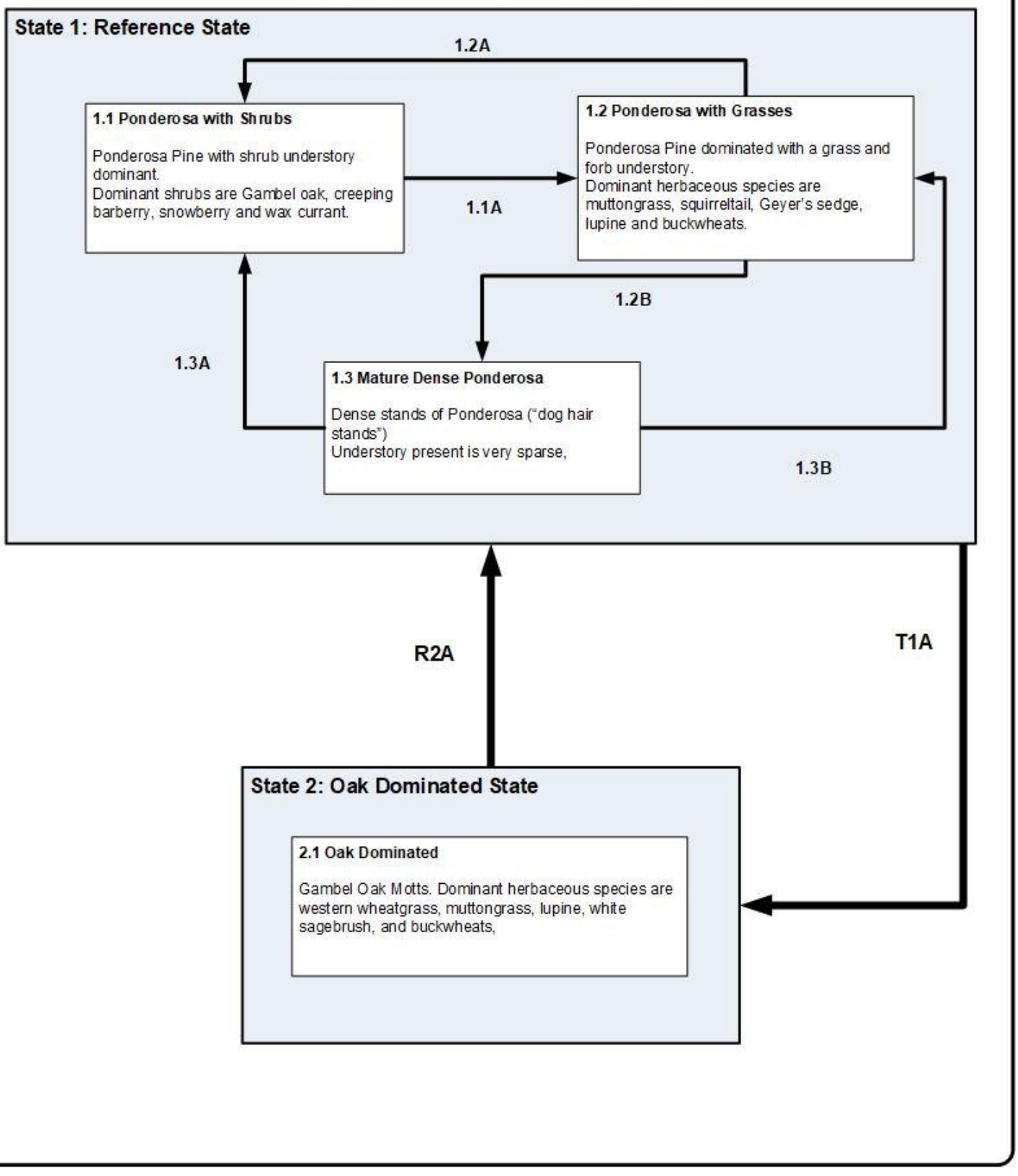
Fire is an important ecological factor in succession on this site (Weaver 1951; Cooper 1960; Johnson 1996). Prior to European settlement, the average fire return interval for the ponderosa pine forest was 2-15 years (Weaver 1951; Cooper 1960; Dietrich 1980; Dietrich and Swetnam 1984; Johnson 1994; Swetnam and Baisan 1996). These fires were low intensity and would clear out brush, kill seedlings and encourage grass growth (Moir 2010; Johnson 1996). In higher elevation sites, fires would become a little less frequent, with slightly higher intensity (Swetnam and Baisan, 1996; Johnson 1996)

