USDA Natural Resources Conservation Service

Ecological site F022BI121CA
Frigid Shallow Or Moderately Deep Medial-Skeletal Slopes

Accessed: 05/14/2025

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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 022B–Southern Cascade Mountains

Site concept:
Landform: (1) Glacial-valley wall (2) Volcanic dome, (3) Lava flow
Elevation (feet): 5,250- 7,490
Slope (percent): 5-90, but generally 15 to 50
Water Table Depth (inches): n/a
Flooding-Frequency: None
Ponding-Frequency: None
Aspect: South, East, West
Mean annual precipitation (inches): 39.0-91.0
Primary precipitation: Winter months in the form of snow
Mean annual temperature: 41 and 44 degrees F (5 and 6.6 degrees C)
Restrictive Layer: Bedrock
Temperature Regime: Frigid
Moisture Regime: Xeric
Parent Materials: Ash mixed with colluvium over residuum, or in tephra over colluvium and residuum, or in residuum from volcanic rock
Surface Texture: (1) Ashy fine sandy loam, (2) Very gravelly ashy sandy loam, (3) Very bouldery medial loamy sand (4) Very stony ashy sand

Surface Fragments <=3" (% Cover): 5-65
Surface Fragments > 3" (% Cover): 0-60
Soil Depth (inches): 10-60+
Vegetation: Open Jeffrey pine (*Pinus jeffreyi*) forest with a heavy understory of greenleaf manzanita (*Arctostaphylos patula*), bush chinquapin (*Chrysolepis sempervirens*), and huckleberry oak (*Quercus vacciniifolia*). Sugar pine (*Pinus lambertiana*), ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*) and/or California red fir (*Abies magnifica*) are occasionally present. These forests remain relatively open because of rock outcrops, bedrock depth, high percentage of rock fragments within the soils, and the consequential extremely droughty nature of the soils.
Notes: This ecological site occurs on glacial-valley walls, lava flows and glacially scoured volcanic domes.

Classification relationships

Forest Alliance = *Pinus jeffreyi* - Jeffrey pine forest; Association = *Pinus jeffreyi/Arctostaphylos patula*. (Sawyer, John O., Keeler-Wolf, Todd, and Evens, Julie M. 2009. A Manual of California Vegetation. 2nd ed. California Native Plant Society Press. Sacramento, California.)

Associated sites

F022BI102CA	**Frigid Bouldery Glacially Scoured Ridges Or Headlands** This is a red fir-western white pine-pinemat manzanita site found at higher elevations.
F022BI103CA	**Frigid Tephra Over Slopes And Flats** This is a white fir-Jeffrey pine forest found on the western portion of the park.
F022BI110CA	**Frigid Humic Loamy Gentle Slopes** This is a white fir-mixed conifer forest found on the eastern side of the park.

Table 1. Dominant plant species

Tree	(1) *Pinus jeffreyi*
Shrub	(1) *Arctostaphylos patula*
Herbaceous	Not specified

Physiographic features

This ecological site occurs on glacial-valley walls, lava flows and glacially scoured volcanic domes. Elevation is primarily between 5,290 and 7,490 feet. Slopes range from 5 to 90 percent, but are generally between 15 and 50 percent.

Table 2. Representative physiographic features

Landforms	(1) Volcanic dome (2) Lava flow
Flooding frequency	None
Ponding frequency	None
Elevation	1,612–2,283 m
Slope	5–90%
Aspect	E, S, W

Climatic features

This ecological site receives most of its annual precipitation in the winter months in the form of snow. The mean annual precipitation ranges from 39 to 91 inches (991 to 2,311 mm) and the mean annual temperature is between 41 and 44 degrees F (5 and 6.6 degrees C). The frost free (>32F) season is 60 to 90 days. The freeze free (>28F) season is 75 to 200 days.

