

## **Ecological site F048AY449CO Aspen Woodland**

Last updated: 5/06/2024  
Accessed: 05/10/2025

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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): 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**

This site is a permanent type aspen stand in Western Colorado. This site is found mostly commonly on mountain slopes, hills, and complex landslides. Soils are moderately deep to very deep (20 to 60+ inches), dark and high in organic matter. Soil surface textures are loam, stony loam, very stony loam, cobbly loam, gravelly loam or very cobbly loam. Subsurface textures can be fine-loamy, loamy-skeletal, clayey-skeletal or fine. It is usually ustic udic

and can be frigid or cryic. It is a Aspen – Wood’s Rose – Slender Wheatgrass community. It Precipitation ranges from 20 to 30 inches, but on favorable north and east aspect it can be found as low as 18" of precipitation.

## Associated sites

R048AY238CO	<b>Brushy Loam</b> Site 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.
R048AY250CO	<b>Subalpine Loam</b> Site 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.
R048AY252CO	<b>Subalpine Clay</b> Site 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.
F048AY918CO	<b>Spruce-Fir Woodland</b> This site is found mostly commonly on mountain slopes, complex landslides, and mesas. Soils are moderately deep to very deep (20 to 60+ inches). Soil surface textures are loam, cobbly loam, gravelly loam, very cobbly sandy loam, very gravelly sandy loam, very stony sandy loam, very cobbly fine sandy loam, or stony fine sandy loam. Subsurface textures can be loamy-skeletal, or clayey-skeletal. It is usually ustic udic or typic udic and cryic. It is a Engelmann Spruce – Subalpine Fir – Elk Sedge – Slender Wheatgrass community. The effective precipitation ranges from 20 to 40 inches.
F048AY908CO	<b>Mixed Conifer</b> This site is found mostly commonly on mountain slopes. Soils are moderately deep to very deep (20 to 60+ inches). Soil surface textures are loam, very gravelly sandy loam, very stony sandy loam, stony sandy loam, stony loam, very stony loam, very cobbly loam or gravelly fine sandy loam. Subsurface textures can be loamy-skeletal or sometimes fine-loamy. It is usually ustic udic or typic udic and cryic. It is a Mixed Conifer community with subalpine fir, white fir, and Douglas fir intermixed. The effective precipitation ranges from 20 to 40 inches.

## Similar sites

F048AY506UT	<b>High Mountain Loam (Aspen)</b> The soils of this site formed mostly in slope alluvium and/or colluvium derived from sedimentary rock over residuum weathered from limestone and shale. Surface soils are loam, silt loam to clay loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are moderately deep to very deep, well-drained, and have moderately slow to moderate permeability. pH is slightly acidic to neutral. Available water-holding capacity ranges from 4 to 8 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly udic and the soil temperature regime is cryic. Precipitation ranges from 22-35 inches annually.
F048AY528UT	<b>High Mountain Very Steep Loam (Aspen)</b> The soils of this site formed mostly in colluvium and/or slope alluvium derived from sedimentary and/or igneous rock. Surface soils are channery to very cobbly loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are moderately deep, well-drained, and have moderate permeability. pH is slightly acidic to slightly alkaline. Available water-holding capacity ranges from 2 to 7 inches of water in the upper 40 inches of soil. The soil moisture regime is mostly udic and the soil temperature regime is cryic. Precipitation ranges from 22-35 inches annually.

**Table 1. Dominant plant species**

Tree	(1) <i>Populus tremuloides</i>
Shrub	(1) <i>Rosa woodsii</i>
Herbaceous	(1) <i>Elymus trachycaulus</i> (2) <i>Vicia americana</i>

## Physiographic features

North and east facing slopes are more favorable than south and west. This site is found mostly commonly on mountain slopes, hills, and complex landslides. Mid and lower slopes positions are more favorable than top slope and ridge positions. Flat mesas areas may be favorable, if soils are deep.