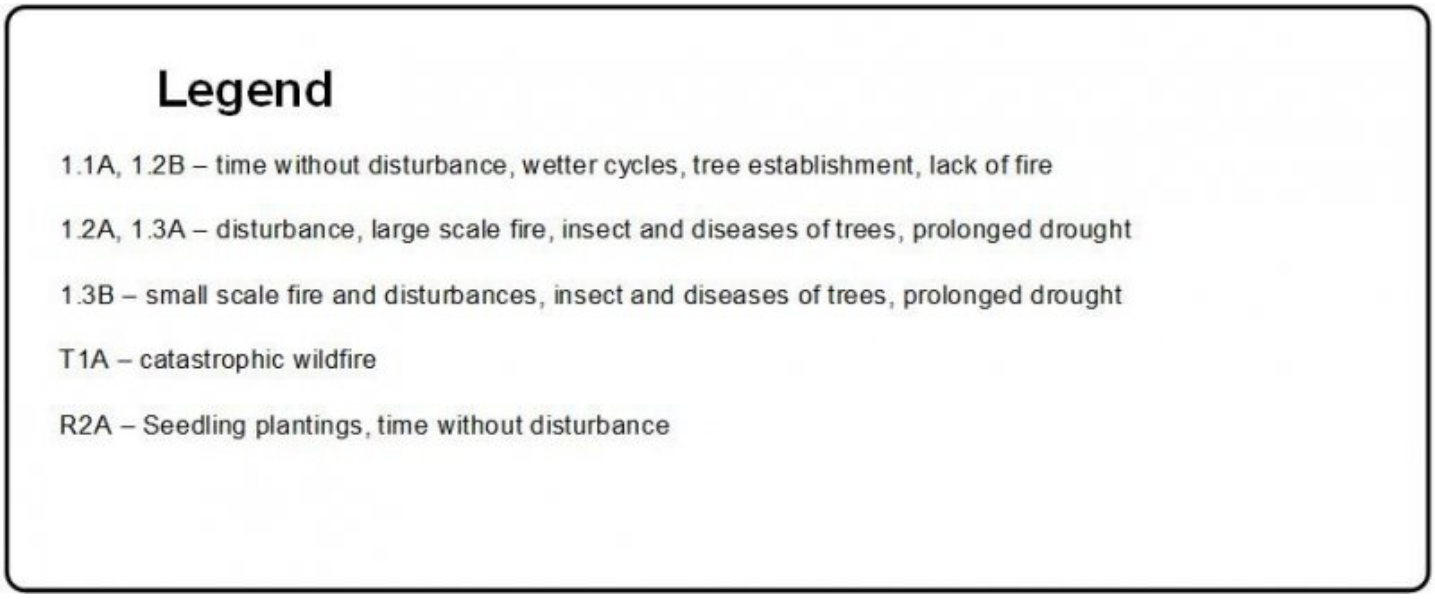
In addition to fire, other drivers of this site include climate change, grazing impacts, logging, and insect and rodent activities.

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

State and transition model

F048AY925CO Ponderosa Pine Forest





State 1
Reference Community

This state is dominated by open stands of ponderosa pine. On the cooler northern slopes of this site, the stands are thicker and may include Douglas-fir. On the lower elevations, pinyon pine and juniper (sp.) will be found. On the lower elevation and more southern aspects of this site, the site may grade into pinyon-juniper sites.

Community 1.1
Shrub Dominated Understory

This community is dominated by ponderosa pine, but has a strong shrubby understory component. The dominant shrub in this community is Gamble Oak.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	300	600	800
Shrub/Vine	300	400	600
Tree	150	300	400
Forb	25	50	100
Total	**775**	**1350**	**1900**

Table 6. Soil surface cover

Tree basal cover	10-30%
Shrub/vine/liana basal cover	5-20%
Grass/grasslike basal cover	5-10%
Forb basal cover	2-5%
Non-vascular plants	0-5%
Biological crusts	0%
Litter	40-60%
Surface fragments >0.25" and <=3"	0-5%
Surface fragments >3"	0-10%
Bedrock	0-5%

Water	0%
Bare ground	5-10%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	–	–	–
>2 <= 4.5	–	5-10%	–	–
>4.5 <= 13	–	15-35%	–	–
>13 <= 40	–	–	–	–
>40 <= 80	30-60%	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

