USDA Natural Resources Conservation Service

Ecological site F022BI125CA
Cold Frigid Tephra Over Outwash Plains Or Lake Terraces

Accessed: 05/09/2024

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.

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) Outwash plain, (2) Lake terrace
Elevation (feet): 5850-6360
Slope (percent): 0-15
Water Table Depth (inches): 19 to greater than 60
Flooding-Frequency: None
Ponding-Frequency: None
Aspect: Non-influencing
Mean annual precipitation (inches): 23.0-49.0
Primary precipitation: Winter months in the form of snow
Mean annual temperature: 42 and 44 degrees F (5.5 and 6.6 degrees C)
Restrictive Layer: Silica-cemented duripan occurs at depths between 20 to 60 inches
Temperature Regime: Frigid
Moisture Regime: Xeric
Parent Materials: Mixed tephra and outwash over outwash from volcanic rocks
Surface Texture: (1) Very bouldery medial loamy coarse sand, (2) Ashy coarse sand
Surface Fragments <=3" (% Cover): 5-70
Surface Fragments > 3" (% Cover): 0-20

Soil Depth (inches): 20-60
Vegetation: Although the heavy dominance of lodgepole pine here is partly in response to high fire frequency, the root restrictive layer and cold air drainage may exclude other conifers from establishing on this site.
Notes: This ecological site occurs on glacial outwash plains and lake terraces.

Classification relationships

Forest Alliance = *Pinus contorta* ssp. murrayana – Lodgepole pine forest; Association = (no matching species). (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

F022BI108CA	**Frigid Moist Sandy Lake Or Stream Terraces** This is a wet lodgepole site found on lake and stream terraces.
F022BI126CA	**Cold Frigid Tephra Over Moraine Slopes** This site is found on the moraines interspersed around the outwash and has more Jeffrey pine.

Similar sites

F022BI105CA	**Frigid Sandy Loam Debris Flow On Stream Terraces** This is a Sierra lodgepole pine-quaking aspen site.
F022BI125CA	**Cold Frigid Tephra Over Outwash Plains Or Lake Terraces** This is a white fir-Sierra lodgepole pine site found in wetter conditions.
F022BI123CA	**Frigid Flat Outwash Terraces** This is a white fir-Sierra lodgepole pine site with some aspen.
F022BI117CA	**Frigid Coarse Glaciolacustrine Gentle Slopes** This is a California red fir-Sierra lodgepole pine site found at higher elevations.

Table 1. Dominant plant species

Tree	(1) *Pinus contorta var. murrayana*
Shrub	Not specified
Herbaceous	(1) *Elymus elymoides*

Physiographic features

This ecological site occurs on glacial outwash plains and lake terraces at 5,850 to 6,360 feet in elevation. Slopes range from 0 to 15 percent.

This site has a seasonal water table associated with the Humic Haploxerands, moist lake terrace component. The water table fluctuates from 19 to 30 inches during the wetter months then drops to below 60 inches from July to November.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Lake terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,783–1,939 m
Slope	0–15%
Water table depth	48 cm

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 23 and 49 inches (594 mm to 1,245 mm) and the mean annual temperature is between 42 and 44 degrees F (5.5 and 6.6 degrees C). The frost free (>32F) season is 60 to 85 days. The freeze free (>28F) season is 75 to 190 days.

There are no representative climate stations for this site. The nearest one is Manzanita Lake.

Table 3. Representative climatic features

Frost-free period (average)	85 days
Freeze-free period (average)	190 days
Precipitation total (average)	1,245 mm

Influencing water features

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

Soil features

This site is associated with the Badgerwash and Humic Haploxerands, moist lake terrace soil components.

The Badgerwash soils are moderately deep, well-drained soils that formed in mixed tephra and outwash over outwash from volcanic rocks. The surface texture is very bouldery medial loamy coarse sand, with extremely stony medial sandy loam textures in the lower horizons. There are greater than 35 percent rock fragments throughout the soil depth and a silica-cemented duripan is encountered at 20 to 40 inches. The Badgerwash soils are classified as Ashy-skeletal, mixed, frigid Humic Vitrixerands.

