

Ecological site F048AY528UT High Mountain Very Steep Loam (Aspen)

Last updated: 3/05/2024
Accessed: 04/20/2024

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.

Ecological site concept

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.

Associated sites

F048AY530UT	High Mountain Very Steep Loam (Douglas Fir) Often occurs adjacent to this site.
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Similar sites

F048AY506UT	High Mountain Loam (Aspen) Similar plant community but occurs on steeper slopes.
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Table 1. Dominant plant species

Tree	(1) <i>Populus tremuloides</i>
Shrub	(1) <i>Symphoricarpos oreophilus</i>
Herbaceous	(1) <i>Elymus glaucus</i>

Physiographic features

This site occurs at elevations between 7,500 and 10,600 feet. It is found on moraines and mountain slopes with slopes ranging from 25-70 percent. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Moraine
Runoff class	High
Flooding frequency	None
Ponding frequency	None

Elevation	7,500–10,600 ft
Slope	25–70%
Aspect	N

Climatic features

The climate of this site is dry subhumid and semiarid. It is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation ranges from 22 to 35 inches. July, August, and October are typically the wettest months with June being the driest. The most reliable sources of moisture for plant growth are the snow that accumulates over the winter and spring rains. Summer thunderstorms are intermittent and sporadic in nature, and thus, are not reliable sources of moisture to support vegetative growth on this site. The soil moisture regime is mostly udic and the soil temperature regime is cryic.

Table 3. Representative climatic features

Frost-free period (characteristic range)	30-50 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	22-35 in

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

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.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–igneous and sedimentary rock (2) Colluvium–igneous and sedimentary rock
Surface texture	(1) Channery, very cobbly loam
Family particle size	(1) Loamy-skeletal (2) Fine-loamy
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	20–40 in
Soil depth	20–40 in
Surface fragment cover ≤3"	0–19%
Surface fragment cover >3"	0–19%
Available water capacity (Depth not specified)	2–7 in
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0–1 mmhos/cm

Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.4–7.4
Subsurface fragment volume <=3" (Depth not specified)	0–29%
Subsurface fragment volume >3" (Depth not specified)	0–44%

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 a 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.

Trigger: The establishment of non-native plant species.

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.

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 affect 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.

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.

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.

a. Nature of Forest Community

The overstory tree canopy cover is about 55 to 65 percent. Slender wheatgrass, mountain brome, Columbia needlegrass, and thurber fescue are common understory species. Understory composition by air-dry weight is about 60 percent perennial grasses and grasslike plants, 15 percent forbs, and 25 percent shrubs and young trees. Understory production ranges from 800 pounds per acre in favorable years to about 400 pounds per acre in unfavorable years. Understory production includes the total annual production of all species within 4 ½ feet of the ground surface.

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 Current Potential State

The current potential state is similar to the reference state, however minor amounts of non-native species may 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. This 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 disturbance, canopy density, weather fluctuations,

and fire, or lack of fire. The current potential state is still 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 disturbances such as fire do occur, the rate of recovery can be quite variable.

Current Potential State: Plant communities influenced by Aspen canopy density, long term weather fluctuations, and periodic fire.

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 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.

Trigger: The increase of non-native plant species.

Community 2.1 Mature Aspen, Non-Native Herbaceous 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. 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 understory species. Non-native species including smooth brome, orchardgrass, and Kentucky bluegrass may now be present in the community. Thick duff layers are present on some sites, completely covering the forest floor with needles and twigs.

Community 2.2 Aspen Seedling/ Non-Native 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. Non-native including smooth brome, orchardgrass, and Kentucky bluegrass may also occur on the site. Thick duff layers are present on some sites, completely covering the forest floor with needles and twigs.

Community 2.3 Immature Aspen Forest/Non-Native 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 understory. Non-native species including smooth brome, orchardgrass and Kentucky bluegrass are present in the community. Thick duff layers are present on some sites, completely covering the forest floor with needles and twigs.

