Ecological site F048AY524UT
High Mountain Stony Loam (Engelmann Spruce)

Last updated: 3/05/2024
Accessed: 05/10/2025

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 alluvium, colluvium or till derived from diorite. Surface soils are gravelly loam to cobbly loam in texture. Rock fragments may be present on the soil surface and throughout the profile, and make up more than 35 percent of the soil volume. These soils are moderately deep to deep, well-drained, and have moderate to moderately rapid permeability. Available water-holding capacity ranges from 2 to 5 inches of water in the upper 60 inches of soil. pH is very strongly acid to neutral alkaline. The soil moisture regime is mostly typic udic and the soil temperature regime is cryic. Precipitation ranges from 22-35 inches annually.

Associated sites

R048AY518UT	**High Mountain Gravelly Loam (Mountain Big Sagebrush)** Often occurs adjacent to this site.

Similar sites

F048AY532UT	**High Mountain Very Steep Stony Loam (Engelmann Spruce)** Similar plant community but has more rock fragments in the soil profile.

Table 1. Dominant plant species

Tree	(1) *Picea engelmannii*
Shrub	(1) *Juniperus communis*
Herbaceous	(1) *Carex geyeri*

Physiographic features

This site occurs at elevations between 8,400 and 12,000 feet. It is found on moraines and mountain slopes with slopes ranging from 5-70 percent. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Moraine
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None

Elevation	8,400–12,000 ft
Slope	5–70%
Aspect	Aspect is not a significant factor

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)	20-60 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 alluvium, colluvium or till derived from diorite. Surface soils are gravelly loam to cobbly loam in texture. Rock fragments may be present on the soil surface and throughout the profile, and make up more than 35 percent of the soil volume. These soils are moderately deep to deep, well-drained, and have moderate to moderately rapid permeability. Available water-holding capacity ranges from 2 to 5 inches of water in the upper 60 inches of soil. pH is very strongly acid to neutral alkaline. The soil moisture regime is mostly typic udic and the soil temperature regime is cryic. Precipitation ranges from 22-35 inches annually.

Table 4. Representative soil features

Parent material	(1) Alluvium–diorite (2) Colluvium–diorite (3) Till–diorite
Surface texture	(1) Gravelly, cobbly loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	40–60 in
Soil depth	40–60 in
Surface fragment cover <=3"	13–22%
Surface fragment cover >3"	0–20%
Available water capacity (Depth not specified)	2–5 in
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm

Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	15–20%
Subsurface fragment volume >3" (Depth not specified)	16–38%

Ecological dynamics

It is impossible to determine in any quantitative detail the historic climax plant community (HCPC) for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). However, up to the 1870s the Shoshone Indians, prevalent in northern Utah and neighboring states, grazed horses and set fires to alter the vegetation for their needs (Parson 1996). In the 1860s, Europeans brought cattle and horses to the area, grazing large numbers of them on unfenced parcels year-long (Parson 1996). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include tree harvest, grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, and kinds and times of timber harvest, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.

The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

State 1 Reference State
The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. At the time of European colonization, what would have been observed on these sites would have primarily depended on the time elapsed since the last wildfire occurred. Had the site been relatively undisturbed (i.e. without fire) for approximately 400 years or longer, the late seral climax of an Engelmann spruce (*Picea engelmannii*) -dominated forest would have been found (1.1). The understory would have been relatively sparse due to tree competition, overstory shading, and duff accumulation. Wildfire (1.1a) would have replaced these stands with diverse herb-dominated vegetation (1.2). In the absence of any major disturbance (1.2a, 1.3a, 1.4a, 1.5a), the vegetation would have progressed into more of a shrub-herb co-dominance (1.3), followed by aspen (*Populus tremuloides*) (1.4), then would have become a mature stand of subalpine fir (*Abies lasiocarpa*) (1.5). Ultimately the site would have been reinvaded by Engelmann spruce (1.1). A more complete list of species by lifeform for the Reference State is available in accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document. Wildfire (1.1a, 1.5b) would have been the primary disturbance factor prior to colonization.

Community Phase 1.1: Engelmann spruce/ sparse understory
This plant community (1.1) would have been characterized by a dense-canopied stand of mature Engelmann spruce with a sparse understory of shade-tolerant herbs such as heartleaf arnica (*Arnica cordifolia*), Geyer's sedge (*Carex geyeri*), Ross' sedge (*Carex rossii*), and spike trisetum (*Trisetum spicatum*). This community would have existed approximately 400 years post fire.

Community Pathway 1.1a:
Wildfire would have removed the trees, allowing herbs to flourish briefly.

Community Phase 1.2: herb-dominated meadow
This plant community would have developed within the first 5 years since the last fire. This would have been dominated by shade-intolerant forbs and grasses.

Community Pathway 1.2a:
After about 5 years, shrubs would begin to establish in the site.