Humic Haploxerands, moist lake terrace soils are moderately deep to deep, moderately well-drained soils that formed in tephra over glaciolacustrine deposits from volcanic rocks. The tephra deposits are blackish in color and are approximately 7 inches deep. The tephra has developed an A/C horizon sequence over the buried soil. The A horizon has an ashy coarse sand, with a gravelly ashy coarse sand texture just below. The buried horizon has a very stony medial sandy loam texture over a very stony medial fine sandy loam. A silica-cemented duripan occurs at depths between 20 to 60 inches.

These soils have very low AWC (available water capacity) in the upper 60 inches of soil. Permeability is moderately rapid to rapid in the upper horizon, and slow to very slow through the duripan.

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

Map Unit Component /Component %
101 Badgerwash /8
101 Humic Haploxerands, moist lake terrace /2
108 Humic Haploxerands, moist lake terrace /3
117 Humic Haploxerands, moist lake terrace /90
117 Badgerwash /2
172 Badgerwash /2
173 Badgerwash /90

Table 4. Representative soil features

Family particle size	(1) Sandy
Drainage class	Moderately well drained to well drained

Permeability class	Very rapid to very slow
Soil depth	51–152 cm
Surface fragment cover <=3"	5–70%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	1.09–8.94 cm
Soil reaction (1:1 water) (0-101.6cm)	5.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	2–95%
Subsurface fragment volume >3" (Depth not specified)	0–85%

Ecological dynamics

This ecological site is on outwash with a root restrictive layer at varying depths between 20 to 60 inches. Although the heavy dominance of lodgepole pine here is partly in response to high fire frequency, the root restrictive layer and cold air drainage may exclude other conifers from establishing on this site.

In 2009, this ecological site within Lassen Volcanic National Park, is mainly dominated by a Sierra lodgepole pine (*Pinus contorta* var. murrayana) forest; however, outside the park it may be expressed by any of the plant communities described within the state and transition model. The canopy is relatively open due to frequent fires of varying intensity. A recent canopy fire has left some areas almost completely bare. Nothing remains; the standing dead and downed trees have been mostly consumed. There is very little regeneration in these areas. In other areas it appears that the understory burned at a low intensity, and a large portion of the overstory Sierra lodgepole pine will survive, leaving gap openings from the dead trees. The understory is dominated with grasses and forbs, including western needlegrass (*Achnatherum occidentale*), Ross' sedge (*Carex rossii*), squirreltail (*Elymus elymoides*), goldenbush (Ericameria spp.), narrowleaf lupine (*Lupinus angustifolius*), and lettuce wirelettuce (*Stephanomeria lactucina*).

Sierra lodgepole pine can be long-lived exceeding 150 years old. The overstory trees cored to obtain representative site index data were between 80 to 100 years old and relatively young. Sierra lodgepole pine does not usually gain much in girth with time and older trees averaged 16 to 21 inch diameters. Trees grow tall and narrow with short branches and 1.2 to 2.4 inch needles in fascicles of two. Its thin bark and shallow roots make it susceptible to fire. Sierra lodgepole pine is the only non-serotinous lodgepole pine. Therefore it does not need fire to open its cones to release seeds. The roots of Sierra lodgepole pine are generally shallow, which enables it to grow on this site. Sierra lodgepole pine produces a taproot that may atrophy or grow horizontally in cases of high water tables or root restrictive layers.