**Table 2. Representative physiographic features**

Landforms	(1) Complex landslide (2) Mountain slope (3) Hill (4) Dip slope (5) Mesa (6) Structural bench
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	8,500–11,500 ft
Slope	0–50%

## Climatic features

Average annual precipitation is about 20 to 30 inches. Of this, approximately 65-75% falls as snow, and 25-35% falls as rain between middle of June to and the middle of September 1. Summer moisture is mostly from thundershowers in July, August and September. May to June is the driest period of the year with the driest month being June. December thru March is the wettest period and the wettest month is usually January. The average annual total snowfall is 198.5 inches. The snow depth usually ranges from 4 to 35 inches during November thru April. The highest winter snowfall record in this area is 354.5 inches which occurred in 1964-1965. The lowest snowfall record is 68.5 inches during the 1914-1915 winter. The frost-free period typically ranges from 25 to 90 days. The last spring frost is typically the end of June to the middle of July. The first fall frost is the first week of August to the first week of September. Mean daily annual air temperature is about 17.9°F to 51.5°F, averaging about 13.6°F for the winter and 54.9°F in the summer. Summer high temperatures of 70°F to mid-70°F are not unusual. The coldest winter temperature recorded was -47°F on February 6, 1982 and the warmest winter temperature recorded was 13.6°F on December 18, 1917. The coldest summer temperature recorded was 15°F on June 20, 1920 and the warmest was 95 °F on July 17, 1949. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2018) for Crested Butte, Colorado Climate Station.

This zone in MLRA 48 will need to be broken up into at least 7 land resources zones in future projects based on current knowledge of precipitation and temperature patterns.

West Central Zone Stations: use in write up above. Driest month is June and wettest months are December thru March.

Northwest Zone Climate Stations: Marvine Ranch, Pyramid, Vail and Winter Park. Driest month is June and the wettest period is October thru April.

Southwest Zone Climate Stations (Precambrian sedimentary and igneous): Cascade, Electra Lake, Rico, Silverton, Telluride 4 WNW and Trout Lake. This area has driest month as June and the wettest months are July and August.

Southwest Volcanics: Platoro and Rio Grande Reservoir. The driest month is June and the Wettest are August and March.

Northeast (Front Range Igneous and Metamorphic): Allen’s Park 2 NNW, Allen’s Park NNW, Breckenridge, Climax, Jones Pass 2E, and Squaw Mountain. April, May, July and August are the wettest months. February, December, November and October are the driest.

Southeast (Sangre de Cristo Mtns): North Lake – This is the only climate station in this zone. It driest months are December and January with July being the wettest. So, this area receives more summer precipitation than other zones in this climate zone.

Frigid high elevation valleys: Aspen 1 SW, Ouray, Tacoma, Gross Reservoir, Coal Creek Canyon, Steamboat Springs, Marvine, and Buckskin Mtn 1 E. These areas have longer growing seasons by 20 to 40 days over the cryic stations.

Table 3. Representative climatic features

Frost-free period (characteristic range)	5-36 days
Freeze-free period (characteristic range)	40-76 days
Precipitation total (characteristic range)	20-30 in
Frost-free period (actual range)	3-46 days
Freeze-free period (actual range)	32-88 days
Precipitation total (actual range)	20-30 in
Frost-free period (average)	19 days
Freeze-free period (average)	56 days
Precipitation total (average)	25 in