Community Phase 1.3: shrub-herb co-dominance
Between 5 and 30 years after fire, shrubs and herbs would co-dominate the site. The Increasing shrub component would have included common juniper (*Juniperus communis*), grouse whortleberry (*Vaccinium scoparium*), gooseberry currant (*Ribes montigenum*), and Oregon boxleaf (*Paxistima myrsinites*). Geyer's and Ross' sedges, spike trisetum, thickspike wheatgrass, heartleaf arnica, and Fendler's meadow-rue would have been beginning to be present in the understory.

Community Pathway 1.3a:
About 30 years after fire, aspen would have become established in the site.

Community Phase 1.4: aspen
This plant community would have been dominated by aspen, a seral species. Subalpine fir would have been present only as an understory species at this time. Aspen would have dominated these sites for approximately 30 to 100 years following the last fire. The understory would have had a mixture of shrubs and herbaceous species.

Community Pathway 1.4a:
With approximately another century without fire, subalpine fir would have out-competed the aspen to become the dominant overstory species at the site.

Community Phase 1.5: subalpine fir
Subalpine fir would have been temporarily dominant at these sites for approximately 100 to 400 years following the last wildfire. Only shade-tolerant understory species would have been present. During this time, Engelmann spruce would become established in the understory.

Community Pathway 1.5a:
After approximately 400 years following the last wildfire, Engelmann spruce would have out-competed subalpine fir to become the dominant overstory species at the site.

Community Pathway 1.5b:
Wildfire would have removed the trees, allowing shade-intolerant herbs to flourish briefly.

Transition T1a: from State 1 to State 2 (Reference State to Secondary Forest/ Introduced State)
The simultaneous introduction of exotic species, both plants and animals, and possible extinctions of native flora and fauna, along with climate change, has caused State 1 to transition to State 2. Although the earliest use of climax Engelmann spruce forests by Europeans was for trapping of fur beavers, this had little impact on the vegetation. Similarly, early livestock grazing had little impact on these lands in climax forests. Instead, the major European influences were from logging (T1a). The first cycle of logging in these forests was for the large spruce trees for building farms, ranches, and city buildings. Continued impacts could prevent the recovery toward potential conifer dominance (State 2, various phases). Spruce establishment dates back to the colder, wetter little Ice Age, thus it is not likely that the slow growing spruce will re-establish under the altered climate of the present day. The reversal of these changes (i.e. a return pathway) back to State 1 is not practical.

State 2 Secondary Forest/ Introduced State
State 2 is similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of native species, a different climate, and a secondary stand of trees. State 2 is a description of the ecological site shortly following Euro-American settlement. This state can be regarded as the current potential. With the large spruce trees being targeted during the first rounds of logging, what was left of these trees was minimal to none. Instead, sites that would have been dominated by Engelmann spruce became more often dominated by subalpine fir with only a scattering of Engelmann spruce (2.1). As with the Reference State, time elapsed since last wildfire or logging event remains the key factor in determining what vegetation will be encountered on these sites. Logging effects, along with associated mechanical and fire disturbances, open up the canopy and allow for the expansion of the herbaceous understory (2.1a, 2.5b). In the absence of any major disturbance (2.2a, 2.3a, 2.4a, 2.5a), the vegetation will progress through shrub-herb co-dominance (2.3), followed by aspen and lodgepole pine (*Pinus contorta*) (2.4), and ultimately by mature subalpine fir (2.1). The resiliency of this State is encouraged by the presence of self-armoring gravelly soils. Livestock grazing and fire exclusion accelerate natural succession of woody species.

Community Phase 2.1: subalpine fir/ scattered Engelmann spruce
This plant community (2.1) is characterized by a stand of mature subalpine fir with a scattering of Engelmann spruce. The understory is sparse and made up of Geyer’s and Ross’ sedges, slender wheatgrass, and heartleaf arnica.

Community Pathway 2.1a:
A stand-replacing wildfire or intensive logging will set the vegetation back to an early seral herb-dominated phase. Logging opens up the forest canopy, allowing shrubs and herbs to flourish for 20 to 30 years.

Community Pathway 2.1b:
Selective timber cutting of mature subalpine fir and remaining Engelmann spruce (i.e. “high grading” - which consists of the harvesting of most valuable trees) will leave a mixed age subalpine fir forest (i.e. “jungled up forest” or “dog-hair stand” - a super dense stand of small trees).

Community Phase 2.2: herb-dominated meadow
This plant community will develop within the first 5 years following the last fire or complete tree removal. The site will be dominated by various shade-intolerant herbs and graminoids and by Fendler’s meadow-rue (*Thalictrum fendleri*) (Reese 1980). A small component of introduced species may be present.

