USDA Natural Resources
Conservation Service

Ecological site F022AF003CA
Frigid, Loamy, Fragipan, Outwash

Accessed: 05/19/2024

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

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): 022A–Sierra Nevada and Tehachapi Mountains

Major Land Resource Area 22A, Sierra Nevada Mountains, is located predominantly in California and a small section of western Nevada. The area lies completely within the Sierra Nevada Section of the Cascade-Sierra Mountains Province. The Sierra Nevada range has a gentle western slope, and a very abrupt eastern slope. The Sierra Nevada consists of hilly to steep mountains and occasional flatter mountain valleys. Elevation ranges between 1,500 and 9,000 ft throughout most of the range, but peaks often exceed 12,000 ft. The highest point in the continental US occurs in this MLRA (Mount Whitney, 14,494 ft). Most of the Sierra Nevada is dominated by granitic rock of the Mesozoic age, known as the Sierra Nevada Batholith. The northern half is flanked on the west by a metamorphic belt, which consists of highly metamorphosed sedimentary and volcanic rocks. Additionally, glacial activity of the Pleistocene has played a major role in shaping Sierra Nevada features, including cirques, arêtes, and glacial deposits and moraines. Average annual precipitation ranges from 20 to 80 inches in most of the area, with increases along elevational and south-north gradients. Soil temperature regime ranges from mesic, frigid, and cryic.

LRU "F" Northeast Mixed Conifer: This LRU includes the drier eastside forests of the northern Sierra Nevada that occur north of Bridgeport, the eastern, lower elevations of the Tahoe area, and the northern extent of the Sierra near Susanville, most closely corresponding to EPA ecoregion 5f. Elevations are typically between 5,000 and 8,000 feet. The frost free season is between 50 and 100 days, MAAT is between 40 and 48 degrees F, and MAP is typically between 17 and 35 inches, but may range higher in the northernmost section. This LRU exists in the rain

shadow formed by the Sierra Nevada Crest, and consequently has much lower precipitation than equivalent elevations on western slopes. Soil temperature regimes are mostly frigid, with some cryic. Soil moisture regimes are xeric.

Classification relationships

Forest Alliance = Pinus contorta ssp. murrayana – Lodgepole pine forest; Association = tentatively Pinus contorta ssp. murrayana. (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.)

Ecological site concept

This site occurs on gently sloping glacial outwash at elevations of approximately 6200 to 6800 feet. Soils are very deep, with a weak fragipan at 12 to 65 inches and redoximorphic concentrations and depletions beginning at 12 inches. Permeability is slow to very slow. The fragipan creates a perched water table, so soils are saturated at shallow depths during the wet season, and droughty during the dry season. This limits the forest canopy to dominance by Sierra lodgepole pine (Pinus contorta var. murrayana), which is tolerant of both saturated and droughty soil conditions. The understory is a sparse cover of native grasses, with squirreltail (Elymus elymoides) the most common species.

Associated sites

F022AE007CA	**Frigid, Sandy, Moraines And Hill Slopes** Occurs on adjacent moraines and moderately sloping hills with sandy soils derived from glacial outwash and till from mixed parent materials. Vegetation is a productive Jeffrey pine (Pinus jeffreyi) - white fir (Abies concolor) forest.
F022AF002CA	**Frigid, Sandy, Or Loamy Outwash** Occurs on adjacent gently sloping outwash, moraines and outwash fans with moderatley deep to very deep soils of mixed origin. Vegetation is an open Jeffrey pine (Pinus jeffreyi) forest.
F022AX100CA	**Frigid, Sandy, Moist, Outwash Fan** Occurs on adjacent very deep, poorly drained soils that formed in alluvium from glacial outwash fans. The vegetation is a Sierra lodgepole pine (Pinus contorta var. murrayana) forest with willows and forbs.

Similar sites

F022AF001CA	**Frigid Sandy Outwash Plain Gentle Slopes** Occurs on undulating outwash soils that are deep to a duripan. The depth to the duripan is variable due to undulating topography, which creates a mosaic of saturated and very droughty soils. The vegetation is a patchy Sierra lodgepole pine (Pinus contorta var. murrayana) forest, with western juniper (Juniperus grandis) scattered in shallower dry areas.
F022AX100CA	**Frigid, Sandy, Moist, Outwash Fan** Occurs on very deep, poorly drained soils that are near to, but not directly associated with riparian systems. This site is moister, and has a more productive understory characterized by willows (Salix sp.) and wetland grasses and grasslike species.