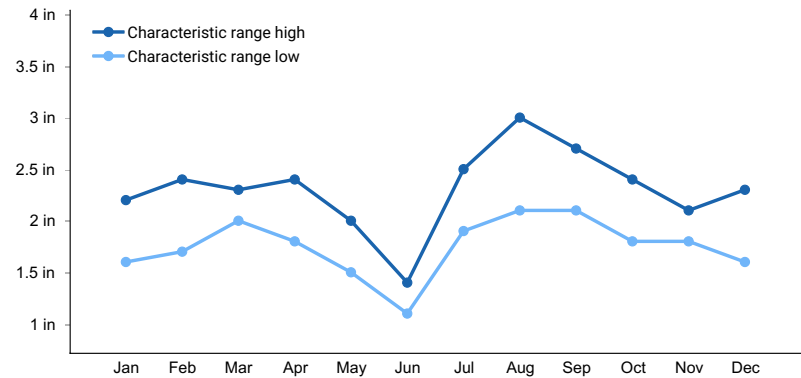


Figure 1. Monthly precipitation range

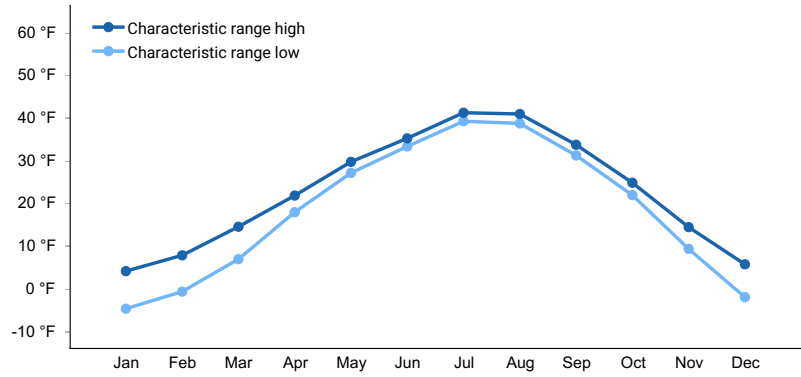
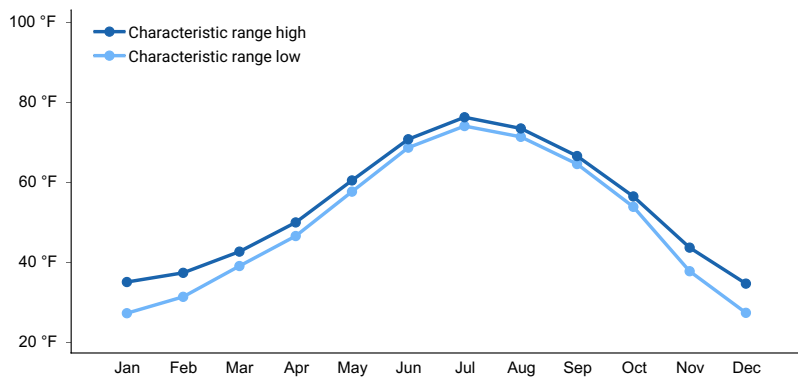
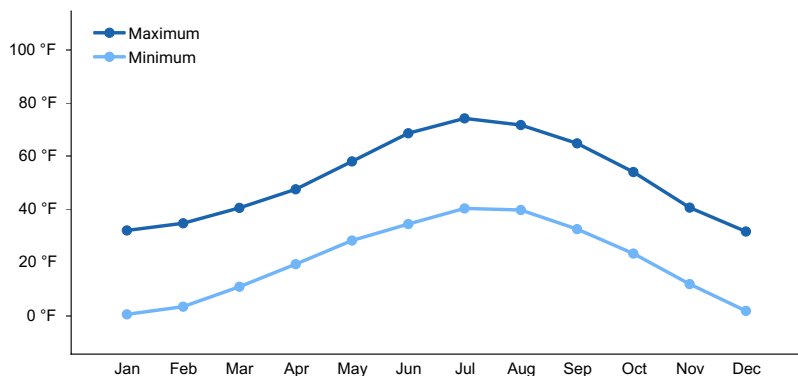


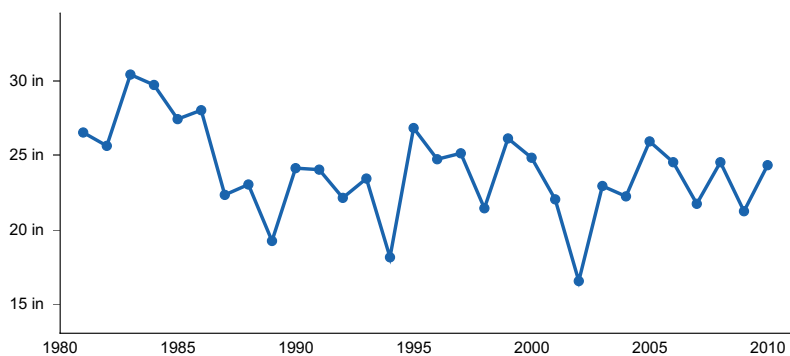
Figure 2. Monthly minimum temperature range



