USDA Natural Resources Conservation Service

Ecological site R022BI205CA
Cirque Floor

Accessed: 11/06/2024

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 –
Slopes:1 to 35, but generally 2 to 15.
Landform: Ground moraines on cirque floors and lava plateaus.
Soils: Well drained, moderately deep, and formed in glacial till from volcanic rock. Dense till occurs between 20 to 40 inches.
Temp regime: Cryic.
MAAT: 38 to 41 degrees F (3 to 5 degrees C).
MAP: 81 to 125 inches (2,057 to 3,175 mm).
Soil texture: Gravelly ashy sandy loam
Surface fragments: 20 to 60 percent gravels and 0-5 percent cobbles.
Vegetation: Mixed forbs often dominated by bluntlobe lupine (*Lupinus obtusilobus*) with scattered mountain hemlock (*Tsuga mertensiana*), Western white pine (*Pinus monticola*) and California red fir (*Abies magnifica*).

Note: Tree growth restricted by dense till layer and cold air drainage.

Associated sites

F022BI104CA	**Cryic Coarse Loamy Colluvial Slopes** This is a mountain hemlock forest.
F022BI111CA	**Cryic Gravelly Or Ashy Sandy Loam Gentle Slopes** This is a sub-alpine mixed-conifer forest.
F022BI124CA	**Upper Cryic Slopes** This is a tree-line mountain hemlock-whitebark pine forest.
R022BI207CA	**Alpine Slopes** This is an alpine range site found on steeper slopes and deeper soils.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Lupinus obtusilobus* (2) *Eriogonum umbellatum*

Physiographic features

This ecological site is situated on ground moraines, cirque floors, and lava plateaus ranging from 6,970 to 9,160 feet in elevation. Slopes range from 1 to 35 percent; however slopes typically are 1 to 15 percent.

Table 2. Representative physiographic features

Landforms	(1) Cirque (2) Ground moraine (3) Lava plateau
Flooding frequency	None
Ponding frequency	None
Elevation	6,970–9,160 ft
Slope	1–35%
Water table depth	60 in
Aspect	N, E, 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 81 to 125 inches (2,057 to 3,175 mm) and the mean annual temperature ranges from 38 to 41 degrees F (3 to 5 degrees C). The frost free (>32 degrees F) season is 50 to 85 days. The freeze free (>28 degrees F) season is 65 to 190 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)	190 days
Precipitation total (average)	125 in

Influencing water features

This site is not influenced by water features.

Soil features

This site is associated with the Xeric Vitricryands, cirque floor soil component. These soils are well drained, moderately deep, and formed in glacial till from volcanic rocks. Dense till is encountered between 20 to 40 inches. The surface texture is a gravelly ashy sandy loam with similar subsurface textures. The AWC (available water capacity) is 1.74 to 4.54 inches in the upper 20 to 40 inches of soil (low to very low). Permeability is very rapid to rapid in the upper horizons and very slow through the dense till.

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

Map Unit Component / Percent
114 Xeric Vitricryands, cirque floor / 2
115 Xeric Vitricryands, cirque floor / 5
116 Xeric Vitricryands, cirque floor / 15
136 Xeric Vitricryands, cirque floor / 15
144 Xeric Vitricryands, cirque floor / 55

Table 4. Representative soil features

Parent material	(1) Subglacial till–dacite
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Very rapid to very slow
Soil depth	20–40 in
Surface fragment cover <=3"	20–60%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	1.74–4.54 in
Soil reaction (1:1 water) (0-40in)	6–7
Subsurface fragment volume <=3" (Depth not specified)	15–40%
Subsurface fragment volume >3" (Depth not specified)	0–70%

Ecological dynamics

This ecological site is found on moderately deep soils on cirque floors. Bluntlobe lupine (*Lupinus obtusilobus*) dominates this site, reaching nearly 50% cover in some areas. Other grasses, grass-likes, and forbs equal about 10 to 15% of the total cover. There is low cover from scattered mountain hemlocks (*Tsuga mertensiana*).

Late snow melt and cool temperatures year-round create conditions for a short growing season, and therefore species that grow here must be capable of withstanding these harsh conditions. This site is situated in lower landform positions where cool air drains down from the upper elevations. This cold air can pool in flatter basins or depressions, causing frost pockets during the growing season. Severe frost can cause mortally of mountain hemlock (*Tsuga mertensiana*), western white pine (*Pinus monticola*) and California red fir (*Abies magnifica*) seedlings. In addition, dense till is encountered at depths of 20 to 40 inches, which restrict deep root development.