Sierra lodgepole pine has a complex disturbance regime that includes cyclic beetle infestations and fire. Fire studies in the lodgepole pine forest of the Caribou Wilderness report a fire return interval of 67 years between 1735 and 1929. Even low intensity fires resulted in high mortality rates for the lodgepole pine (Taylor and Solem, 1995). Sierra lodgepole pine regenerates prolifically after fire and evenly aged stands are formed. The mountain pine beetle (Dendroctonus ponderosae) is a natural pest that can kill a significant portion of the larger trees in a stand. Infestations can last for several years and often return in 20 to 40 year cycles (Cope, 1993). After an outbreak the forest may be dominated by standing dead trees. These trees eventually fall, creating layers of overlapping logs. Fuel loads are high, but the downed logs burn slowly and at a low intensity. As noted, even low intensity fire can cause damage to live trees, and fire damaged trees are rendered more susceptible to the next beetle attack. Pine beetle infestations, wind throw and other small scale disturbances create gaps for Sierra lodgepole pine or white fir regeneration. Over time these gaps will break up the uniformity of evenly aged stands that formed after the last large fire event.

White fir is presently not common on this site. This area has been burned repeatedly in the last century, which may have reduced its presence. The root restrictive layer and/or the cold air drainage may also keep white fir from firmly establishing. There are however sufficient white fir present in the understory to indicate that, without fire and with appropriate climate conditions, white fir could establish here. White fir is a large long-lived tree in this area. It commonly reaches 300 to 400 years in age and heights of 120 to 140 feet. It produces single needles1.2 to 2.8 inches long that are distributed along young branches. Because the female seed cones open and fall apart while still attached to the tree, cones are not often seen on the forest floor. White fir tends to develop a shallow root system that can graft to other white fir roots and spread root rots (Zouhar, 2001). White fir is a shade-tolerant conifer and is able to establish in the understory of the Sierra lodgepole pine on this site. If it continues to grow and reproduce in the understory in the absence of disturbance, it will eventually dominate the forest. In the past, the natural fire regime kept these forests from developing into the later successional stages dominated by white or red fir (Taylor, and Solem, 2001). White fir and Sierra lodgepole pine are both relatively fire intolerant species and tend to have high mortality rates after fire.

The mountain pine beetle is the most significant forest pathogen to affect this site, but several other pathogens have the potential to cause mortality or diminish productivity. Most of these pathogens represent natural cycles of regulation and can push the closed forest types into more open forest types. Large outbreaks are often associated with drought years or overstocked forests.

There is evidence that warming temperatures are allowing mountain pine beetles to exist farther north and into upper elevations. Warmer temperatures are altering the reproductive cycles and distribution of the mountain pine beetle. It is possible that the warmer temperatures will increase mountain pine beetle infestations for several decades. The southern mountain pine beetle may move northward due to temperature change as well (Carroll et al, 2003)