Table 1. Dominant plant species

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

Physiographic features

This ecological site is on hillslopes on outwash terraces at elevations ranging from 6,250 to 6,710 feet. It is found on all aspects and has slopes ranging from 0 to 15 percent. Runoff is very high.

Table 2. Representative physiographic features

Landforms	(1) Outwash terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,905–2,045 m
Slope	0–15%
Water table depth	25 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 23 to 33 inches, mostly in the form of snow in the winter months (November through April). The average annual air temperature ranges from 41 to 46 degrees Fahrenheit. The frost-free (>32F) season is 40 to 90 days, and the freeze-free (>28F) season is 70 to 140 days.

Table 3. Representative climatic features

Frost-free period (average)	65 days
Freeze-free period (average)	105 days
Precipitation total (average)	711 mm

Influencing water features

This ecological site has a seasonal high water table between 10 to 20 inches, with mottles beginning at 12 inches. This site usually lacks the vegetation to qualify as a wetland, and the soils and hydrology are borderline. However, in some areas it may qualify as forested palustrine wetland.

Soil features

The soils associated with this ecological site are very deep and formed glacial outwash derived from predominately granitic mixed materials. These soils are poorly drained with slow to moderately rapid permeability. The soil moisture regime is xeric and the soil temperature regime is frigid. There are several argillic horizons with a weak fragipan from 12 to 65 inches that can be root restricting. Many fine, medium and course roots are present above 15 inches, and a few fine and medium roots are found from 15 to 92 inches. Redoximorphic concentrations and depletions begin at 12 inches. Permeability is slow to very slow. Surface rock fragments smaller than 3 inches in diameter average 5 percent and larger fragments are generally absent. Surface textures are coarse sandy loam. Partially decomposed organic matter overlies the mineral horizons (Oi horizon). Subsurface textures are coarse sandy loam, and loamy coarse sand. Subsurface rock fragments smaller than 3 inches in diameter average 10 percent by volume, and larger fragments are generally absent (for a depth of 0 to 79 inches). The soils that are correlated to this ecological site are the Oneidas soils (Coarse-loamy, mixed, active, frigid Fragiaquic Haploxeralfs), and a minor component of Jabu (Coarse-loamy, mixed, superactive, frigid Ultic Haploxeralfs).

This ecological site has been correlated with the following mapunits and soil components in the Tahoe Basin soil survey area (CA693):

7491 ; Oneidas coarse sandy loam, 0 to 5 percent slopes ; Oneidas ; ; 80
7492 ; Oneidas coarse sandy loam, 5 to 15 percent slopes ; Oneidas ; ; 80
7482 ; Meeks gravelly loamy coarse sand, 5 to 15 percent slopes, stony ; Oneidas ; ; 7
7541 ; Ubaj sandy loam, 0 to 9 percent slopes ; Jabu ; ; 5
7444 ; Christopher-Gefo complex, 0 to 5 percent slopes ; Oneidas ; ; 5
7461 ; Jabu coarse sandy loam, 0 to 9 percent slopes ; Oneidas ; ; 5
7462 ; Jabu coarse sandy loam, 9 to 30 percent slopes ; Oneidas ; ; 5
7541 ; Ubaj sandy loam, 0 to 9 percent slopes ; Oneidas ; ; 5
7441 ; Christopher loamy coarse sand, 0 to 9 percent slopes ; Oneidas ; ; 3

7442 ; Christopher loamy coarse sand, 9 to 30 percent slopes ; Oneidas ; ; 3
7443 ; Christopher gravelly loamy coarse sand, 9 to 30 percent slopes ; Oneidas ; ; 3
7451 ; Gefo gravelly loamy coarse sand, 2 to 9 percent slopes ; Oneidas ; ; 3
7452 ; Gefo gravelly loamy coarse sand, 9 to 30 percent slopes ; Oneidas ; ; 3

Table 4. Representative soil features

Parent material	(1) Outwash–granite
Surface texture	(1) Coarse sandy loam
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Slow to moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.87–3.78 cm
Soil reaction (1:1 water) (0-101.6cm)	2.8–4
Subsurface fragment volume <=3" (Depth not specified)	10%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Abiotic factors
This site occurs on gently sloping glacial outwash at elevations of approximately 6200 to 6800 feet. Soils are very deep, with a weak fragipan at 12 to 65 inches and redoximorphic concentrations and depletions begin at 12 inches. Permeability is slow to very slow. The fragipan creates a perched water table, so soils are saturated at shallow depths during the wet season, and droughty during the dry season. This limits the forest canopy to dominance by Sierra lodgepole pine, which is tolerant of both saturated and droughty soil conditions. The understory is a sparse cover of native grasses, with squirreltail the most common species.