There are no representative climate stations for this site.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	200 days
Precipitation total (average)	2,311 mm

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

This site is associated with the Scoured, Dittmar, Typic Vitrixerands, bouldery and Typic Vitrixerands, unglaciated soil components. These soils developed in ash mixed with colluvium over residuum, or in tephra over colluvium and residuum, or in residuum from volcanic rock. They are shallow to deep over bedrock. These soils are all well drained, with high amounts of rock fragments, and very low to low AWC. The surface textures are ashy fine sandy loam, very gravelly ashy sandy loam, very bouldery medial loamy sand, and very stony ashy fine sand. Permeability is rapid in the upper horizons and impermeable through bedrock.

This ecological site is associated with the following soil components within the Lassen Volcanic National Park Soil Survey Area (CA789):

Map Unit Component / Component %

104 Dittmar/ 5
107 Dittmar/ 3
126 Dittmar/ 20
127 Dittmar/ 5
146 Scoured/ 3
157 Typic Vitrixerands, unglaciated/ 3
158 Typic Vitrixerands, unglaciated/ 75
159 Typic Vitrixerands, bouldery/ 40
169 Scoured/ 15
176 Scoured/ 5

Table 4. Representative soil features

Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Rapid
Soil depth	25 cm
Surface fragment cover <=3"	5–65%
Surface fragment cover >3"	0–60%
Available water capacity (0-101.6cm)	0–10.11 cm
Soil reaction (1:1 water) (0-101.6cm)	5.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	2–45%
Subsurface fragment volume >3" (Depth not specified)	3–90%

Ecological dynamics

An open Jeffrey pine (*Pinus jeffreyi*) forest with a heavy understory of greenleaf manzanita (*Arctostaphylos patula*), bush chinquapin (*Chrysolepis sempervirens*), and huckleberry oak (*Quercus vacciniifolia*) is associated with this site. Sugar pine (*Pinus lambertiana*), ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*) and/or California red fir (*Abies magnifica*) are occasionally present. These forests remain relatively open because of rock outcrops, bedrock depth, high percentage of rock fragments within the soils, and the consequential extremely droughty nature of the soils. They are often located on the upper ridgelines where water drains earlier in the season and desiccating winds remove snow, drying out the soils. Other associated plants for this site include western needlegrass (*Achnatherum occidentale*), western serviceberry (*Amelanchier utahensis*), prostrate ceanothus (*Ceanothus prostratus*), lace lipfern (*Cheilanthes gracillima*), Mt. Hood pussypaws (*Cistanthe umbellata* var. umbellata), spreading groundsmoke (*Gayophytum diffusum*), Sierra cliffbrake (*Pellaea brachyptera*), Plumas County beardtongue (*Penstemon neotericus*), and mountain pride (*Penstemon newberryi*).

Jeffrey pine, the dominant tree associated with this site, is relatively large and long-lived. It can attain heights of 200 feet and live for 400 to 500 years or more. It produces 3 to 8 inch needles in bundles of three. The female seed cones range in length from 4.7 to 12 inches. Jeffrey pine produces a deep taproot and extensive lateral roots (Gucker, 2007) that are intolerant of wet conditions. It looks similar to ponderosa pine but has a vanilla-like odor in the bark, which is not as yellow as ponderosa pine. Jeffrey pine is shade intolerant and can be replaced over time by white fir if fire is excluded from the system. Mature Jeffrey pines are somewhat adapted to fire because their bark is thicker and offers protection from moderate intensity flames. Additionally, the branches of Jeffrey pine tend to thin out along the lower portion of the tree trunk, leaving the crown 20 to 30 meters above the forest floor.

Conifers have evolved with their environment and have developed characteristics that enable them to survive specific climatic conditions. Temperature and precipitation are important environmental variables that determine which conifer species are most likely to be present in a given area. Temperature is critical in initiating conifer growth after snowmelt. Trees generally start stem growth about 2 weeks after snow melt, a delay that may be related to the warming of soils and roots. Heavy shrub cover may delay soil warming, thus delaying conifer growth. If the snow melt is unusually early, trees will not begin annual growth until specific air temperatures and/or a photoperiod (a ratio of light hours to dark hours during one 24 hour period) is met. The pines associated with this site begin leader growth at cooler temperatures than the firs. The pines have heavily insulated terminal buds, whereas the terminal buds of the fir trees are less insulated and more susceptible to frost damage (Royce and Barbour, 2001). Seedling establishment and survival are also dependent upon the frost resistance of the species. After temperatures and the photo period criteria have been met, precipitation and soil available water determine the length of the growing season. The length of the leader growth is predetermined by growth conditions of the prior year. If drought conditions set in before the leader has reached its determinate length, growth will be terminated prematurely. If precipitation comes after the snow has melted, it can prolong the growing season. Conifer growth ceases with the onset of drought conditions and the decline of water potentials (Royce and Barbour, 2001). In addition to drought conditions, the growing season is shorter at higher elevations due to late snow melt and early frost dates in fall (Royce and Barbour, 2001).