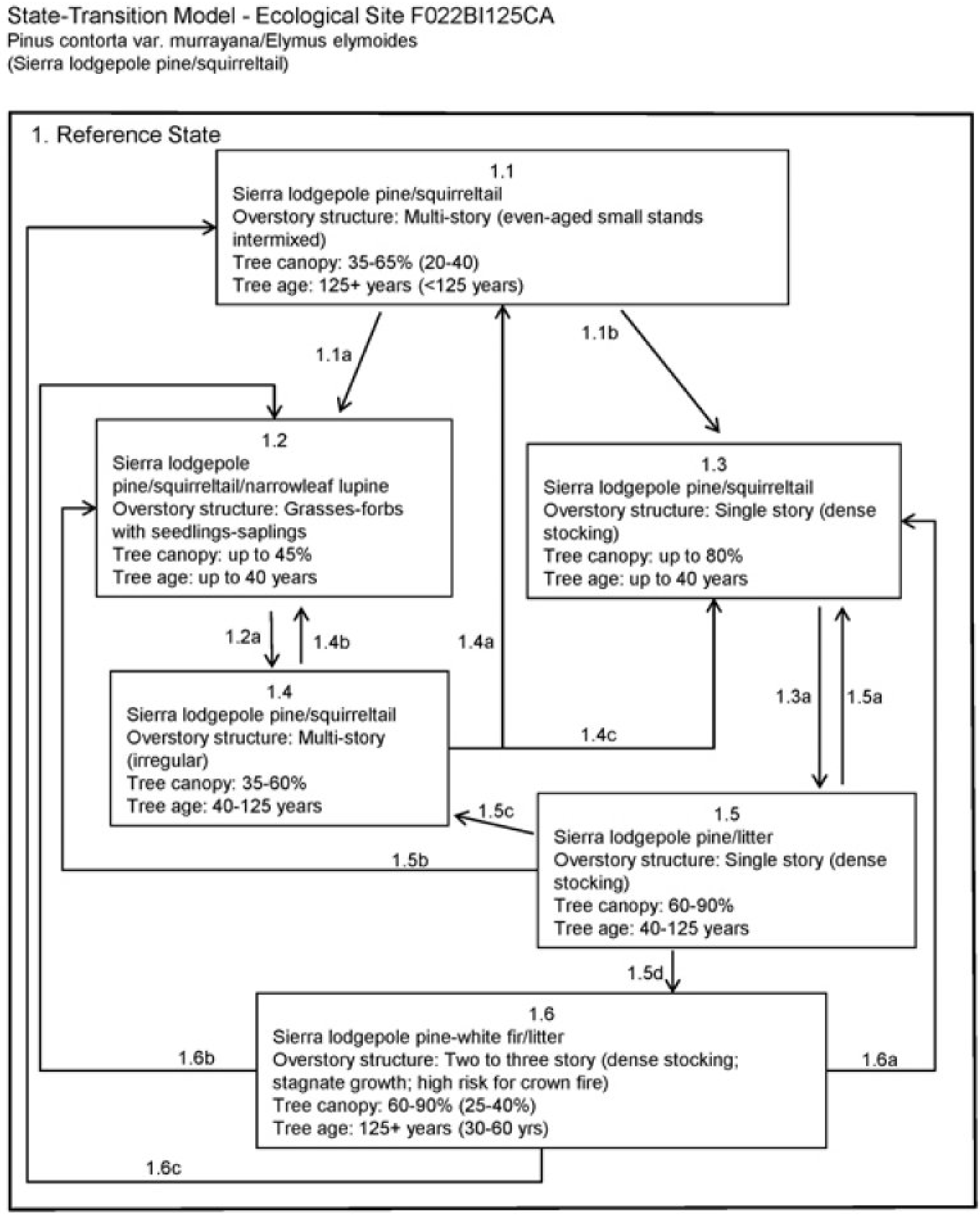
Pathogens that affect Sierra lodgepole pine include other insects such as the pine engraver (Ips pini), the weevil (Magdalis gentiles), the lodgepole terminal weevil (Pissodes terminalis), the Warren's collar weevil (Hylobius warreni), the pine needle scale (Chionaspis pinifoliae), the black pineleaf scale (Nuculaspis californica), the spruce spider mite (Oligonychus ununguis), the lodgepole sawfly (Neodiprion burkei), the lodgepole needle miner (Coleotechnites milleri), the sugar pine tortrix (Choristoneura lambertiana), the pine tube moth (Argyrotaenia pinatubana), and the pandora moth (Coloradia pandora). Ips commonly develops in logging slash, especially slash that is shaded and does not dry quickly. Prompt slash disposal is an effective control measure. Ips also can build up in windthrows. Fungal diseases that affect lodgepole pine productivity include the stem cankers caused by atropelius canker (Atropellis piniphilia), comandra blister rust (Cronartium comandrae), and western gall rust (Peridermium harknessii). The honey mushroom (Armillaria mellea) and annosus root disease (Heterobasidion annosum) are sources of root rot, and wood decay is caused by such fungi as red rot (Phellinus pini) and red heart wood stain (Peniophora pseudo-pini). Dwarf mistletoe (*Arceuthobium americanum*) is a common parasite that affects large areas of lodgepole pine (Lotan and Critchfield, 1990).