Ecological/Disturbance factors
The presumed most successionally advanced community phase is dominated by Sierra lodgepole pine forests. These forests are dense, single aged stands of Sierra lodgepole pine with an occasional white fir (*Abies concolor*) and Jeffery pine (Pinus Jeffreyi). The understory cover is sparse with scattered native grasses.

Sierra lodgepole pine can tolerate harsher conditions than many other conifers, inclduing cold, light, heat, drought, saturation, and hardpan soils (Lotan and Critchfield 1990, Kocher 2005). They are also moderately shade and competition tolerant. However, the thin bark and shallow root systems make Sierra lodgepole pine susceptible to fire and windfall (Lotan and Critchfield 1990). Prolonged drought and flooding can kill the trees, or make them vulnerable to disease and pest outbreaks.

Historically, fire played an important role in thinning and renewing Sierra lodgepole pine forests. Studies on fire frequency in Sierra lodgepole pine forest vary from 20 to 200 years, depending on location, elevation, and precipitation (Cope 1993, Murphy and Knopp 2000). This area has moderate precipitation, is at mid-elevations, and has seasonal wetness. The fire intervals for moderate and severe fires were most likely between 70 to 100 years, heavily correlated with mountain pine beetle (Dendroctonus ponderosae) infestations and the decline of overstory trees. In addition to a natural fire regime, it is believed the Washoe Indians used fire to preserve meadow environments and to keep forests open (Murphy and Knopp,2000).

Human disturbance regimes have altered the historic plant community and its natural cycles. Much of the Sierra lodgepole pine forest terrain was clear-cut during the Comstock era, from the mid-1870s to the mid-1890s, although small-scale logging occurred in sections from 1911 to the 1970s (Murphy and Knopp 2000). Intense sheep and cattle grazing began as early as 1850, especially in the meadows. Almost a century of fire exclusion has led to increased forest density and over- and understory fuel build-up (Murphy and Knopp 2000). Consequently, this Sierra lodgepole pine community is younger and more overstocked than the pre-European settlement forest.

The reference state consists of the most successionally advanced community phase (numbered 1.1) as well as other community phases that 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 F022AF003CA
Pinus contorta var. murrayana/Squirreltail
(Sierra lodgepole pine/squirreltail)