Soil characteristics such as depth and texture determine how much water the soil can hold and how long it will remain before filtering through, evaporating away, or being lost to evapotranspiration. The soils associated with this site have very low to low water holding capacities. Under the same climatic conditions, drought would come earlier to these soils than those with higher water holding capacities.

Historically, this community developed with frequent low to moderate intensity fires. Fire regime studies of tree rings and fire scars report historic median fire return intervals in the Jeffrey pine-white fir forest of 14.0, 18.8, and 70.0 years (Bekker and Taylor; Skinner and Chang; Taylor and Solem respectively). Beaty and Taylor report that fire frequency and intensity are associated with slope position, aspect, and climatic fluctuations. Fire return intervals are longer on north facing slopes than on south facing slopes, and fire intensity increases from the lower slopes to the upper slope positions. Their study also indicates a slightly later burn season in the Southern Cascades than in the Sierra Nevada. Fire scars in the Southern Cascades are primarily found at the annual tree ring boundary, indicating that the trees were dormant at the time of the fire, whereas in the Sierra Nevada fires scars are often in the late-season wood. This timing shift may be due to summer drought conditions, which begin earlier in the south. In July and August thunderstorms are common in Lassen Volcanic National Park and summer drought conditions begin, initiating the fire season. Large fires and multiple small fires in the same season are associated with dry and very dry years (Beaty and Taylor, 2001). Beaty and Taylor report that stand replacing fires are more common on the upper slopes while low to moderate intensity fires occur only along the lower slopes. This is probably due to the tendency of fires to burn upslope, preheating the fuels as they go (Beaty and Taylor, 2001).

This ecological site has a post-fire shrub phase that may last indefinitely. Shrubs persist on these sites because of the droughty soils and because of fire prone landscape positions. Greenleaf manzanita (*Arctostaphylos patula*), bush chinquapin (*Chrysolepis sempervirens*), and huckleberry oak (*Quercus vacciniifolia*) can have high cover post-fire and may have some negative affects on conifer regeneration.

Tree pathogens and insect infestations can have significant impacts on the composition and structure of mid and upper montane coniferous forests. Small infestations may affect just a few trees but large outbreaks can kill the dominant trees over large areas of forest, creating large canopy openings and stand regeneration. Most of these pathogens are a natural cycle of regulation and can push the closed forest types to a more open forest. Fuel loads are often high after outbreaks, creating ideal conditions for high intensity fires.

Jeffrey Pine is susceptible to several diseases and insect infestations, especially in periods of drought or when overcrowded. Pathogens that affect Jeffrey pine in this area are dwarf mistletoe (Arceuthobium campylopodium), root disease (Phaeoleus schweinitzii), needle cast (Elytroderma deformans), Jeffrey pine bark beetle (Dendroctonus jeffreyi), Red turpentine beetle (D. valens), and pine engravers (Ips species). The most threatening of these are the dwarf mistletoe and the Jeffrey pine bark beetle (Bohne, 2006; Jenkinson, 1990).

