USDA Natural Resources Conservation Service

Ecological site R022BI204CA
Glaciated Mountain Slopes

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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 –
Slopes: 5 to 80, but generally 15 to 50 Landform: Mountain slope.
Soils: Well drained, shallow to moderately deep soils over bedrock. Tephra or ash deposits are over or mixed with the colluvium or residuum. Ashy-skeletal, amorphic Xeric Vitricryands and Ashy-skeletal, glassy Lithic Vitricryands.
Temp regime: Cryic (but in some areas bordering on frigid).
MAAT: 38 to 43 degrees F (3.3 to 6.1 degrees C).
MAP: 55 to 117 inches (1,397 mm to 2,972 mm).
Soil texture: Ashy highly organic sand and gravelly ashy sandy loam. Surface fragments: 2 to 17 percent gravel.
Vegetation: Pinemat manzanita (Arcostaphlyos nevadensis), with scattered western white pine (Pine monticola), California red fir (*Abies magnifica*), mountain hemlock (*Tsuga mertensiana*) and Sierra lodgepole pine (*Pinus contorta* ssp. murrayana).

Associated sites

F022BI115CA	**Frigid And Cryic Gravelly Slopes** This site has similar species but is found on the adjacent deeper soils with greater than 25 percent tree cover.

Similar sites

F022BI102CA	**Frigid Bouldery Glacially Scoured Ridges Or Headlands** This site has similar species but is a forest site with higher production and diversity.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Arctostaphylos nevadensis*
Herbaceous	Not specified

Physiographic features

This ecological site is found on mountain slopes, knobs on glaciated lava flows and scoured glacial-valley walls and floors. Elevation ranges from 5,722 to 8,500 feet. Slopes generally range from 15-50%, however due to the locations of this site, slopes can range anywhere from 5 to 80% in some places.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,744–2,591 m
Slope	5–80%
Aspect	SE, S, SW

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 55 to 117 inches (1,397 mm to 2,972 mm) and the mean annual temperature ranges from 38 to 43 degrees F (3.3 to 6.1 degrees C). The frost free (>32 degrees F) season is 50 to 85 days. The freeze free (>28 degrees F) season is 65 to 195 days.

There are no representative climate stations for this site. The nearest one is Manzanita Lake, which receives substantially less precipitation than this area.

Table 3. Representative climatic features

Frost-free period (average)	85 days
Freeze-free period (average)	195 days
Precipitation total (average)	2,972 mm

Influencing water features

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

Soil features

This site is associated with the Terrracelake and Acroph soil components. The Terracelake soils are well drained and moderately deep with volcanic bedrock encountered between 20 to 40 inches. The Acroph soils are well drained and shallow with andesite, dacite or rhyodacite bedrock encountered between 10 to 20 inches. These soils have tephra or ash deposits over or mixed with the colluvium or residuum. The surface textures are ashy highly organic sand and gravelly ashy sandy loam, with loamy sand and sandy loam subsurface textures. These soils have 60 to 80 percent rock fragments in the lower horizons.

Terracelake taxonomic class: Ashy-skeletal, amorphic Xeric Vitricryands
Acroph taxonomic class: Ashy-skeletal, glassy Lithic Vitricryands

This ecological site has been correlated with the following map units and components within the CA789 Soil Survey Area:

Map Unit Component percent
112 Terracelake 13
113 Acroph 3
113 Terracelake 35
137 Acroph 3
149 Acroph 4
150 Acroph 15
151 Acroph 20
152 Acroph 15

Table 4. Representative soil features

Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Very slow
Soil depth	25–102 cm
Surface fragment cover <=3"	2–17%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	2.29–6.6 cm
Soil reaction (1:1 water) (0-101.6cm)	5.5–6.7
Subsurface fragment volume <=3" (Depth not specified)	20–45%
Subsurface fragment volume >3" (Depth not specified)	5–35%

Ecological dynamics

This ecological site is characterized by open slopes dominated by pinemat manzanita (*Arctostaphylos nevadensis*), with less than 25 percent tree cover. Tree species include California red fir (*Abies magnifica*), western white pine (*Pinus monticola*), mountain hemlock (*Tsuga mertensiana*) and Sierra lodgepole pine (*Pinus contorta* ssp. murrayana).