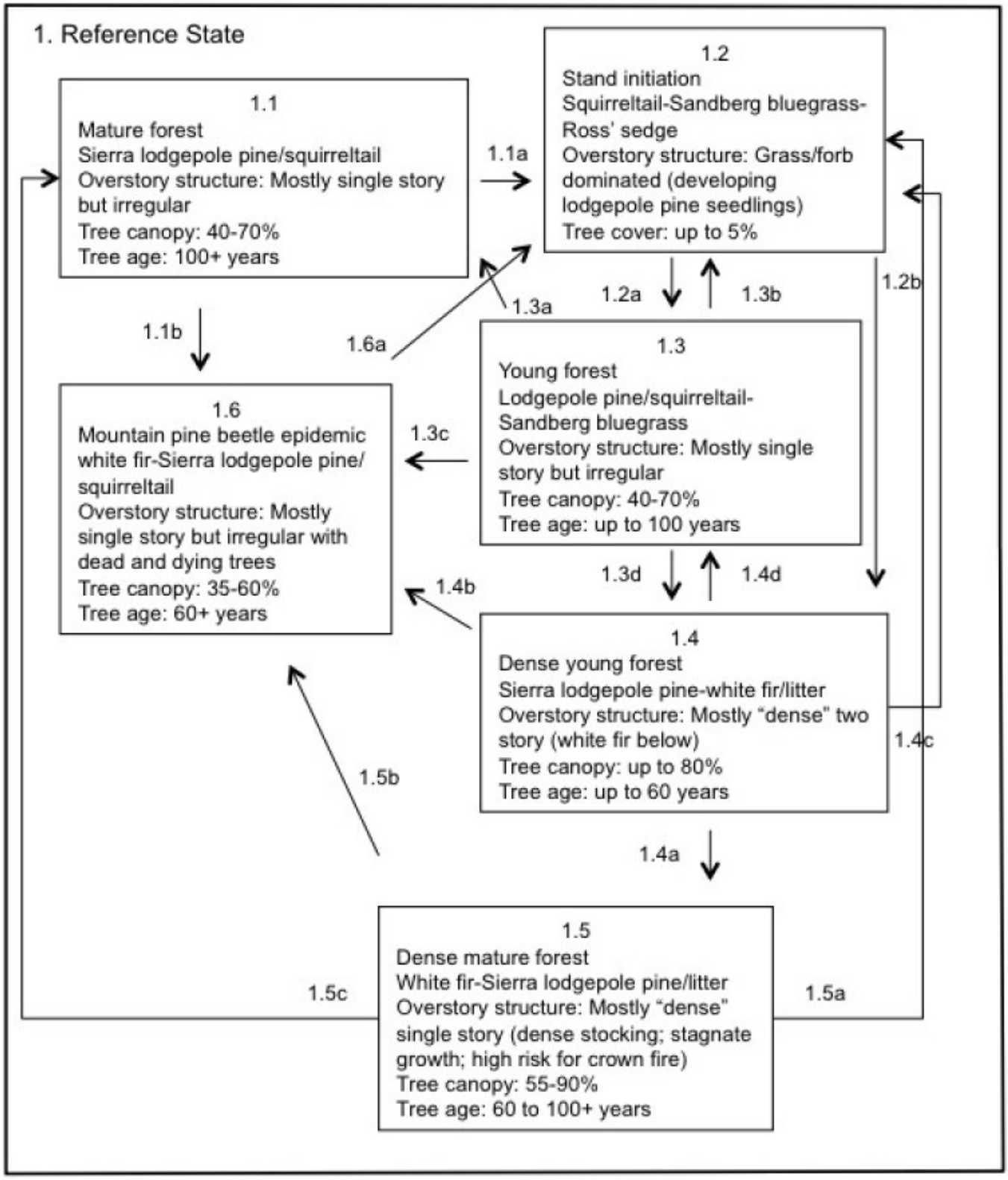

Figure 6. F022AF003CA

State 1
Reference

Community 1.1
Mature forest

This community phase is currently very rare, however it may become more extensive with appropriate management. This phase develops large old growth Sierra lodgepole pine with a mix of younger aged trees. The age for this community is estimated to have ranged from about 100 to more than 200 years. Small pockets of younger community phases intermixed to create a diverse forest structure. White fir and Jeffrey pine may be present at low cover due to high water table levels and a partially root restricting fragipan that limit establishment in this sites. Pine beetle infestations, wind throw and other small-scale disturbances create gaps for Sierra lodgepole pine regeneration. Over time these gaps break up the uniformity of the evenly aged stand that formed after the last large fire event. Old growth Sierra lodgepole pine that has not experience severe fire has an irregular forest structure and is able to regenerate in canopy gaps created by disturbances. The understory cover was probably sparse with scattered grasses.

Forest overstory. The overstory canopy cover may range from 40 to 70 percent. White fir and Jeffrey pine can be present with low frequency and cover.

Forest understory. The understory cover was most likely low with a range of 5 to 10 percent herbaceous cover. Data is unavailable for this historic community, but the species were most likely similar to those listed in community phase 1.3.

Community 1.2
Stand initiation

This short lived, community phase develops after a severe canopy fire. A carefully planned harvest and prescribed burn could imitate a canopy fire and initiate forest regeneration. Remnant overstory trees may be present in limited numbers. This community type was not observed, but grasses and sedges may dominate this phase, until Sierra lodgepole pine seedlings increase in cover. Sierra lodgepole pine readily germinates from seed in the spring in the mineral soil exposed by fire and can survive in the frost pockets that define these sites, where other tree seedlings cannot.

Forest overstory. Young, developing Sierra lodgepole pine seedlings.

Forest understory. Numerous species of grasses, including squirreltail (Elymus elymoides), Sandberg bluegrass (Poa Secunda), and Ross' sedge (Carex rossii) regenerate from seed after fire and will dominate this community for several years. The seeds require moist soil and full sun to establish in the first season. Herbaceous species may include grassy tarweed (Madia gracilis), common yarrow (Achillea millefolium), and yampah (Perideridium spp.). In some instances, the grasses can dominate for a prolonged period from continual grazing or management that excludes establishment of lodgepole pine regeneration.