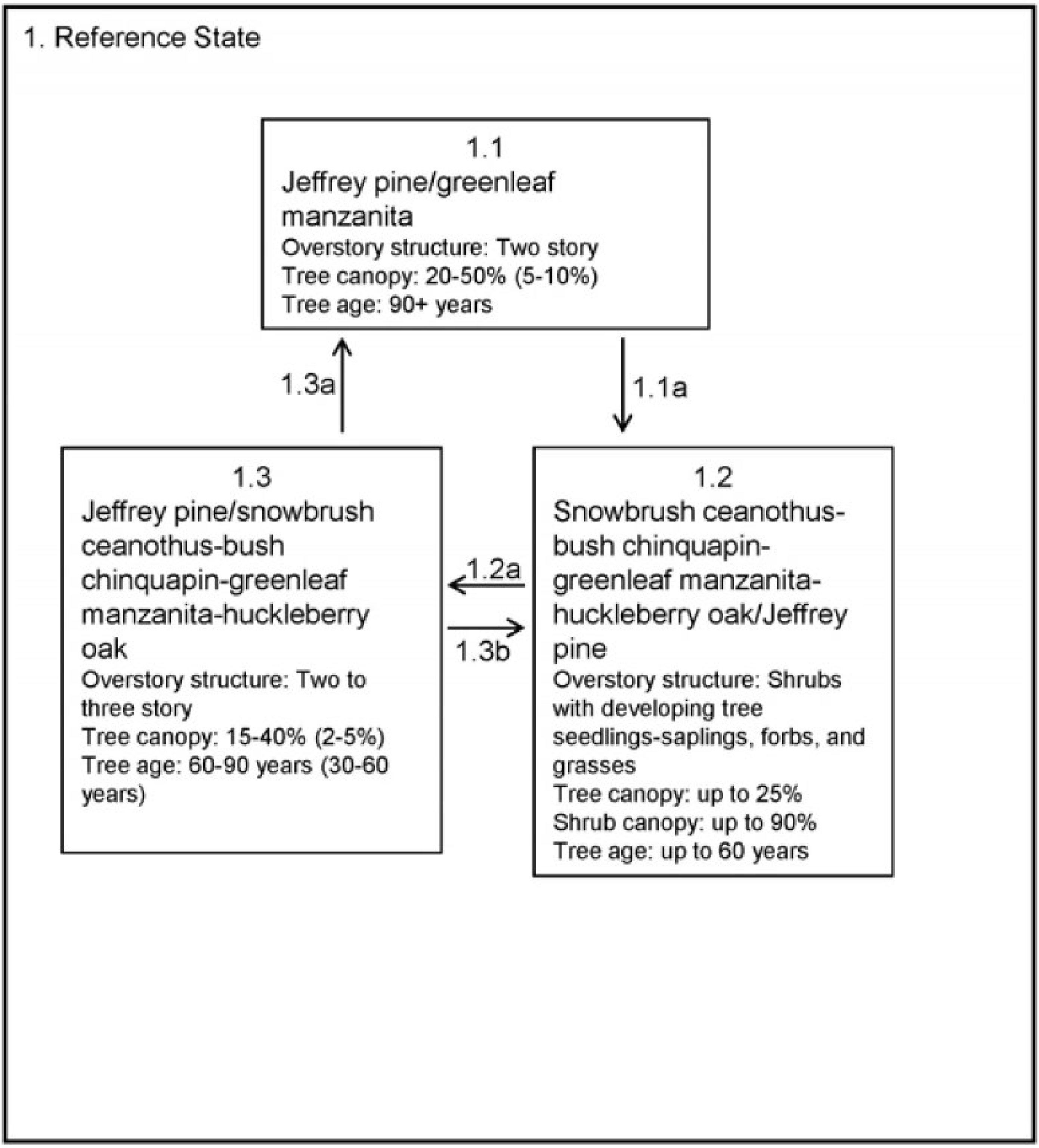
Pathogens that affect white fir are dwarf mistletoe (*Arceuthobium abietinum* f. sp. concoloris), Cytospora canker (Cytospora abietis), broom rust (Melampsorella caryophyllacearum), annosus root disease (Heterobasidium annosum), trunk rot (Echinodontium tinctorium), and the fir engraver (Scotylus ventralis). The most threatening of these is the combination of the fir engraver and annosus root disease. These pathogens can kill large areas of white fir (Bohne, 2006; Laacke, 1990).

The reference state consists of the most successionally advanced community phase (numbered 1.1) as well as other community phases which result from natural and human disturbances. Community phase 1.1 is deemed the phase representative of the most successionally advanced pre-European plant/animal community including periodic natural surface fires that influenced its composition and production. Because this phase is determined from the oldest modern day remnant forests and/or historic literature, some speculation is necessarily involved in describing it.