The soils on this site are limited by bedrock contact between 10 to 40 inches and have very coarse textures with very low water holding capacities. In addition, this site is often situated on southern slopes and/or on convex topographies that drain rather that hold water. Trees do not establish well on these sites because they are unable to tap into deeper water sources and the seasonal water supply is quickly drained away, transpired or evaporated.

Pinemat manzanita is characteristic of dry cold sites on well drained soils. Pinemat manzanita is considered to be important for soil stabilization, especially on steep slopes, and is known to recover quickly following a disturbance such as fire. Reproduction techniques employed by pinemat manzanita include sprouting and establishing from seed. Seeds require treatment before germination, with digestion by animals or fire cracking the seed coat (Hurteau, 2009). Hurteau reports that pinemat manzanita has an obligate relationship with mycorrhizal fungi. These fungi are important for water and nutrient uptake. Expanded root systems provided by mycorrhizal fungi help plants extract water from the soil, especially during drought conditions. Plants assist the fungi by providing carbohydrates from their photosynthetic processes. The research is unclear on whether mycorrhizal fungi in sites with a well established shrub field will aid or inhibit conifer regeneration.

Extensive cover of pinemat manzanita can create competition for water in the upper soil profile, especially during the dry summer months (Rose, 2003). This does not affect trees already established on the site as they are deeper rooted and able to utilize moisture stored deeper in the profile, but it is problematic for seedling establishment. Initially a high percentage of shrub cover may aid seedling germination by providing shelter and protection. Ultimately, however, very few seedlings will persist on a shrub dominated site due to increased competition for soil moisture. A combination of competition from the shrub component and relatively shallow soil will prevent this site from becoming forested.