Pathogens that affect white fir are the dwarf mistletoe (*Arceuthobium abietinum* f. sp. concoloris), Cytospora canker (Cytospora abietis), broom rust (Melamsporella caryophyllacearum), annosus root disease (Heterobasidium annosum), armillaria root disease (Armillaria sp.), 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 1
Reference

Community 1.1
Sierra lodgepole pine/squirreltail

This mature Sierra lodgepole pine forest develops with continual small scale disturbances that create gaps in the canopy. These gaps (single tree fall to .25 acres in size) provide suitable sites for Sierra lodgepole pine regeneration and, over time, will create an uneven forest structure and composition. Several age classes of Sierra lodgepole pine are present.

Forest overstory. The Sierra lodgepole pine canopy cover ranges from 35 to 60 percent. Mature overstory trees are 140 to 180 years old and 60 to 80 feet tall. Dbh (diameter at breast height) ranges from 12 to 17 inches. There are older trees in the stand that were not measured. Basal area ranges from 100 to 210 ft2/ acre.

Forest understory. The cover of grasses and forbs is moderate due to recent fire, which has opened the canopy and removed litter and fuels from the forest floor. Common plants are western needlegrass (Achnatherum occidentale), Ross' sedge (Carex rossii), squirreltail (Elymus elymoides), goldenbush (Ericameria spp.), narrowleaf lupine (Lupinus angustifolius), and lettuce wirelettuce (Stephanomeria lactucina).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	16	43	80
Forb	–	34	68
Tree	3	10	17
Total	**19**	**87**	**165**

Community 1.2
Sierra lodgepole pine/squirreltail/narrowleaf lupine

After a stand replacing event such as a high mortality fire or mountain pine beetle infestation, Sierra lodgepole pine will regenerate from wind dispersed seed. This site generally has less than 500 stems per acre and will grow into a relatively open forest. Seedlings can develop into pole-sized trees with up to 55 percent canopy cover. Grasses and forbs may increase in cover for a several years.

Community 1.3
Sierra lodgepole pine/squirreltail

This regeneration community phase is defined by dense Sierra lodgepole pine seedlings. Fires leave bare soil and disturbed duff in open sunlight, which are ideal conditions for Sierra lodgepole pine seed germination. More research is needed to determine the cause of dense versus open seedling establishment, and appropriate indicators need to be defined to distinguish the two regeneration patterns. For now, it has been observed that more than 500 to 700 stems of Sierra lodgepole pine per acre can cause stagnant forest growth. There are many variables to influence seedling density. Sierra lodgepole pine produces good seed crops every 1 to 3 years, and seeds are dispersed from late August to mid-October. These seeds can be stored in the soil for several years, however seedlings tend to regenerate from wind dispersed seeds after fire. Therefore, the season and timing of a burn in relation to seed crop cycles may affect seedling density. Smaller fires may produce higher seedling densities due to the proximity of available seed sources. Seasonal precipitation patterns and air temperatures during germination influence seedling survival. As the seedlings develop they form dense thickets. As the trees grow taller, they thin their lower branches. Most trees persist even with limited sunlight on their canopies. Growth becomes stagnant when chronic competition for light, water and nutrients exists. After a certain point of stagnation Sierra lodgepole pine may not respond to competitive release from thinning, disease, or fire.

Community 1.4
Sierra lodgepole pine/squirreltail

This forest is multi-aged with an irregular canopy distribution due to small scale or patchy disturbances. The two most significant forest disturbances to create canopy gaps are provided by mountain pine beetle infestations and fire. After a pest infestation, patches of a stand die and leave gaps for lodgepole pine regeneration. Because low intensity fire is often fatal to mature lodgepole pine, even a low severity fire can be a stand replacing event; however low intensity smoldering fires have been documented which spread through downed trees after mountain pine beetle infestations. Although damage to live trees was minor, those with fire scars were rendered more susceptible to the next mountain pine beetle attack. Canopy gaps may also be created by wind throw, a susceptibility of Sierra lodgepole pine due to its shallow root system.