All tabular data listed for a specific community phase within this ecological site description represent a summary of one or more field data collection plots taken in communities within the community phase. Although such data are valuable in understanding the phase (kinds and amounts of ground and surface materials, canopy characteristics, community phase overstory and understory species, production and composition, and growth), it typically does not represent the absolute range of characteristics nor an exhaustive listing of species for all the dynamic communities within each specific community phase.

State and transition model

State-Transition Model - Ecological Site No. F022BI121CA
Pinus jeffreyi/Arctostaphylos patula
(Jeffrey pine/greenleaf manzanita)



State 1
Reference

Community 1.1
Jeffrey pine/greenleaf manzanita

This community phase is the reference community phase for this ecological site. Jeffrey pine is generally dominant, although sugar pine may exhibit a major presence in one area of the park, and a mix of Jeffrey pine, white fir, red fir, sugar pine, western white pine and ponderosa pine exist in another area. The central concept is an open forest with high shrub cover. Total tree cover is low, ranging from 20 to 30 percent, with 10 to 60 percent shrub cover. Greenleaf manzanita (*Arctostaphylos patula*), bush chinquapin (*Chrysolepis sempervirens*), snowbrush ceanothus (*Ceanothus velutinus*) and huckleberry oak (*Quercus vacciniifolia*) may be present. Huckleberry oak is more common on the eastern side of the park, while snowbrush ceanothus is more common on the western side of the park. This may be a result of the fire history or seed source. This community phase has evolved with fire, but it does not need fire to maintain an open forest. Forest productivity is limited by soil depth, available water, and competition for resources within the shrub community.

Forest overstory. Jeffrey pine is generally dominant with 20 to 30 percent canopy cover. Tree heights and age are variable, and the forest is rarely evenly aged. Sampled trees ranged from 60 to 250 years old with canopy heights between 60 to 100 feet. Basal area ranged from 100 to 120 ft/acre.

Forest understory. Montane shrubs dominate this site. A variety of associated species may be found. Dominant shrubs are greenleaf manzanita (Arctostaphylos patula), prostrate ceanothus (Ceanothus prostratus), bush chinquapin (Chrysolepis sempervirens)huckleberry oak (Quercus vacciniifolia) and/or snowbrush ceanothus (Ceanothus velutinus). Other plants encountered on this site are western needlegrass (Achnatherum occidentale ssp. occidentale), western serviceberry (Amelanchier utahensis), lace lipfern (Cheilanthes gracillima), Mt. Hood pussypaws (Cistanthe umbellata var. umbellata), spreading groundsmoke (Gayophytum diffusum), Sierra cliffbrake (Pellaea brachyptera), Indian warrior (Pedicularis densiflora), Plumas County beardtongue (Penstemon neotericus), and mountain pride (Penstemon newberryi). Understory species varied from the east to west side of the park.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	–	499	1206
Forb	–	6	17
Tree	–	9	16
Grass/Grasslike	–	4	11
Total	**–**	**518**	**1250**

Community 1.2
Snowbrush ceanothus-bush chinquapin-greenleaf manzanita-huckleberry oak/Jeffrey pine

When large fires burn into the forest canopy and kill the majority of the overstory trees, a montane shrub community phase thrives in the new openings. Even if shrubs were not present at the time of a fire, their seeds may be stored in the soil. Greenleaf manzanita and snowbrush ceanothus seeds can lie dormant in the soil for several hundred years, until the heat from a fire scarifies the seed coat and initiates germination. These seeds also require light and cold stratification for germination. If present at the time of a fire, snowbrush ceanothus, bush chinquapin, and huckleberry oak can resprout. Hauser (2007) states that greenleaf manzanita does not resprout after fire in this area. The size and the intensity of a burn may influence the shrub expression. Shrubs were found associated with large burn size, whereas trees were not able to establish across the landscape (Royce and Barbour, 2001). The intensity of burn may affect the scarification of seeds. Shrubs can prevail in areas prone to frequent fire, such as ridges and wind tunnels. Greenleaf manzanita is a strong competitor for water. It continues to deplete water after conifer species have gone dormant for the drought season. This competition for water and sunlight between the shrubs and conifer seedlings can delay the establishment of a forest (Royce and Barbour, 2001). The shrub community phase can be perpetuated by frequent fire or other disturbances.