State and transition model

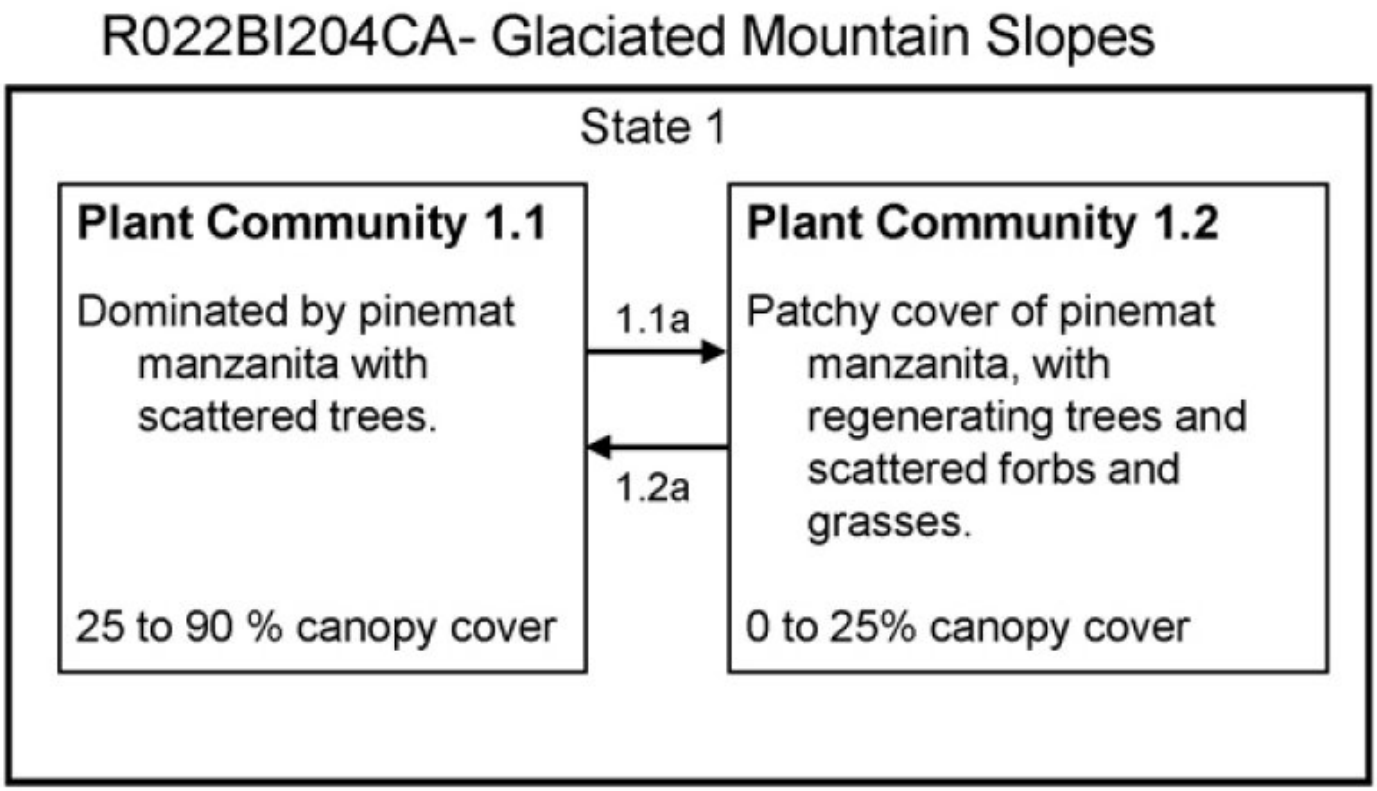

Figure 3. Glaciated Mountain Slopes

State 1
Natural State

This state represents the natural state and conditions for this ecological site. There is not an altered state.

Community 1.1
Pinemat manzanita dominated slope with scattered trees

Figure 4. Glaciated Mountain Slopes

Community phase 1.1 is the reference community for this ecological site. It consists of scattered mature trees with an extensive understory of pinemat manzanita (Arcostaphlyos nevadensis). Tree species include western white pine (Pine monticola), California red fir (*Abies magnifica*), mountain hemlock (*Tsuga mertensiana*) and Sierra lodgepole pine (*Pinus contorta* ssp. murrayana). Large scale disturbances do not regularly occur on this site, creating the potential for plant community 1.1 to remain relatively unchanged for decades and possibly centuries.

Forest overstory. Mature trees are scattered around the site, with less than 25 percent total canopy. Representative overstory canopy cover is: California red fir (Abies magnifica), 3 percent; western white pine (Pinus monticola), 4 percent; mountain hemlock (Tsuga mertensiana), 2 percent; and Sierra lodgepole pine (Pinus contorta var. murrayana), 1 percent.

Forest understory. The understory is dominated by pinemat manzanita (Arcostaphylos nevadensis) with about 60 percent cover. It is separated by patches of open ground with a light cover of grasses and forbs growing mostly within the pinemat manzanita canopy. The herbaceous community accounts for about 8 percent total cover.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	280	453	628
Tree	–	17	39
Grass/Grasslike	–	6	11
Forb	–	2	8
Total	**280**	**478**	**686**

Table 6. Ground cover

Tree foliar cover	1-25%
Shrub/vine/liana foliar cover	35-90%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-5%
Non-vascular plants	0-2%
Biological crusts	0%
Litter	35-80%
Surface fragments >0.25" and <=3"	0-50%
Surface fragments >3"	0-35%
Bedrock	0-10%
Water	0%

Bare ground	0-10%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	0-1%	–
>0.15 <= 0.3	–	–	0-9%	0-3%
>0.3 <= 0.6	0-1%	35-90%	–	–
>0.6 <= 1.4	0-1%	–	–	–
>1.4 <= 4	0-4%	–	–	–
>4 <= 12	0-2%	–	–	–
>12 <= 24	5-15%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Patchy cover of pinemat manzanita with regenerating shrubs and trees

Community phase 1.2 exists after a disturbance creates openings in the shrubs for regrowth. If the correct conditions were present, a fire could remove a large amount of the vegetation on this site. Pinemat manzanita is known to respond favorably following a fire. Heavy recruitment from seed has been documented after fire (Howard 1993). This suggests that seeds lay dormant in the soil until a fire occurs, prepping the seed for germination and providing an opening for establishment. Species richness could increase following a fire since seeds stored in the soil would take advantage of reduced competition from the shrubs.