Community 1.5
Sierra lodgepole pine/litter

This dense Sierra lodgepole pine forest develops after dense seedling establishment in the absence of canopy disturbances. This forest is even-aged with a high basal area of tall thin trees. The forest is stagnant. Only the upper crowns get sunlight, and the understory branches die back. This self-thinning process is slow and does not eliminate competition. There is almost no regeneration due to the lack of openings in the forest. Understory production and cover decreases due to the lack of sunlight. The potential for a severe pest infestation or disease is high because the trees are stressed from competition for sunlight, water, and nutrients. The close proximity of the trees enables pathogens to spread quickly. Severe fire is likely during this phase because of the high accumulation of fuels on the forest floor. White fir establishes in some areas under the Sierra lodgepole pine overstory in the absence of fire.

Community 1.6
Sierra lodgepole pine-white fir/litter

The dense Sierra lodgepole pine-white fir forest develops with the continued exclusion of fire or other disturbances, allowing tree density to increase to unhealthy levels. Competition for water and sunlight continues and tree health and vigor decreases. Sierra lodgepole pine persists in the understory of the white fir for some time, but eventually declines due to the lack of sunlight and natural senescence. Fuel loads are high from the trees dying in the understory. Understory vegetation is absent due to the high cover of litter and debris and the lack of sunlight on the forest floor.

Pathway 1.1a
Community 1.1 to 1.2

This pathway is created by a high mortality fire or forest infestation, followed by relatively open Sierra lodgepole pine seedling regeneration (Community Phase 1.2).

Pathway 1.1b
Community 1.1 to 1.3

This pathway is created by a high mortality fire or forest infestation, followed by relatively dense Sierra lodgepole pine seedling regeneration (Community Phase 1.3) from an ample supply of cones and seeds and favorable conditions for seed germination.

Pathway 1.2a
Community 1.2 to 1.4

This pathway is followed with time and growth and small scale canopy disturbances. An open multi-age lodgepole pine forest develops (Community Phase 1.4).

Pathway 1.3a
Community 1.3 to 1.5

With time and growth the stand remains dense and evenly aged (Dense lodgepole forest, Community Phase 1.5). Trees are generally healthy and few gaps are created from tree mortality in this young forest.

Pathway 1.4a
Community 1.4 to 1.1

With time and growth and small scale disturbances, this forest continues to develop into an open Sierra lodgepole pine forest (Community Phase 1.1) with a multi-aged complex forest structure.

Pathway 1.4b
Community 1.4 to 1.2

This pathway is triggered by a high mortality fire, which initiates open Sierra lodgepole pine regeneration (Community Phase 1.2).

Pathway 1.4c
Community 1.4 to 1.3

This pathway is triggered by a high mortality fire, which initiates dense lodgepole pine regeneration (Community Phase 1.3) assuming an ample supply of cones and seeds and favorable conditions for seed germination.

Pathway 1.5b
Community 1.5 to 1.2

This pathway is triggered by a high mortality fire, creating appropriate conditions for open lodgepole pine regeneration (Community Phase 1.2). Pathways 1.5a and 1.5b are common with the natural fire cycle. The historic fire return interval for a nearby Sierra lodgepole pine forest is 67 years. Such a fire return interval would not allow for later succession communities (Community Phases 1.1 and 1.6) to develop.

Pathway 1.5a
Community 1.5 to 1.3

This pathway is triggered by a high mortality fire, creating appropriate conditions for dense lodgepole pine regeneration (Community Phase 1.3) based on an ample supply of cones and seeds and favorable conditions for seed germination.

Pathway 1.5c
Community 1.5 to 1.4

This pathway is initiated by repeated small scale canopy disturbances caused by mountain pine beetle infestations, low mortality fires, or wind throw. A more open Sierra lodgepole pine forest (Community Phase 1.4) develops with several age classes. With continued small scale disturbances, it can eventually develop into Community Phase 1.1.

Pathway 1.5d
Community 1.5 to 1.6

With time and growth and the absence of disturbance the stand remains evenly aged and dense. White fir, which has established in the understory, becomes increasingly prevalent in the canopy and creates a dense Sierra lodgepole pine-white fir forest (Community Phase 1.6).