Community Pathway 2.2a:
Shrubs will become more common and the understory will diminish due to natural succession. Heavy season-long livestock grazing will accelerate woody plant recovery and diminish the understory.

Community Phase 2.3: shrub-herb co-dominance
A plant community co-dominated by shrubs and herbs will develop approximately 5 to 30 years post-fire. A small component of introduced species may be present.

Community Pathway 2.3a:
Woody plant recovery will occur due to natural succession. Heavy season-long sheep grazing, deer and elk grazing, and fire exclusion will accelerate woody plant recovery and diminish the understory.

Community Phase 2.4: aspen followed by lodgepole pine
Aspen will establish in the site 30 to 100 years after the last fire or complete tree removal. Lodgepole pine will become established following aspen.

Community Pathway 2.4a:
Aspen recovery followed by the establishment of lodgepole pine will occur due to natural succession. Heavy season-long livestock grazing and fire exclusion will accelerate woody plant recovery and diminish the understory.

Community Phase 2.5: mixed age subalpine fir
A stand of mature aspen and/or lodgepole pine with an inter-mixing of subalpine fir, white fir (*Abies concolor*), and Engelmann spruce will develop approximately 100 to 400 years following fire or complete tree removal.

Community Pathway 2.5a:
Through natural succession, subalpine fir will dominate the site 400 years or more years following the last fire or complete tree removal. Fire exclusion will accelerate woody plant recovery and diminish the understory.

Community Pathway 2.5b:
A stand-replacing wildfire or intensive logging will set the vegetation back to an early seral shade-intolerant herb-dominated phase. Logging opens up the forest canopy allowing shrubs and herbs to flourish for 20 to 30 years.

Community Pathway 2.5c:
Selective timber harvest of subalpine fir will allow aspen or lodgepole pine to regain temporary dominance.

Transition T2a: from State 2 to State 3 (Secondary Forest/ Introduced State to Lodgepole Pine Plantation State)
Sites that have had the most intense logging pressure have also had greatest degree of forest soil erosion and soil compaction. Once the forest reaches a certain level of degradation, managers often decide to focus on favoring one tree, usually lodgepole pine because of its greater growth rate and merchantability. This requires a clear cut and slash disposal followed by planting.

Transition T2b: from State 2 to State 4 (Secondary Forest/ Introduced State to Unassisted Forest Recovery State)
A less costly alternative compared to logging/slashing/replanting is to defer logging and control livestock grazing to allow whatever self-regenerating trees that occur on the site to recover. This process could, however, be thwarted by heavy game usage (i.e. elk utilization of aspen, or snowshoe hare utilization of subalpine fir). The Forest Service calls this “passive restoration.” Recovery of Engelmann spruce may not occur if climates continue with current warming trends. The pre-settlement spruce forest establishment may have been a product of the cooler, wetter Little Ice Age (AD 1450-1850).

State 3Lodgepole Pine Plantation State
State 3 is plantation forest of lodgepole pine planted specifically to replace previously degraded forests and to increase productivity of the site for economic profitability. Subsequent harvests and replanting will take place at maximum wood accumulation. Thinning to reduce insect or pathogen outbreaks will help maintain the resiliency of this State. Conversely, no management action may reduce the resiliency of this State.