Community 2.4 Decadent Aspen, Non-Native Herbaceous 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 2.1B Community 2.1 to 2.2

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

Pathway 2.1A Community 2.1 to 2.4

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

Pathway 2.2A Community 2.2 to 2.3

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

Pathway 2.3A Community 2.3 to 2.1

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

Pathway 2.3B Community 2.3 to 2.2

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

Pathway 2.4B Community 2.4 to 2.1

This community pathway occurs when insect damage or disease kills old trees and allows the community to return to a community phase 2.1 type with snags present.

Pathway 2.4A Community 2.4 to 2.2

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

State 3 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 resistance 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.

Trigger: The increase of non-native plant species.

Community 3.1 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 road building, pipeline construction or fenceline clearing provides and 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.

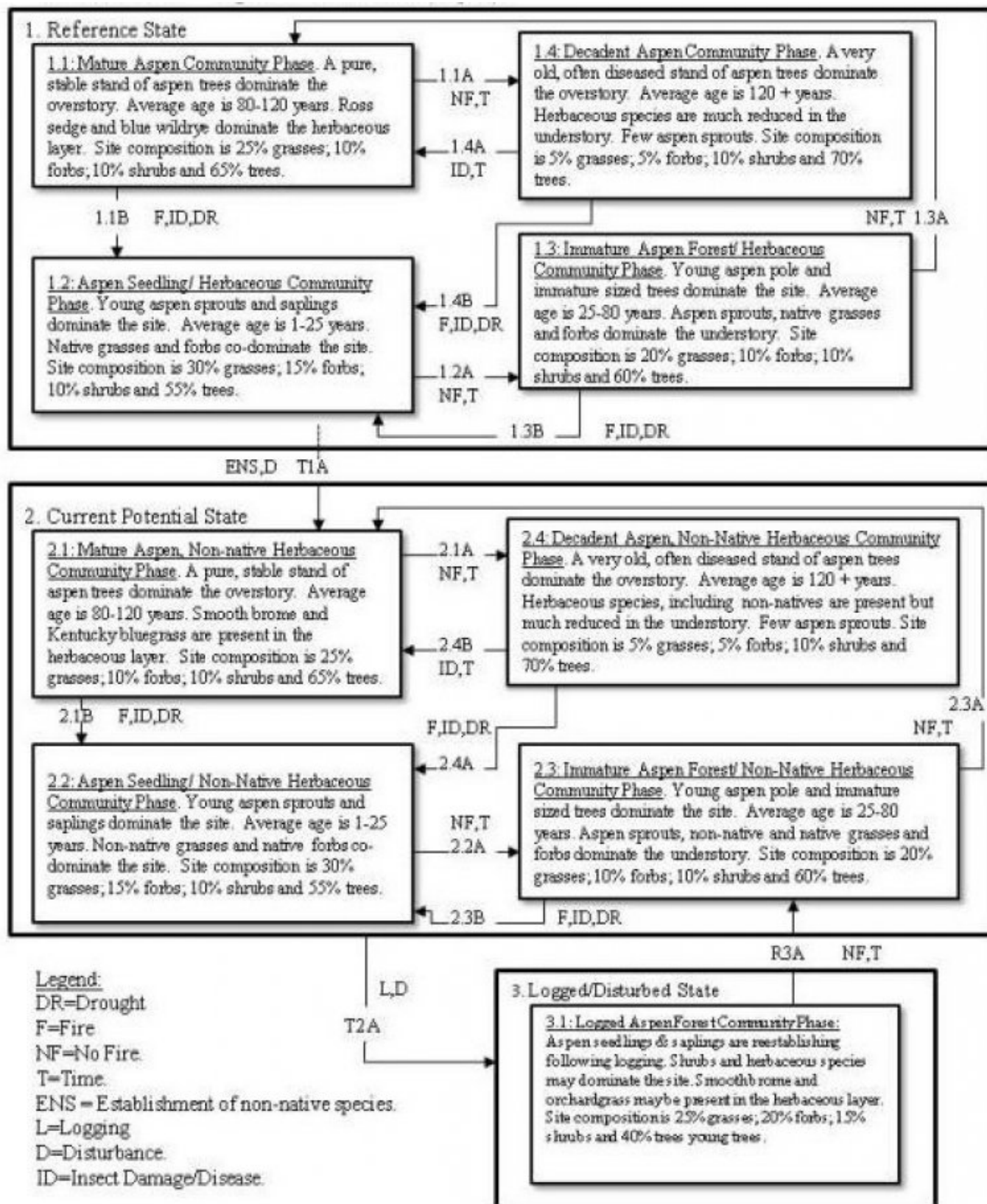
Transition T2A State 2 to 3

This transitional pathway occurs when timber logging and its associated activities, including road building and skid trail development, removes mature and over-mature aspen trees from the site and provides an opportunity for non-native species to increase. Seeding species such as orchardgrass and smooth brome would often be a normal part of these activities. Once the site is logged, a threshold has been crossed.

Restoration pathway R3A State 3 to 2

This restoration pathway occurs following logging activities when the site is allowed to recover naturally. Pole sized and immature aspen trees are increasing in dominance. Seeded, non-native herbaceous species where present, are well established.

State and transition model



**State 1
Reference State**

**Community 1.1
Reference State**

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	400	600	800
Shrub/Vine	100	150	200
Forb	60	90	120
Total	560	840	1120

Additional community tables

Animal community

a. Livestock Grazing