Community 1.3
Young forest

Figure 7. Community Phase 1.3

This young, open Sierra lodgepole pine community phase is dependent partially on the initial density of seedling establishment. In some cases, seedlings establish at different times, and in relatively open distribution. This depends in part on seed storage, time and intensity of fire, and post fire climate conditions. This community's duration ranges up 60 years. Some reports indicate surface fires historically kept this forest open in the understory. However, it appears that a fire in these dense stands could be moderate to severe. The burns may be patchy, burning just the small dense groves and under the older forest nearby, which would create open conditions in some areas.

Forest overstory. In the young open Sierra lodgepole pine forest, the overstory is dominated by Sierra lodgepole pines with canopy cover ranging from 25 to 60 percent. White fir and Jeffrey pine each range from 0 to 5 percent canopy cover.

Forest understory. The understory is dominated by graminoid species. Ross' sedge (Carex rossii) and squirreltail (Elymus elymoides) are commonly represented along with a variety of other species.

Community 1.4
Dense young forest

The dense young forest may develop when fire suppression results in increased seed source and infill of white fir. White fir seedlings are more shade tolerant than lodgepole pine seedlings, which allows them to continue to reproduce in the understory of the lodgepole pine forest. The density of white fir increases over time and creates competition with the lodgepole pines for sunlight and water. This stress makes the trees more susceptible to death from pests and drought, which in turn increases the fuel loads and potential for a severe fire. It appears that this site is not conducive for the optimum growth of white fir because of the properties of the soil, the high water table, and the high frequency of frost. However, in some areas within this site white fir is present and reproducing well. If white fir does not infill, lodgepole pine can increase in density and create the same conditions mentioned above. Canopy cover is high in this phase, at up to 80 percent.

Forest overstory. This phase is dominated by a relatively open overstory of 60 to 100 year old Sierra lodgepole

pine trees. This community phase develops with occasional fire, pest outbreaks or tree fall, which create canopy gaps. White fir may germinate during this time in the shade of the young lodgepole pines and small shrubs.

Forest understory. The understory is dominated by graminoid species.

Community 1.5
Dense mature forest

The dense mature forest will develop with the continued exclusion of fire, allowing white fir to reach the upper canopy and gain dominance over lodgepole pine. Competition for water and sunlight will cause Sierra lodgepole pine's health and vigor to decline. An estimated age for this community phase ranges from 60 to more than 200 years. However, drought, pest attacks and water table fluctuations are disturbances likely to decimate this phase. Canopy cover is high, at up to 90 percent, and trees are 60 to over 100 years old.

Forest overstory. Sierra lodgepole pine is still dominant in the main canopy, but white fir is becoming increasingly dense in the understory. Overall density is high, with canopy cover ranging from 55 to 80 percent. The main canopy is composed of young, small-diameter trees around 60 feet tall, with several understory layers.

Forest understory. The high canopy cover and deep accumulation of woody debris causes a lack of sunlight and little to no understory.

Community 1.6
Mountain pine beetle epidemic

Standing dead forests can result following mountain pine beetle epidemics, sometimes in combination with prolonged drought or flooding. Large patches of forest remain standing dead for many years until fire or manual treatment remove the dead trees and surface fuels. If surface fuels are not too high, grasses and forbs may grow in the understory and in openings.

Forest overstory. White fir is dominant in the main canopy and in the understory. Overall density is high with canopy cover ranging from 55 to 90 percent. The main canopy is composed of mature trees around 100 feet tall with several canopy layers beneath. An estimate for an age for this community is 60 to more than 200 years.

Forest understory. The high canopy cover and deep accumulation of woody debris causes a lack of sunlight and little to no understory.

Pathway 1.1a
Community 1.1 to 1.2

In the event of a severe canopy fire, or a clear-cut with or without a prescribed burn, phase 1.1 would quickly develop into phase 1.2, the stand initiation phase.

Pathway 1.1c
Community 1.1 to 1.5

This pathway occurs with fire suppression.

Pathway 1.1b
Community 1.1 to 1.6

Plant community phase 1.1 may develop into phase 1.6 with the infestation of pests. The primary threat to Sierra lodgepole pine from pest invasion is the mountain pine beetle (Dendroctonus ponderosae). Infestations can lead to a high mortality rate, sometimes leaving a stand of dead trees, and causing high fuel loads. Natural outbreaks of variable severity tend to occur every 20 to 40 years (Cope,1993).