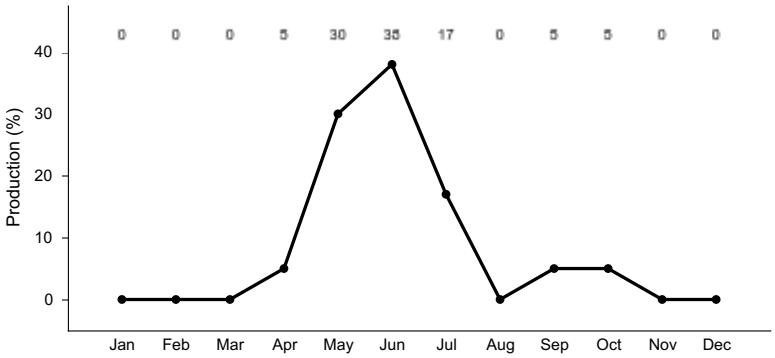


Figure 8. Plant community growth curve (percent production by month). CO0105, MLRA 48A - Mountain Sites. MLRA 48A.

Community 1.2
Grass Dominated Understory

This community has a grass dominated understory. Frequent low intensity fires reduce brush cover causing the grass understory to respond positively.

Community 1.3
Mature Dense Ponderosa

This community is characterized by dense stands of "dog hair" ponderosa. These sites have such a dense canopy cover that they shade out the ground and have very little understory production.

Pathway 1.1A
Community 1.1 to 1.2

Frequent low intensity fires on this site clear out shrub growth allowing the understory to grow. Also, disease and insects can tree density.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Pathway 1.2A
Community 1.2 to 1.1

After time without fire, diseases and insect outbreaks; shrubs begin to dominate the understory, grasses decline, and ponderosa seedlings become established.

Pathway 1.2B
Community 1.2 to 1.3

Fire suppression causes changes in ponderosa pine communities. Fire suppression in conjunction with improper grazing and high precipitation years as well as fire suppression followed by a high intensity crown fire can lead to dense stands of "dog hair" ponderosa (Covington and Moore 1994; Johnson 1996).

Pathway 1.3A
Community 1.3 to 1.1

Large scale fires and disturbance. The fire frequency and intensity has changed becoming more intense and less frequent. Seeding of understory species and ponderosa saplings may need to be done, if enough species are not left in the understory.

Pathway 1.3B
Community 1.3 to 1.2

Restoration from a fire suppressed community may be possible by making patches on the landscape with thinning and and prescribed fire. Seeding of understory species and ponderosa saplings may need to be done, if enough species are not left in the understory.

State 2
Oak Dominated State

This state is dominant by Gambel's Oak.

Community 2.1
Oak Mott

This community is characterized by a dense stand of Gambel oak. The landscape has clumps of oaks called motts with open spaces with grasses. The open spaces will allow for colonization of Ponderosa over time.

Transition T1A
State 1 to 2

If the fire frequency or intensity of fire on this site has becomes more frequent and intense. Gambel oak forms dense thickets by extensive root sprouting after crown fires.

Restoration pathway R2A
State 2 to 1

Time without fire and/or insect/pathogen outbreaks will see Ponderosa slowly recover on this site. Seeding of grasses, forbs and ponderosa may be needed depending of what plants regenerate after intense fires.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					

1	**cool season bunch grass**			200–700	
	muttongrass	POFE	*Poa fendleriana*	75–150	–
	squirreltail	ELEL5	*Elymus elymoides*	30–100	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	40–75	–
	mountain muhly	MUMO	*Muhlenbergia montana*	5–50	–
	Arizona fescue	FEAR2	*Festuca arizonica*	5–50	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	10–40	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–15	–
2	**warm season bunch grasses**			10–75	
	blue grama	BOGR2	*Bouteloua gracilis*	15–45	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–15	–
3	**cool season rhizomatous grasses**			10–50	
	western wheatgrass	PASM	*Pascopyrum smithii*	5–40	–
4	**grass like plants**			30–75	
	Geyer's sedge	CAGE2	*Carex geyeri*	30–75	–
Forb					
5	**forbs**			25–100	
	silvery lupine	LUAR3	*Lupinus argenteus*	5–40	–
	common yarrow	ACMI2	*Achillea millefolium*	0–30	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	5–15	–
	buckwheat	ERIOG	*Eriogonum*	5–15	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–15	–
	fleabane	ERIGE2	*Erigeron*	5–10	–
	Wright's deervetch	LOWR	*Lotus wrightii*	0–5	–
	woolly cinquefoil	POHI6	*Potentilla hippiana*	0–5	–
	yellow stonecrop	SENU	*Sedum nuttallianum*	0–5	–
	pineywoods geranium	GECA3	*Geranium caespitosum*	0–5	–
	mariposa lily	CALOC	*Calochortus*	0–5	–
	Geyer's onion	ALGE	*Allium geyeri*	0–5	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–5	–
	Fendler's sandwort	ARFE3	*Arenaria fendleri*	0–5	–
Shrub/Vine					
6	**shrubs**			200–500	
	Gambel oak	QUGA	*Quercus gambelii*	100–450	–
	serviceberry	AMELA	*Amelanchier*	25–100	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	5–50	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	5–20	–
	wax currant	RICE	*Ribes cereum*	5–15	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–15	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–15	–
	kinnikinnick	ARUV	*Arctostaphylos uva-ursi*	0–10	–
	manzanita	ARCTO3	*Arctostaphylos*	0–5	–