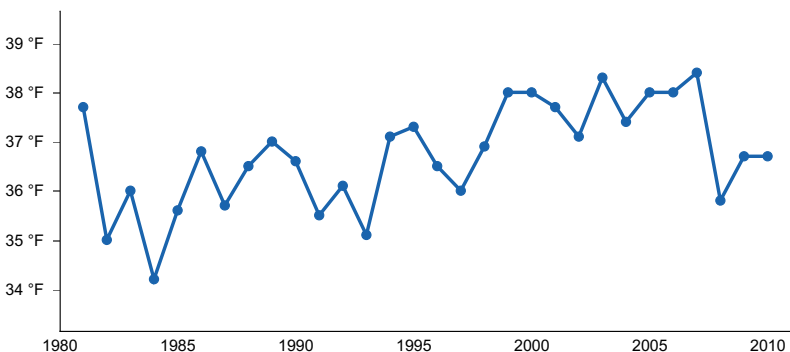
**Figure 3. Monthly maximum temperature range**



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



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) CLIMAX [USC00051660], Leadville, CO
- (2) CRESTED BUTTE [USC00051959], Crested Butte, CO
- (3) MARVINE RCH [USC00055414], Meeker, CO

- (4) RICO [USC00057017], Cahone, CO
- (5) RIO GRANDE RSVR [USC00057050], Lake City, CO
- (6) SILVERTON [USC00057656], Silverton, CO
- (7) TELLURIDE 4WNW [USC00058204], Telluride, CO
- (8) VAIL [USC00058575], Vail, CO

## Influencing water features

None

## Soil features

Soils are moderately deep to very deep, and dark from organic matter in the mollic horizon. They are high in organic matter.

**Table 4. Representative soil features**

Parent material	(1) Slide deposits–igneous, metamorphic and sedimentary rock (2) Colluvium–sandstone and shale (3) Slope alluvium–sandstone and shale (4) Complex landslide deposits–igneous, metamorphic and sedimentary rock (5) Colluvium–igneous, metamorphic and sedimentary rock (6) Residuum–sandstone and shale (7) Slope alluvium–diorite (8) Slope alluvium–rhyolite
Surface texture	(1) Loam (2) Stony, very stony, cobbly loam (3) Gravelly, very cobbly loam
Family particle size	(1) Fine-loamy (2) Loamy-skeletal (3) Clayey-skeletal (4) Fine
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	20–100 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Calcium carbonate equivalent (Depth not specified)	0%
Clay content (Depth not specified)	20–40%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–40%

## Ecological dynamics

The following State and Transition diagram depicts the most common plant communities found on this ecological

site. It does not necessarily depict all the plant communities that can occur, but does show the most prevalent and repeatable. As more data are collected, some of these plant communities may be revised or removed, and new ones added. These descriptions capture the current knowledge and experience at the time of this revision.

#### State 1 Reference State

This Reference State describes the biotic communities that may become established on this ecological site if all successional sequences are completed under natural disturbance conditions. Species composition is generally dominated by mature or seral aspen community types. Shrubs are of minor importance in this state.

Several seral communities are described in this reference state including those of open canopy, seedling, sapling, pole, immature forest, mature forest, and eventually to an old or overmature forest type if fire is excluded for very long periods of time.

The primary disturbance mechanisms in this state are overstory canopy density, weather fluctuations, and fire, or lack of fire. The reference state is self-sustaining and resistant to change beyond its normal seral community types due to a good adaptation to natural disturbances and a high resilience following those disturbances. When natural disturbances such as fire do occur, the rate of recovery can be quite variable.

Feedbacks: Natural fluctuations in weather patterns that allow for a self-sustaining mix of an aspen, shrubs and native grass and grasslike community. Insect herbivory, more frequent fires, or other disturbances that may allow for the establishment of invasive species.

At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for non-native plants to establish.