Community 1.3
Jeffrey pine/snowbrush ceanothus-bush chinquapin-greenleaf manzanita-huckleberry oak

This community phase develops as trees begin to have presence above the shrubs. The trees establish in the openings in the shrubs or encroach upon them from the edges of the shrub field. This is a slow process and could take up to 100 years.

Pathway 1.1a
Community 1.1 to 1.2

Fire is the primary disturbance for this site that will initiate shrubland and conifer regeneration (Community Phase 1.2).

Pathway 1.2a
Community 1.2 to 1.3

The natural pathway is to Community Phase 1.3, the open Jeffrey pine forest with shrubs. This pathway is followed with time and establishes the tree canopy over the shrubs.

Pathway 1.3a
Community 1.3 to 1.1

This pathway leads to Community Phase 1.1, the open Jeffrey pine forest with shrubs. This pathway is created with time by the dominance of the trees over the shrubs. Total tree canopy should be at least 20 percent. Low to moderate intensity fires may occur, but the heavy shrub creates ladder fuels that would most likely lead to a canopy fire.

Pathway 1.3b
Community 1.3 to 1.2

In the case of a severe canopy fire, the conifer and shrubland regeneration community phase 1.2 is initiated.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Tree (understory only)**			0–16	
	Jeffrey pine	PIJE	*Pinus jeffreyi*	0–13	0–5
	sugar pine	PILA	*Pinus lambertiana*	0–2	0–1
Shrub/Vine					
0	**Shrub**			0–1206	
	huckleberry oak	QUVA	*Quercus vacciniifolia*	0–560	0–35
	greenleaf manzanita	ARPA6	*Arctostaphylos patula*	0–404	0–35
	snowbrush ceanothus	CEVE	*Ceanothus velutinus*	0–135	0–10
	bush chinquapin	CHSE11	*Chrysolepis sempervirens*	0–73	0–5
	prostrate ceanothus	CEPR	*Ceanothus prostratus*	0–24	0–3
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–11	0–1
Grass/Grasslike					
0	**Grass/Grasslike**			0–11	
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	0–11	0–2
Forb					
0	**Forb**			0–17	
	Indian warrior	PEDE	*Pedicularis densiflora*	0–6	0–1
	Plumas County beardtongue	PENE2	*Penstemon neotericus*	0–3	0–1
	mountain pride	PENE3	*Penstemon newberryi*	0–3	0–1
	lace lipfern	CHGR	*Cheilanthes gracillima*	0–1	0–1
	Mt. Hood pussypaws	CIUMU	*Cistanthe umbellata var. umbellata*	0–1	0–1
	spreading groundsmoke	GADI2	*Gayophytum diffusum*	0–1	0–1
	Sierra cliffbrake	PEBR3	*Pellaea brachyptera*	0–1	0–1

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
Jeffrey pine	PIJE	*Pinus jeffreyi*	Native	–	20–27	–	–
sugar pine	PILA	*Pinus lambertiana*	Native	–	0–3	–	–
California red fir	ABMA	*Abies magnifica*	Native	–	0–0.5	–	–