Single and small clumping trees are scattered throughout the site but canopy cover is less than 10 percent. Historically it is likely this site remained in the forb and grass state (Community 1.1) for hundreds of years. Disturbances combined with ideal climatic conditions would allow the site to move to a new plant community phase (Community 1.2). Ordinary environmental conditions do not favor seedling establishment on this site. Mountain hemlock can exist in a variety of successional states, as minor or dominate species, as well as a pioneering species

on certain sites (Tesky, 1992).

The life forms growing here are well adapted to the harshness of this site. Perennial plants are small, close to the ground, and often widely spaced (Billings and Mooney 1968). The majority of biomass from the plant community on this site is located underground, allowing the plants a large area to store reserves (Billings and Mooney, 1968) for use throughout the winter. The short growing season and high elevation means the plants will break dormancy as early as possible and maintain an increased photosynthetic rate while conditions are favorable, before the onset of dormancy. Plants are able to survive drought conditions brought on by frozen soils and dry winds during the winter months by decreasing water potentials and closing stomata (Billings and Mooney 1968).

The fire interval for this site is poorly documented but is estimated to be between 400 to 800 years (Tesky, 1992) for the mountain hemlock zone. The fire interval may be longer or even absent due to the deficiency of established overstory and lack of available fuel.

State and transition model

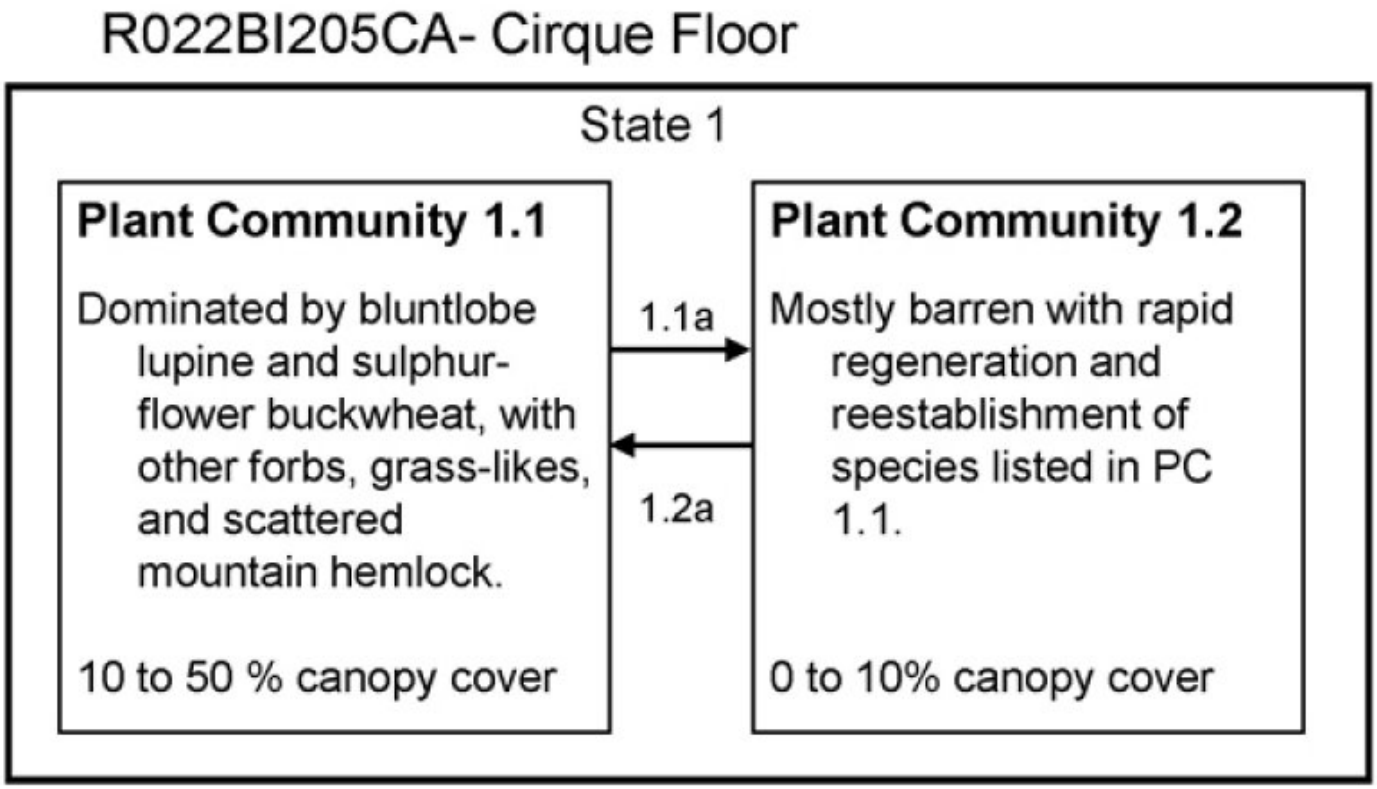

Figure 2. Cirque Floor Model

State 1
Natural State

Community 1.1
Low growing forb community with some grasses and scattered trees

Figure 3. Cirque Floor

Total canopy cover is between 10% and 50%, depending on the location. Often 80% to 90% of the total canopy is bluntlobe lupine (*Lupinus obtusilobus*). Other forbs present include various species of buckwheat (Eriogonum spp.), Davis' knotweed (*Polygonum davisiae*), Mt. Hood pussypaws (*Cistanthe umbellata* var. umbellata), and occasionally purple mountainheath (*Phyllodoce breweri*). Squirreltail (*Elymus elymoides*), sedge (Carex spp.), and rush (Juncus spp.) are present in small amounts. Mountain hemlock (*Tsuga mertensiana*), western white pine (*Pinus monticola*) and California red fir (*Abies magnifica*) are present in trace amounts in some areas. Lupine (Lupinus spp.) species commonly have a symbiotic relationship with nitrogen-fixing bacteria. These bacteria influence the site by increasing nitrogen levels and soil organic matter (Titus 2009). Studies have shown lupine can have facultative or inhibitory affects on other species trying to inhabit a site (Titus 2009). It is likely bluntlobe lupine was a pioneering species on this site and that it will persist as the dominant species throughout the successional process, due to its affect on soil fertility. Grasses are present in negligible amounts. Sedges and rushes are slightly more common; they particularly take advantage of the soil moisture provided during and after snowmelt. Trees are a minor component of this plant community and are present in small patches scattered around the site, ranging from 2% to 5%. The relatively small number of trees on this site will remain viable through vegetative reproduction, also called layering. Layered saplings grow in the shade and protection of the parent tree, which provides nutrients through its established root system (Tesky, 1992). This site will be dominated by forbs for hundreds of years should conditions not be conducive to seedling establishment. Mountain hemlocks are a minor climax species in this plant community phase. This site is an important high elevation summer grazing resource for wildlife like deer and is a favored habitat of rodents. The tree species provide shelter and protection for birds and larger wildlife.