#### Community 1.1 Mature Aspen Community Phase.

This community phase is dominated by an overstory canopy of mature aspen that have reached or are near maximal heights for the site. Average age is 80 to 120 years. Trees have developed tall, straight, clear stems with short, high rounded crowns. Tree canopy cover ranges from 20 to 40 percent. Understory vegetation is strongly influenced by tree competition, overstory shading, duff accumulation, etc. A few seedlings and/or saplings of quaking aspen occur in the understory. Shade tolerant plants dominate the understory. Non-native species including smooth brome, orchardgrass, and Kentucky bluegrass may be present in the community. Thick duff layers are present on some sites, completely covering the forest floor with needles and twigs. The species composition table in this description provides an example of the typical vegetative floristics of a community phase 1.1 plant community.

#### Community 1.2 Aspen Seedling/ Herbaceous Community Phase.

This community phase is dominated by aspen sprouts and seedlings, and by perennial grasses and forbs under nearly full sunlight. This stage is experienced after a major disturbance such as crown fire, insect damage or disease. Any skeleton forest (dead trees) remaining have little or no effect on the composition and production of the herbaceous vegetation. Various amounts of tree seedlings 1 to 25 years old are present up to the point where they are obviously a major component of the vegetal structure. Thick duff layers are present on some sites, completely covering the forest floor with needles and twigs. Non-native including smooth brome, orchardgrass, and Kentucky bluegrass may also occur on the site.

#### Community 1.3 Immature Aspen Forest/ Herbaceous Community Phase.

This community phase is characterized by a growing canopy of pole sized and/or immature aspen. Trees are developing tall, straight, clear stems with narrow pointed crowns. Average age is 25 to 80 years. Tree canopy cover ranges from 10 to 20 percent. Understory vegetation is somewhat influenced by tree competition, overstory shading, duff accumulation, etc. Seedlings and/or saplings of quaking aspen are common in the understory. Shade tolerant plants dominate the understory. Thick duff layers are present on some sites, completely covering the forest floor with needles and twigs. Non-native species including smooth brome, orchardgrass and Kentucky bluegrass may be present in the community.

#### Community 1.4 Decadent Aspen Community Phase.

This community phase is dominated by an overstory canopy of very mature and decadent aspen that have reached maximal heights for the site. Average age is 120 plus years. Trees have developed tall, straight, clear stems with high, very rounded crowns. This phase typically develops in the absence of wildfire or other naturally occurring disturbances including disease and insect damage. Tree canopy cover is at a maximum for the site and is



commonly greater than 50 percent. Very old trees often show signs of disease and/or insect damage. Understory vegetation is somewhat sparse due to tree competition, overstory shading, duff accumulation, etc. Minor amounts of non-native species including smooth brome, orchardgrass and Kentucky bluegrass may be present on the community. Thick duff layers are often present, completely covering the forest floor with needles and twigs.

#### Pathway 1.1B Community 1.1 to 1.2

This community pathway occurs when wildfire removes the aspen overstory. This event can be exacerbated by drought, insect damage or disease.

#### Pathway 1.1A Community 1.1 to 1.4

This community pathway occurs when fire is excluded from the plant community for long periods of time.

#### Pathway 1.2A Community 1.2 to 1.3

This community pathway occurs when fire is excluded from the plant community for long periods of time.

#### Pathway 1.3A Community 1.3 to 1.1

This community pathway occurs when fire is excluded from the plant community for long periods of time.

#### Pathway 1.3B Community 1.3 to 1.2

This community pathway occurs when wildfire removes the growing aspen overstory. This event can be exacerbated by drought, insect damage and/or disease.

#### Pathway 1.4A Community 1.4 to 1.1

This community pathway occurs when insect damage or disease kills old trees and allows the community to return to a community phase 1.1 type with snags present.

#### Pathway 1.4B Community 1.4 to 1.2

This community pathway occurs when wildfire removes the aspen overstory. This event can be exacerbated by drought, insect damage or disease.

### State 2 Logged/Disturbed State

The logged or disturbed state is similar to the current potential state, however merchantable timber composed mostly of mature and old aspen have been removed. Various amounts of invasive species may also now be present in all community phases. This condition has not been well documented and so community phases in this state are based on possible community dynamics and not documented facts. Species composition is generally dominated by an immature canopy of aspen. Shrubs are of minor importance in the understory. A wide diversity of perennial forbs and grasses are also present. Non-native species including orchard grass, Kentucky bluegrass and smooth brome may also be present. These species could have been seeded as part of the site rehabilitation following the logging process.