Pathway 1.2a
Community 1.2 to 1.3

The natural transition would be to community phase 1.3, the young Sierra lodgepole pine forest, if given time without severe disturbances. This pathway is followed with a natural fire regime. Reports vary on the natural fire return interval, but this pathway assumes that surface fires were relatively frequent with 20- to 40-year cycles (Cope 1993). Manual thinning with prescribed burns can imitate the natural cycle and lead to the same relatively open forest community phase 1.3.

Pathway 1.2b
Community 1.2 to 1.4

This pathway occurs with fire suppression that prevents thinning necessary for the natural patchy structure of this ecological site. Lack of ground fire allows white fir to establish and gain maturity in the understory.

Pathway 1.3a
Community 1.3 to 1.1

The natural shift for this phase is to grow and develop into community phase 1.1. This pathway evolved with a historic fire regime of occasional surface and moderately severe fires, with occasional pest outbreaks that can lead to partial tree death. Manual thinning or prescribed burning can be implemented to replace the natural disturbances that kept this forest relatively open.

Pathway 1.3b
Community 1.3 to 1.2

In the event of a canopy fire, the phase would quickly shift to community phase 1.2.

Pathway 1.3c
Community 1.3 to 1.4

This pathway occurs with fire suppression that prevents thinning necessary for the natural patchy structure of this ecological site. Lack of ground fire allows white fir to establish and gain maturity in the understory.

Pathway 1.3d
Community 1.3 to 1.6

This phase can transition to phase 1.6 with the infestation of pests. The primary threat to Sierra lodgepole pines from pest invasion is from the mountain pine beetle (Dendroctonus ponderosae). Infestations can lead to a high mortality rate; leaving a forest of standing dead trees, and causing high fuel loads. Natural outbreaks of variable severity tend to occur every 20 to 40 years (Cope 1993).

Pathway 1.4c
Community 1.4 to 1.2

In the event of a severe canopy fire or clear-cut/scarification, phase 1.2 would develop.

Pathway 1.4d
Community 1.4 to 1.3

A naturally occurring moderate or surface fire in this forest is unlikely due to the high fuel load. Considerable management effort would be needed to create the open forest conditions that should exist in this forest with a natural fire regime. Manual treatment or prescribed burns could thin out dense Sierra lodgepole pine, western juniper and white fir. This would shift this forest back to its natural state of open, patchily distributed young Sierra lodgepole pine forest (community phase 1.3).

Pathway 1.4a
Community 1.4 to 1.5

With continued fire suppression, this phase will transition to a dense mature forest.

Pathway 1.4b
Community 1.4 to 1.6

This phase can transition to phase 1.6 with the infestation of pests. The primary threat to Sierra lodgepole pines from pest invasion is from the mountain pine beetle (Dendroctonus ponderosae). Infestations can lead to a high mortality rate; leaving a forest of standing dead trees, and causing high fuel loads. Natural outbreaks of variable severity tend to occur every 20 to 40 years (Cope 1993).

Pathway 1.5c
Community 1.5 to 1.1

A naturally occurring moderate or surface fire in this forest is unlikely due to the high fuel load. Considerable management effort would be needed to create the open forest conditions that should exist in this forest with a natural fire regime. Manual treatment or prescribed burns could thin out dense Sierra lodgepole pine, western juniper and white fir. This would shift this forest back to its natural state of open, patchily distributed Sierra lodgepole pine forest (community phase 1.1).

Pathway 1.5a
Community 1.5 to 1.2

In the event of a severe canopy fire, or a clear-cut with or without a prescribed burn, this phase would quickly develop into phase 1.2, the stand initiation phase. Sierra lodgepole pine is susceptible to death from fire at any age because of their thin bark and shallow root systems (Kocher 2005).

Pathway 1.5b
Community 1.5 to 1.6

This phase can transition to phase 1.6 with the infestation of pests. The primary threat to Sierra lodgepole pines from pest invasion is from the mountain pine beetle (Dendroctonus ponderosae). Infestations can lead to a high mortality rate; leaving a forest of standing dead trees, and causing high fuel loads. Natural outbreaks of variable severity tend to occur every 20 to 40 years (Cope 1993).