Pathway 1.6c
Community 1.6 to 1.1

This pathway is created in time with a high incidence of small scale disturbances, which break up the uniformity and density of this forest. With continued disturbances the open multi-aged Sierra lodgepole pine forest (Community Phase 1.1) may develop. The natural event of a moderate or surface fire in this forest is unlikely due to the high fuels and low fire tolerance of the dominant tree species. Considerable management efforts would be needed to create the open forest conditions that should exist in this forest had it developed with small scale disturbances over time.

Pathway 1.6b
Community 1.6 to 1.2

A severe fire would initiate open lodgepole pine regeneration (Community Phase 1.2).

Pathway 1.6a
Community 1.6 to 1.3

A severe fire would initiate dense lodgepole pine regeneration (Community Phase 1.3) assuming ample cone and seed and favorable conditions for seed germination.

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)**			3–17	
	Sierra lodgepole pine	PICOM	*Pinus contorta var. murrayana*	3–17	1–5
Grass/Grasslike					
0	**Grass/Grasslike**			16–80	
	squirreltail	ELEL5	*Elymus elymoides*	9–36	2–8
	western needlegrass	ACOC3	*Achnatherum occidentale*	7–27	2–6
	Ross' sedge	CARO5	*Carex rossii*	0–17	0–5
Forb					
0	**Forb**			0–68	
	narrowleaf lupine	LUAN4	*Lupinus angustifolius*	0–54	0–15
	goldenbush	ERICA2	*Ericameria*	0–13	0–2
	lettuce wirelettuce	STLA	*Stephanomeria lactucina*	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							
Sierra lodgepole pine	PICOM	*Pinus contorta var. murrayana*	Native	15.2–24.4	35–60	30.5–43.2	–

Table 8. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
squirreltail	ELEL5	*Elymus elymoides*	Native	–	2–8
western needlegrass	ACOC3	*Achnatherum occidentale*	Native	–	2–6
Ross' sedge	CARO5	*Carex rossii*	Native	–	0–5
Forb/Herb					
narrowleaf lupine	LUAN4	*Lupinus angustifolius*	Native	–	0–15
goldenbush	ERICA2	*Ericameria*	Native	–	0–2
lettuce wirelettuce	STLA	*Stephanomeria lactucina*	Native	–	0–1
Tree					
Sierra lodgepole pine	PICOM	*Pinus contorta var. murrayana*	Native	–	1–5

Animal community

Sierra lodgepole pine forests provide food, cover and habitat for a variety of species. There are 31 mammals and almost 50 bird species documented in Sierra lodgepole pine forests. Snags and downed logs are important for cavity-nesting birds and mammals. Other animals feed on the Sierra lodgepole pine needles and consume the seeds (Cope, 1993).

Recreational uses

This area is suitable for trails and camping.

Wood products

Sierra lodgepole pine wood is used for framing, paneling, trim, posts, and other construction products. The forests are often uniform is size, which makes harvesting easier. The wood tends to be light and straight grained with consistent texture (Cope 1993).

Other information

Alexander (1966) was used to determine forest site productivity for lodgepole pine. 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 phase 1.4 and older stands in 1.2 and 1.3. They are selected according to guidance listed in the site index publications.

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
Sierra lodgepole pine	*PICOM*	68	89	66	102	100	520	–	
Sierra lodgepole pine	*PICOM*	68	89	57	78	–	–	100TA	Alexander, Robert R. 1966. Site indexes for Lodgepole pine, with corrections for stand density: instructions for field use. USDA, Forest Service. Rocky Mountain Forest and Range Experiment Station Research Paper RM-24.

Inventory data references

The following NRCS vegetation plots were used to describe this ecological site.

789110
789369- Type location
789397

Type locality

Location 1: Shasta County, CA	
Township/Range/Section	T31 N R5 E S10
UTM zone	N
UTM northing	4490710
UTM easting	634578

General legal description	The type location is about 1.6 miles west northwest from the western edge of Soap Lake 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):**

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:**