Logging will release younger aspen trees and will give the site the look of an immature forest. Site will return to a mature, and finally an old or over-mature forest type if fire is excluded for very long periods of time.

The primary disturbance mechanisms are logging, road building or other man caused activities, weather fluctuations and fire or lack of fire. The logged state is still self sustaining but has a lower resistant to change due to a reduced resistance to disturbances. When disturbances do occur, the rate of recovery can be highly variable.

Logged/disturbed State: Plant communities influenced by man caused activities, wildlife browsing, insect herbivory, weather fluctuations, fire periods and surface disturbances.

Indicators: A community dominated by immature aspen with an understory of aspen reproduction, shrubs, grasses and forbs. The density of the overstory canopy determines the amount and composition of the other native perennial grasses, grasslikes and forbs that may be present.

Feedbacks: Natural fluctuations in weather patterns that allow for a self-sustaining mix of a aspen, shrubs and native grass and grasslike community. Insect herbivory, more frequent fires, or other disturbances that may allow for the increase of non-native species.

At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become

available for non-native plants to increase.

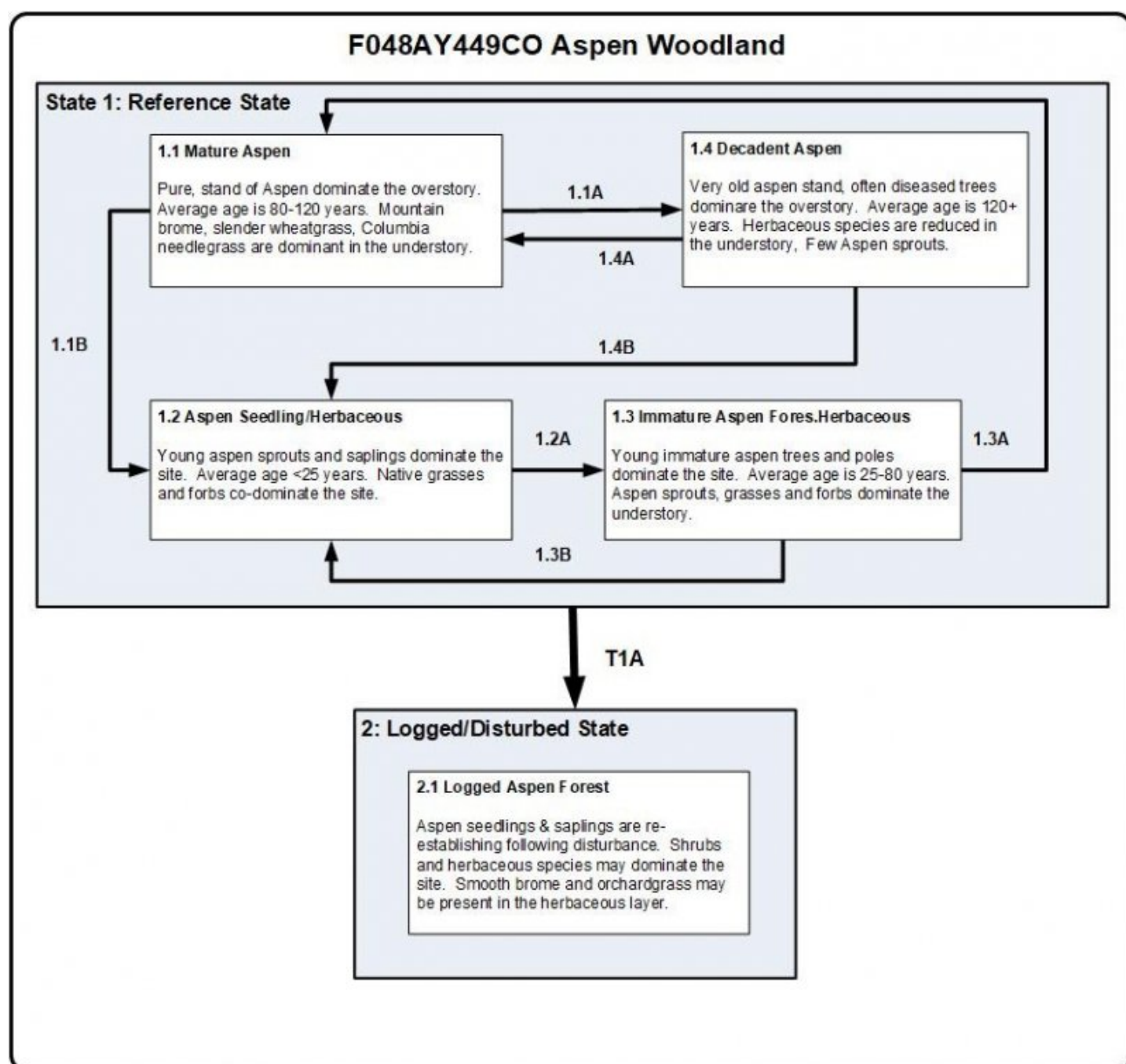
### Community 2.1 Logged Aspen Forest Community Phase.