Pathway 1.6a
Community 1.6 to 1.2

After a prolonged period, this phase will progress to phase 1.2. Severe fire will accelerate this transition. Fire is the natural disturbance at this point in the Sierra lodgepole pine cycle and will allow for the regeneration of the lodgepole pine forest seen in phase 1.3. Mechanical removal of the dead trees with partial scarification of the surface or a prescribed burn in the understory can also induce stand regeneration.

Additional community tables

Table 5. Community 1.3 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	–	23–50	–	–
Jeffrey pine	PIJE	*Pinus jeffreyi*	Native	–	1–5	–	–
white fir	ABCO	*Abies concolor*	Native	–	1–5	–	–

Table 6. Community 1.3 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Sandberg bluegrass	POSE	*Poa secunda*	Native	–	3–6
squirreltail	ELEL5	*Elymus elymoides*	Native	–	1–4
Ross' sedge	CARO5	*Carex rossii*	Native	–	1–2
sedge	CAREX	*Carex*	Native	–	0–1
Forb/Herb					
longstalk clover	TRLO	*Trifolium longipes*	Native	–	1–4
plantainleaf buttercup	RAAL	*Ranunculus alismifolius*	Native	–	1–3
lambstongue ragwort	SEIN2	*Senecio integerrimus*	Native	–	0–2
Nevada bird's-foot trefoil	LONEN2	*Lotus nevadensis var. nevadensis*	Native	–	0–2
turkey pea	SATU	*Sanicula tuberosa*	Native	–	0–0.5
spreading groundsmoke	GADI2	*Gayophytum diffusum*	Native	–	0–0.5
spreading groundsmoke	GADI2	*Gayophytum diffusum*	Native	–	0–0.5
Shrub/Subshrub					
whitethorn ceanothus	CECO	*Ceanothus cordulatus*	Native	–	0–2
wax currant	RICE	*Ribes cereum*	Native	–	0–2
Tree					
white fir	ABCO	*Abies concolor*	Native	–	0–1

Animal community

These forests provide cover at the edges of meadows and riparian corridors. There are many mammals including bear, deer, and squirrel and almost 50 bird species that use Sierra lodgepole pine forests for food, cover, or habitat. Dead or dying trees provide nesting sites for cavity-nesting birds. The fallen branches from these trees provide sites for ground-nesting birds and mammals. The seeds are a food source for squirrels, chipmunks, birds, and mice (Cope 1993).

Hydrological functions

This soil is in hydrologic soil group C. It has a slow infiltration rate, and a fragipan layer that impedes the downward movement of water. It has a slow rate of water transmission (USDA 2002).

Recreational uses

This site is primarily used for hiking and bicycle trails.

Wood products

The wood is suited for common lumber grades, and used for light framing materials, interior paneling, exterior trim, posts, railroad ties, pulp and paper, and has potential for structural particle board. The uniform size of Sierra lodgepole pine makes harvesting efficient (Cope 1993). In this area, pole-sized trees may be most useful as fence material.

Other information

Site index documentation:

Alexander (1966), Schumacher (1926), and Meyer (1961) were used to determine forest site productivity for lodgepole pine, white fir and Jeffrey pine, respectively. 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.

Trees appropriate for site index measurement typically occur in stands of community phases 1.4, 1.5 and 1.6. Site trees are selected according to guidance in the cited publications. Please refer to the Tahoe Basin Area Soil Survey for detailed site index information by soil component.

Table 7. 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
white fir	*ABCO*	50	50	91	91	70	030	–	
Jeffrey pine	*PIJE*	90	90	85	85	40	600	–	
Sierra lodgepole pine	*PICOM*	70	70	70	70	100	520	–	

Inventory data references

The Following NRCS plots were used to describe this ecological site.

Jeb02545
Jeb02547
EV0202

Type locality

Location 1: El Dorado County, CA	
Township/Range/Section	T12N R18E S18E
UTM zone	N
UTM northing	4306119
UTM easting	240384
General legal description	The site location is 100' south of dirt road extension of Oneidas Street, 1.3 miles northeast of Meyers, California.

Other references

Cope, A. B. 1993. Pinus contorta var. murrayana. Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

Kocher, S. D. 2005. Why does lodgepole pine grow here? In: Working in the woods: a guide for California's landowners. University of California Press, Berkeley; Division of agricultural and natural resources cooperative extension, Berkeley, CA.

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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:**