Forest overstory. Mature trees remain scattered around the site, but some may have been removed by fire, reducing the canopy cover slightly. Species include California red fir (Abies magnifica), western white pine (Pinus monticola), mountain hemlock (Tsuga mertensiana) and Sierra lodgepole pine (Pinus contorta var. murrayana). Tree regeneration will be relatively slow due to limited seed sources availability and competition for resources with pinemat manzanita.

Forest understory. Large patches of regenerating pinemat manzanita (Arcostaphylos nevadensis) and increased herbaceous cover follow disturbance.

Pathway 1.1a
Community 1.1 to 1.2

1.1a- A lighting strike could burn small areas of pinemat manzanita or strike individual trees, creating open areas and an opportunity for seedling and shrub regeneration.

Pathway 1.2a
Community 1.2 to 1.1

1.2a- With time pinemat manzanita re-colonizes open patches on the ground. Trees establish where the opportunity exists.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass/ grasslike**			0–11	
	western needlegrass	ACOC3	*Achnatherum occidentale*	0–6	0–2
	squirreltail	ELEL5	*Elymus elymoides*	0–4	0–2
	sedge	CAREX	*Carex*	0–1	0–1
Forb					
2	**Forbs**			1–8	
	buckwheat	ERIOG	*Eriogonum*	1–6	1–3
	rockcress	ARABI2	*Arabis*	0–2	0–1
Shrub/Vine					
3	**Shrubs**			280–628	
	pinemat manzanita	ARNE	*Arctostaphylos nevadensis*	280–616	35–90
	oceanspray	HODI	*Holodiscus discolor*	0–11	0–2
Tree					
4	**Tree**			0–39	
	California red fir	ABMA	*Abies magnifica*	0–22	0–5
	western white pine	PIMO3	*Pinus monticola*	0–9	0–2
	mountain hemlock	TSME	*Tsuga mertensiana*	0–4	0–1
	Sierra lodgepole pine	PICOM	*Pinus contorta var. murrayana*	0–3	0–1

Animal community

The older leaves of pinemat manzanita are not considered to be a preferred forage plant by any species of wildlife or livestock. The fruit however is eaten by black bear, deer, coyote, and various birds and rodents.

Recreational uses

The prostrate growth form and strong branches of pinemat manzanita make walking across this site difficult and prevent sites like this from becoming a preferred recreation location.

Wood products

Pinemat manzanita branches can be used to make various wood tools.

Other products

Ethnobotanical uses for pinemat manzanita include a treatment for diarrhea and poison oak (Toxicodendron diversiloba)poisoning.

Other information

Dried pinemate manzanita berries are a potential food source for humans and dried leaves can be smoked like a type of tobacco.

Inventory data references

There are four NRCS vegetation plots used to describe this ecological site.

789314- Acroph modal pit- higher elevation
789318

789322- Terracelake modal pit
789339

Type locality

Location 1: Shasta County, CA	
Township/Range/Section	T30 N R5 E S17
UTM zone	N
UTM northing	4480405
UTM easting	630803
General legal description	The site location is about 1 mile east north east of the Kings Creek Picnic Area

Other references

Howard, Janet L. 1993. Arcostaphylos nevadensis. In: Fire Effects Information System [online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station Fire Science Laboratory. Available: http://www.fs.fed.us/database/feis/ [2009, July 21].

Hurteau, Matthew D. Plant Guide Pinemat Manzanita. USDA-NRCS National Plant Data Center. [online] Available: http://www.plants.usda.gov/plantguide/docpg_arne.doc [2009, July 22]

Phillips, Jonathon D, Alice V. Turkington and Daniel A. Marion. Weathering and vegetation effects in early stages of soil formation. Catena 72: 21-28. 2008. [online] www.sciencedirect.com

Pinder J.E.III, G. C. Kroh, J.D. White and A.M. Basham May. The relationship between vegetation type and topography in Lassen Volcanic National Park. Plant Ecology 131:17-92. 1997.

Rose, K. L., R. C. Graham and D. R. Parker. Water source utilization by Pinus jeffreyi and Arctostaphylos patula on thin soils over bedrock. Oecologica 134:46-54 (2003).

Contributors

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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:**