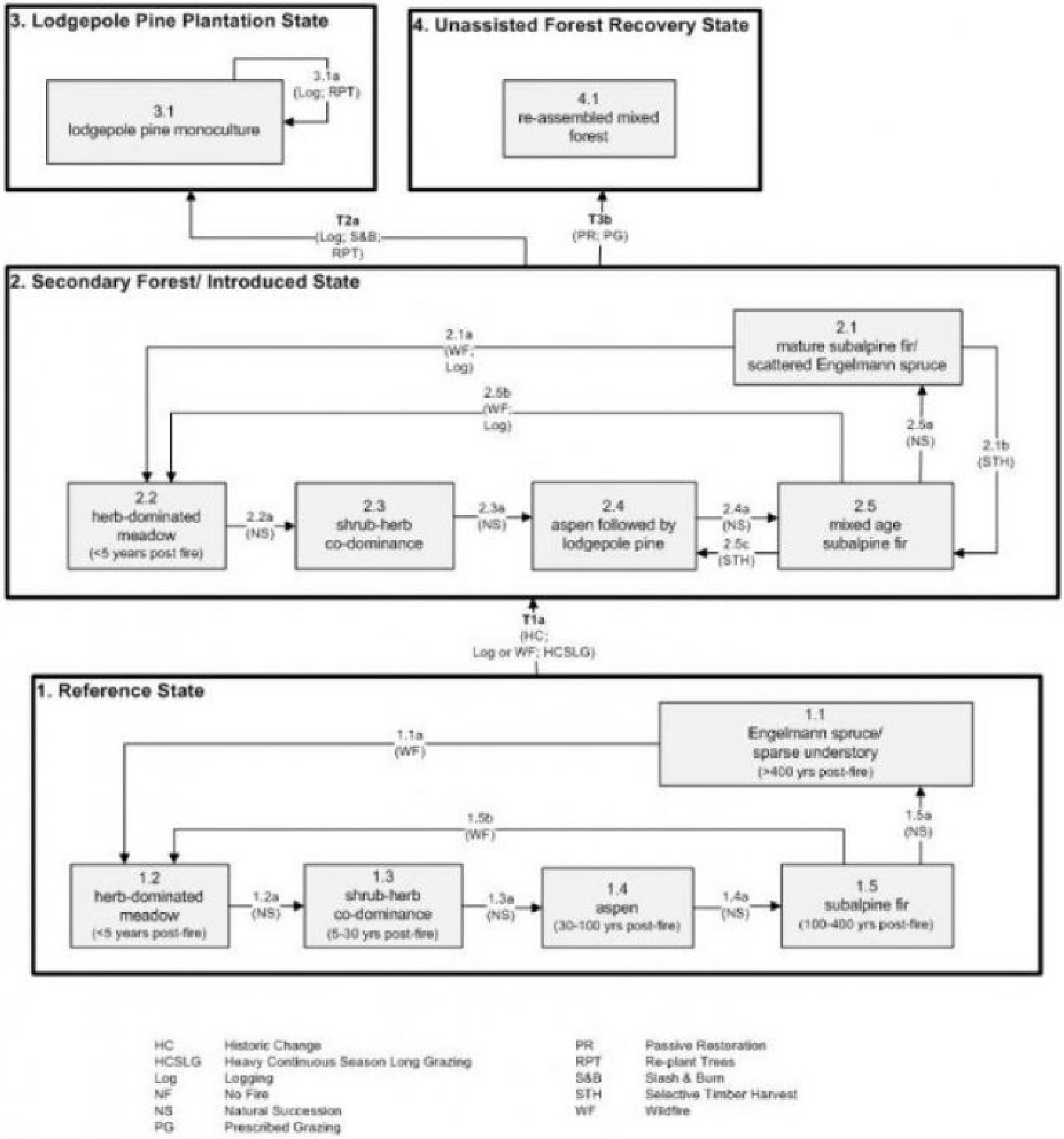
Community Phase 3.1: lodgepole pine monoculture
This plant community is a monoculture of lodgepole pine managed specifically for growth rate and harvestability.

Community Pathway 3.1a:
Maintenance of the Lodgepole Pine Plantation State requires subsequent harvests at maximum accumulated wood followed by replanting.

State 4 Unassisted Forest Recovery State
This state is achieved through “passive restoration”, allowing whatever self-regenerating trees that occur on the site to recover naturally. Thinning to reduce insect or pathogen outbreaks will help maintain the resiliency of this State. Conversely, no management action may reduce the resiliency of this State.

Community Phase 4.1: re-assembled mixed forest
The trees likely to occur in this phase include aspen and subalpine fir.

State and transition model



State 1
Reference State

Community 1.1
Reference State

a. Nature of Forest Community The overstory tree canopy cover is about 55 percent. Common understory plants are dwarf blueberry, creeping Oregon grape, Ross sedge, pinegrass, and gooseberry current. Understory composition by air-dry weight is about 20 percent perennial grasses and grasslike plants, 5 percent forbs, and 75 percent shrubs. Understory production ranges from 110 pounds per acre in favorable years to about 90 pounds per acre in unfavorable years. Understory production includes the total annual production of all species within 4 ½ feet of the ground surface.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	68	75	83
Grass/Grasslike	18	20	22
Forb	4	5	6
Total	**90**	**100**	**111**

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. Many areas are not used because of steep slopes or lack of adequate water. Attentive grazing management is required due to steep slopes and erosion hazards. Harvesting trees under a sound management program can open up the tree canopy to allow increased production of understory species desirable for grazing.

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. Precommercial thinning and improvement cutting – removal of poorly formed, diseased, and low vigor trees of little or no value.

2. Commercial thinning – selectively harvest surplus trees to achieve desired spacing. Save large, healthy, full-crowned trees. Do not select only “high grade” trees during thinning.

b. Prescription burning program may be used to reduce competition before replanting a harvest site.

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

d. Pest Control – use necessary and approved control for specific pests or diseases.

e. Fire hazard – fire is usually not a problem in mature grazed stands. Install firebreaks or firelines as necessary.

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 steeper slopes and on sites having extreme surface stoniness.

c. Proper spacing is the key to a well managed multiple use and multi-product forest.

5. Essential Requirements

a. Adequately protect from uncontrolled burning.

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
Engelmann spruce	*PIEN*	40	50	15	50	–	–	–	

Inventory data references

When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

Other references

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Contributors

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Approval

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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:**