Forest overstory. Trees account for a small amount of this plant community. Scattered trees and/or small clumps of mountain hemlock (Tsuga mertensiana) can be found on and around the site. Other species include California red fir (Abies magnifica) and western white pine (Pinus monticola). Total tree canopy cover ranges from 2% to 5%.

Forest understory. Vegetative cover is largely made up of bluntlobe lupine (Lupinus obtusilobus) with lesser amounts of marumleaf buckwheat (Eriogonum marifolium), Davis' knotweed (Polygonum davisiae), Shasta knotweed (Polygonum shastense), Mt. Hood pussypaws (Cistanthe umbellata var. umbellate), Ross' sedge (Carex rossii), Parry's rush (Juncus parryi), purple mountainheath (Phyllodoce breweri), and squirreltail (Elymus elymoides). Cover and production vary greatly, depending upon the abundance of bluntlobe lupine.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Forb	200	406	829
Grass/Grasslike	7	20	33
Tree	0	19	32
Total	**207**	**445**	**894**

Table 6. Soil surface cover

Tree basal cover	0-1%

Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0-1%
Forb basal cover	2-15%
Non-vascular plants	0%
Biological crusts	0%
Litter	18-78%
Surface fragments >0.25" and <=3"	20-60%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	0-16%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	1-8%	2-12%
>0.5 <= 1	–	–	0-2%	10-50%
>1 <= 2	0-2%	–	–	–
>2 <= 4.5	0-4%	–	–	–
>4.5 <= 13	1-5%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 1.2
Mostly barren with some forbs and grasses

This plant community is made up of bluntlobe lupine (*Lupinus obtusilobus*), pussypaws (*Cistanthe umbellata* var. umbellata), various buckwheats (Eriogonum spp.), and trace amounts of grasses and grass likes. Species are represented in smaller quantities and are much less productive than for Community 1.1. The landscape appears to be mostly barren with existing vegetation being widely spread across the site. Total canopy cover is between 0% and 10%. Small scale disturbances like rodent burrowing, snow creep, and severe frost could reduce the canopy cover from Community 1.1. The small gaps opened by such disturbances provide opportunities for regeneration. A particularly dry year with less than normal snow pack could also reduce the plant cover from Community 1.1. Plants would remain sparse until the conditions were conducive for an increase in biomass production and a pulse of recruitment. Assuming that succession occurs along an elevational gradient, higher elevation sites should be more homogeneous than lower sites (Dlugosh, 1999), especially with time. Therefore, immediately following a disturbance this site will increase in biodiversity, with a majority of the species from plant Community 1.1 being present. Over the long term however, heterogeneity is expected to decrease due to a variety of influencing factors (Dlugosh, 1999). This means that, with time, the variety of plant species present will decrease and the abundance of one or two will increase.