This community phase is typically found following logging or other man caused activity such as road building or pipeline construction. It is characterized by a partial canopy of aspen. Pole and/or immature sized trees are present and are beginning to once again dominant the community. Shrubs are a minor component in the understory as well as native perennial grasses and forbs. Non-native species including orchard grass, Kentucky bluegrass and smooth brome may potentially also be found on the site. Understory vegetation is somewhat influenced by tree competition, overstory shading, duff accumulation, etc. Seedlings and/or saplings of quaking aspen are common in the understory. Thick duff layers are present on some sites, completely covering the forest floor with needles and twigs.

### Transition T1A State 1 to 2

This transitional pathway occurs when various disturbances such as timber logging including skid trail development, road building, pipeline construction or fenceline clearing removes mature and over-mature aspen trees from the site and provides an opportunity for non-native species to become established. Seeding of these species could be a normal part of these activities. Once non-native species are established, a threshold has been crossed. Seeding species such as orchardgrass and smooth brome would often be a normal part of these activities.

## State and transition model



# Legend

1.1A, 1.2A, 1.3A – lack of fire, time without disturbance, lack of insect/pathogen outbreaks  
 1.1B, 1.3B, 1.4B – fire, insect damage/disease, drought  
 1.4A – insect damage/disease, time without disturbance

T1A – fire, disturbance, logging, vegetative treatments

## State 1

### Reference State

## Community 1.1

### Reference Plant Community

Quaking aspen is the dominant overstory plant. Shade tolerant plants such as wild celery, bluebells, cow parsnip, blue wildrye, mountain brome, bearded wheatgrass and Columbia needlegrass, sweetanice, meadowrue, and western valerian are the dominant understory species.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1500	1800	2100
Forb	375	450	525
Tree	375	450	525
Shrub/Vine	250	300	350
<b>Total</b>	<b>2500</b>	<b>3000</b>	<b>3500</b>

## Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Grasses/Grass-likes</b>			1600–2000	
	mountain brome	BRMA4	<i>Bromus marginatus</i>	350–550	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	350–550	–
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	350–550	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	200–500	–
	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	200–400	–
	Geyer's sedge	CAGE2	<i>Carex geyeri</i>	200–400	–
	blue wildrye	ELGL	<i>Elymus glaucus</i>	100–200	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	100–200	–
	Thurber's fescue	FETH	<i>Festuca thurberi</i>	0–50	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0–50	–
	Parry's oatgrass	DAPA2	<i>Danthonia parryi</i>	0–50	–