Table 8. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	Native	–	0–2
Forb/Herb					
lace lipfern	CHGR	*Cheilanthes gracillima*	Native	–	0–1
mountain pride	PENE3	*Penstemon newberryi*	Native	–	0–1
Mt. Hood pussypaws	CIUMU	*Cistanthe umbellata var. umbellata*	Native	–	0–1
spreading groundsmoke	GADI2	*Gayophytum diffusum*	Native	–	0–1
Sierra cliffbrake	PEBR3	*Pellaea brachyptera*	Native	–	0–1
Indian warrior	PEDE	*Pedicularis densiflora*	Native	–	0–1
Plumas County beardtongue	PENE2	*Penstemon neotericus*	Native	–	0–1
Shrub/Subshrub					
huckleberry oak	QUVA	*Quercus vacciniifolia*	Native	–	0–35
greenleaf manzanita	ARPA6	*Arctostaphylos patula*	Native	–	0–35
snowbrush ceanothus	CEVE	*Ceanothus velutinus*	Native	–	0–10
bush chinquapin	CHSE11	*Chrysolepis sempervirens*	Native	–	0–5
prostrate ceanothus	CEPR	*Ceanothus prostratus*	Native	–	0–3
Utah serviceberry	AMUT	*Amelanchier utahensis*	Native	–	0–1
Tree					
Jeffrey pine	PIJE	*Pinus jeffreyi*	Native	–	0–5
sugar pine	PILA	*Pinus lambertiana*	Native	–	0–1

Animal community

American black bears, a diversity of small mammals and bird species, as well as insects, amphibians, and reptiles utilize Jeffrey pine for habitat or use the seeds and needles for food. Animals that eat the seeds include California quail, northern flickers, American crows, Clark's nutcrackers, western gray squirrels, Douglas's squirrels, California ground squirrels, Heermann's kangaroo rats, deer mice, yellow-pine chipmunks, least chipmunks, Colorado chipmunks, lodgepole chipmunks, and Townsend's chipmunks (Gucker, 2007).

Although the leaves of the montane shrubs are not a highly desired browse, their berries and seeds are eaten in large quantities. Greenleaf manzanita berries and seeds are eaten in large quantities by bears and other wildlife. Bush chinquapin seeds are a staple food for several birds and rodents. Huckleberry oak acorns are eaten by small mammals.

Recreational uses

This site is suitable for trails, and may provide open views.

Wood products

Jeffrey pine wood is used for lumber. No commercial distinction is made between ponderosa pine and Jeffrey pine lumber.

Other products

Jeffrey pine seeds are edible. Native Americans used Jeffrey pine sap as a remedy for pulmonary disorders. Later, heptane was distilled from the sap and sold as a treatment for pulmonary problems and tuberculosis. Jeffrey pine heptane was also utilized in developing the octane scale used to rate petroleum for automobiles (Gucker, 2007).

Other information

Site index Documentation:

Meyer (1961), Dunning (1942), and Schumacher (1928) were used to determine forest site productivity for Jeffrey pine, sugar pine, and California red fir respectively. Both sugar pine and red fir are of very limited extent. Low to High values of Site index and CMAI (culmination of mean annual increment) give an indication of the range of inherent productivity of this ecological site. Site index relates to height of dominant trees over a set period of time and CMAI relates to the average annual growth of wood fiber in the boles/trunks of trees. Site index and CMAI listed in the Forest Site Productivity section are in units of feet and cubic feet/acre/year, respectively. Both site index and CMAI are estimates; on-site investigation is recommended for specific forest management units for each soil classified to this ecological site. The historical and actual basal area of trees within a growing stand will greatly influence CMAI.

Conifer trees appropriate for site index measurement typically occur in community phases 1.1 and 1.3. They are selected according to guidance listed in the site index publication.

Table 9. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
California red fir	*ABMA*	55	55	192	192	140	050	–	
sugar pine	*PILA*	157	157	146	146	70	605	–	
Jeffrey pine	*PIJE*	61	67	47	52	55	600	–	
Jeffrey pine	*PIJE*	61	67	47	52	–	–	300TA	Dunning, Duncan. 1942. A site classification for the mixed-conifer selection forest of the Sierra Nevada. USDA, Forest Service. California Forest and Range Experiment Station Research Note 28.

Inventory data references

The following NRCS plots were used to describe this ecological site:

789131- Typic Vitrixerands, boulders
789305- Dittmar- site location
789312- Typic Vitrixerands, unglaciated

Type locality

Location 1: Plumas County, CA	
Township/Range/Section	T30 N R6 E S30
UTM zone	N
UTM northing	4477532
UTM easting	639009
General legal description	The type location is about 0.25 miles northwest of Kelly Camp in Lassen Volcanic National Park.

Other references

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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	
Approved by	
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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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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:**