Forest overstory. Trees are a small component of this plant community. Species can include mountain hemlock, California red fir, and western white pine. Seedling recruitment into this stand is very slow. Total canopy cover ranges from 0% to 5%.

Forest understory. Large open areas void of vegetation are broken up by the occasional forb or graminoid. Species include bluntlobe lupine, buckwheat, knotweed, and mountain heath. Sedges, rushes and grasses are also present. Overall canopy cover is between 0% and 10%.

Pathway 1.1a
Community 1.1 to 1.2

This community can sustain itself without large scale disturbances, however small scale disturbances such as rodent activity, small single tree lighting strikes, or snow creep can create openings for regeneration (Community 1.2).

Pathway 1.2a
Community 1.2 to 1.1

Regeneration would likely come from rodent or wind dispersed seed from species already present. Time and growth of the perennial cover will shift this community toward plant Community 1.1.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**naitve grasses/grass likes**			7–33	
	Parry's rush	JUPA	*Juncus parryi*	3–15	1–5
	Ross' sedge	CARO5	*Carex rossii*	4–12	1–3
	squirreltail	ELEL5	*Elymus elymoides*	0–6	0–2
Forb					
2	**native forbs**			200–829	
	bluntlobe lupine	LUOB	*Lupinus obtusilobus*	50–800	3–50
	marumleaf buckwheat	ERMA4	*Eriogonum marifolium*	0–9	0–3
	Mt. Hood pussypaws	CIUMU	*Cistanthe umbellata var. umbellata*	0–6	0–2
	Shasta knotweed	POSH	*Polygonum shastense*	0–4	0–2
	Davis' knotweed	PODA	*Polygonum davisiae*	0–2	0–2
Tree					
3	**native trees**			0–32	
	mountain hemlock	TSME	*Tsuga mertensiana*	0–15	0–5
	western white pine	PIMO3	*Pinus monticola*	0–13	0–4
	California red fir	ABMA	*Abies magnifica*	0–5	0–2

Animal community

The plant communities growing on this site provide habitat and shelter for large wildlife as well as birds. The forbs and grasses provide a nutritious summer grazing resource, even in limited quantities. High elevation sites with limited stands of mountain hemlock (*Tsuga mertensiana*) are home to Clark’s nutcracker, deer mice and various species of chipmunks. The upper limits of this ecological site are home to gray-crowned rosy finch, pika, and the golden mantled ground squirrel.

Gray-crowned rosy finch use Lassen Volcanic National Park as a winter range. They eat mostly insects and some vegetation while commonly foraging among low-growing plants, in snow fields, or in and among conifers.

A variety of invertebrates also use this site, the most common of which is the California tortoise shell butterfly. This orange-brown butterfly can regularly be seen by the thousands around the peaks of mountains.

Hydrological functions

This site is in the soil hydrologic group b.

Recreational uses

Hiking and photography opportunities are available on this site.

Wood products

Not applicable

Inventory data references

There are two points of data collection for this site represented by NRCS vegetation plots:

789254
789283- site location

Type locality

Location 1: Shasta County, CA	
Township/Range/Section	T30 N R4 E S11
UTM zone	N
UTM northing	4480770
UTM easting	625872
General legal description	The site location is about 900 feet north of the Bumpass Hell parking lot, off of HW 89.

Other references

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Billings, W.D. and H.A. Mooney, 1968. The Ecology of Artic and Alpine plants. Biological Reviews, Vol. 43, No. 4, pp 481-529. 1968.

Taylor, Alan H. 1995. Forest Expansion and Climate Change in the Mountain Hemlock (*Tsuga mertensiana*) Zone, Lassen Volcanic National Park, California, U.S.A. Artic and Alpine Research, Vol. 27, No. 3, 1995, pp. 207-216.

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Tesky, Julie L. 1992. *Tsuga mertensiana*. In: Fire Effects Information System, [Online].
U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
[Available online: http://www.fs.fed.us/database/feis/] (2008, June 16).

Woo, Ming-ko, Philip Marsh, and John W. Pomeroy; 2000. Snow, frozen soils, and permafrost hydrology in Canada, 1995-1998. Hydrological Processes 14, 1591-1611 (2000). [Available online: http://www3.interscience.wiley.com]

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:

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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:**