This site is suited to cattle and sheep grazing during the summer and fall. Livestock will often concentrate on this site taking advantage of the shade and shelter offered by the tree overstory. Grazing management should allow aspen saplings to attain a minimum height of 55 to 60 inches before use to prevent destructive browsing by livestock. Harvesting trees under a sound management program for fuelwood or other products can open up the tree canopy to allow increased production of understory species desirable for grazing while rejuvenating the aspen forest.

Wildlife species seeking food and cover in this forest site include elk, mule deer, bear, porcupine, snowshoe hare, owl, and woodpecker.

Wood products

6. Silvicultural Practices

a. Harvest cut selectively or in small patches (size dependent upon site conditions) to enhance forage production.

1. Thinning and improvement cutting – removal of poorly formed, diseased, and low vigor trees for fuelwood.
2. Harvest cutting – selectively harvest surplus trees to achieve desired spacing. Harvest stands in small blocks of 1/5 to 1/2 acre with slash left in place to shelter emerging aspen suckers from browsing.
3. Spacing guide: A spacing of about 15 x 15 feet is considered desirable for multiple use management during period of stand maturity.

b. Selective tree removal on suitable sites to enhance forage production and manage site reproduction.

Other information

4. Limitations and Considerations

- a. Potential for sheet and rill erosion is moderate to severe depending on slope.
- b. Moderate to severe equipment limitations on wet soils during critical times of the year.
- c. Proper spacing is the key to a well managed multiple use and multi-product aspen forest.

5. Essential Requirements

- a. Adequately protect from high intensity wildfire.
- b. Protect soils from accelerated erosion.
- c. Apply proper grazing management practices (see management guides)

Table 6. 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
quaking aspen	POTR5	40	50	16	21	–	–	–	

Inventory data references

Historic data collected by USDA range professionals was reviewed in support of this description.

Other references

Meuggler, Walter F., 1988 Aspen Community Types of the Intermountain Region, General Technical Report, INT-250, page 42, POTR/SYOR/BRCA

Nevada Soil Conservation Service Forest Suitability Group Description 028BY067NV

Contributors

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Approval

Kirt Walstad, 3/05/2024

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	04/20/2024
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:
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17. **Perennial plant reproductive capability:**
-