	oniongrass	MEBU	<i>Melica bulbosa</i>	0–50	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–50	–
<b>Forb</b>					
2	<b>Forbs</b>			300–500	
	Forb, perennial	2FP	<i>Forb, perennial</i>	200–400	–
	Forb, annual	2FA	<i>Forb, annual</i>	200–400	–
	aspen fleabane	ERSP4	<i>Erigeron speciosus</i>	100–200	–
	heartleaf arnica	ARCO9	<i>Arnica cordifolia</i>	1–50	–
	aspen pea	LALA6	<i>Lathyrus laetivirens</i>	1–50	–
	lupine	LUPIN	<i>Lupinus</i>	1–50	–
	geranium	GERAN	<i>Geranium</i>	1–50	–
	cinquefoil	POTEN	<i>Potentilla</i>	1–50	–
	northern bedstraw	GABO2	<i>Galium boreale</i>	1–50	–
	starwort	STELL	<i>Stellaria</i>	1–50	–
	strawberry	FRAGA	<i>Fragaria</i>	1–50	–
	meadow-rue	THALI2	<i>Thalictrum</i>	1–50	–
	lesser rushy milkvetch	ASCO12	<i>Astragalus convallarius</i>	1–50	–
	giant hyssop	AGAST	<i>Agastache</i>	1–50	–
	owl's-claws	HYHO	<i>Hymenoxys hoopesii</i>	1–50	–
	elkweed	FRSP	<i>Frasera speciosa</i>	1–50	–
	western valerian	VAOC2	<i>Valeriana occidentalis</i>	1–50	–
	common cowparsnip	HEMA80	<i>Heracleum maximum</i>	0–25	–
	licorice-root	LIGUS	<i>Ligusticum</i>	0–25	–
	Colorado blue columbine	AQCO	<i>Aquilegia coerulea</i>	0–25	–
	larkspur	DELPH	<i>Delphinium</i>	0–25	–
	monkshood	ACONI	<i>Aconitum</i>	0–25	–
	American vetch	VIAM	<i>Vicia americana</i>	0–25	–
	bluebells	MERTE	<i>Mertensia</i>	0–25	–
	western coneflower	RUOC2	<i>Rudbeckia occidentalis</i>	0–25	–
	western brackenfern	PTAQ	<i>Pteridium aquilinum</i>	0–25	–
	creeping barberry	MARE11	<i>Mahonia repens</i>	0–25	–
<b>Shrub/Vine</b>					
3	<b>Shrubs</b>			250–350	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	100–300	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	100–200	–
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–50	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	0–50	–
	Woods' rose	ROWO	<i>Rosa woodsii</i>	0–50	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–50	–
	blue elderberry	SANIC5	<i>Sambucus nigra ssp. cerulea</i>	0–50	–
	shrubby cinquefoil	DAFR6	<i>Dasiphora fruticosa</i>	0–50	–
<b>Tree</b>					
4	<b>Trees</b>			300–500	
	quaking aspen	POTR5	<i>Populus tremuloides</i>	300–500	–

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## Animal community

**Grazing Use:** This is a considerable amount of grazing use in this type. Much of the grazing consists of a few palatable grasses, forbs and browse. As overgrazing takes place, there is an increase in less desirable grasses and forbs such as Letterman's needlegrass and rabbitbrush in the understory. There is more grazing available in older stands than in young stands. For best woodland production, the grazing should be very light following any clear cutting on this site. The normal season of use is summer grazing and some early fall use.

## Wood products

**Light Tolerance:** Aspen is intolerant to shade.

**Use for Species:** The aspen in this site has increasing use as veneer, lumber, matchsticks, corestocks and excelsior. It may have a small amount of value in pulp production also.

**Spacing requirements:** Thinning should be done only 10-15 years after clear cutting on Sites I and II when there is indication of dominance in the stand. The USFS aspen management guide recommends leaving 600 to 900 trees per acre (spacing seven to eight feet between trees)

**Site Index:** The aspen in this site includes aspen of site quality I and II as described in Rocky Mountain Region Timber Management Guide for Aspen. The site index (Based on 80 yrs. age) is 77 for Site I and 67 for Site II. It is difficult to read growth rings in aspen so it may be necessary to judge this site by old tree only.

## Other information

In this essentially permanent type aspen which occurs largely in Western Colorado, the type is practically pure. It will not be mapped on the Eastern Slope of the state.

## Other references

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## Contributors

Suzanne Mayne-Kinney

## Approval

Kirt Walstad, 5/06/2024

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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	05/06/2024
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):**
- 
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):**
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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

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17. **Perennial plant reproductive capability:**

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