	skunkbush sumac	RHTR	*Rhus trilobata*	0–5	–
	soapweed yucca	YUGL	*Yucca glauca*	0–5	–
	Woods' rose	ROWOU	*Rosa woodsii var. ultramontana*	0–5	–
7	**sub-shrubs**			5–50	
	creeping barberry	MARE11	*Mahonia repens*	10–50	–
	soapweed yucca	YUGL	*Yucca glauca*	0–10	–
Tree					
8	**trees**			160–400	
	ponderosa pine	PIPO	*Pinus ponderosa*	150–225	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	10–45	–
	twoneedle pinyon	PIED	*Pinus edulis*	0–40	–

Animal community

The mixture of trees and shrubs found in the various plant communities on this ecological site provides habitat for foothills wildlife species. Historic large grazers that influenced these plant communities were elk and mule deer. Domestic grazers now share these habitats with wildlife. Changes in the composition of the plant community when moving from the reference state to other states on this ecological site may result in changes in carrying capacity for the wildlife species found here. Urban development and associated recreational use by urban populations has affected wildlife habitat availability and quality on this site.

Ponderosa Pine Forest Community (Reference State):
This state provides both food and cover for many species. Rainbow and cutthroat trout may be found in streams on this site. Reptiles using the site inclued short-horned, plateau, and sagebrush lizard; and Western rattlesnake. Ponderosa pine seeds provide food for several bird species including Steller’s jay, chickadees, finches, evening grosbeak, Clark's nutcracker, nuthatches, towhees, and wild turkey. Pygmy nuthatch and evening grosbeak favor ponderosa pine for nesting. Snags are important for Williamson’s sapsucker and downy, hairy, and Lewis’ woodpecker. Wild turkey use mature ponderosa pine trees for roost sites. Other birds frequently seen on this site include white breasted nuthatch, western tanager, chipping sparrow, crow, black-billed magpie, mountain bluebird northern goshawk, and sharp-shinned hawk. Elk, mule deer, black bear, mountain lion, bobcat, Abert’s squirrel, and chickaree (pine squirrel) are common mammals on this site. Ponderosa pine seeds are an important food for the squirrels, chipmunks, and other small mammals.

Grass Dominated Understory
Many of the Reference state species will also be found in this state. Deer and elk will be favored because of the availability of openings that create browse and grass.

Mature Dense Ponderosa
Species that need forest openings or understory vegetation such as elk, mountain bluebird, and Lewis’ woodpecker would decline in this state. This state provides good thermal and hiding cover for most species, but lacks forage.

State 2 Oak Dominated State
Reptiles in this state will be similar to the HCPC. The change in shrub, forb, and grass species and the increasing oak production changes habitat quality and suitability for some of the bird and mammal species that are dependent on ponderosa pine. The increased shrub cover and mast production in this state favors bird and mammal species such as towhees, MacGillivary’s and Virginia’s warblers, wild turkey, mountain lion, and deer. Abert’s squirrel, pygmy nuthatch, evening grosbeak, Williamson’s sapsucker, and three-toed woodpecker will decline or disappear in this state.

Author: Terri Sage

Recreational uses

The ponderosa pine forest has many recreational uses including hiking, horseback riding, mountain biking, motor

biking, and camping. It can also be used for cross country skiing and snowshoeing in the winter.

Other information

Although livestock grazing is common in this site, dense oak thickets and a general lack of surface water are a hindrance to management in many areas; also, forage production is low. However gambel oak and mountain mahogany are favorable browse species and receive moderate to heavy use by deer and elk. Big game cover often is very good; some areas may be used as winter range.

Table 9. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
ponderosa pine	*PIPO*	40	70	30	53	–	–	–	

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Approval

Kirt Walstad, 3/05/2024

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--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 48A must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/10/2025
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:**