

Ecological site R003XY010OR

Pumice Desert 40-60 PZ (Depressional)

Last updated: 1/29/2025
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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.

Associated sites

R003XY011OR	Ashy Alpine Desert 50-70 PZ Occurs in adjacent areas.
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Similar sites

R003XY011OR	Ashy Alpine Desert 50-70 PZ
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

Subalpine concave valley bottoms and footslopes adjacent to volcanic cones. The type location is the Pumice Desert in Crater Lake National Park. Other pumice desert sites occur in alpine basins adjacent to volcanic cones (Union Peak).

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Valley flat (3) Depression
Flooding frequency	None
Ponding frequency	None
Elevation	5,500–6,500 ft
Slope	2–8%
Ponding depth	0 in
Water table depth	60 in
Aspect	Aspect is not a significant factor

Climatic features

Precipitation comes mostly as snow. Winters are snowy and very cold; summers are cool and dry. Summer thunderstorms sometimes occur, providing small amounts of growing season precipitation.

The Pumice Desert areas are depressions of cinders and pumice surrounded by Lodgepole Pine forests and are collection areas for localized cold air drainage. The Pumice Desert has a severe climatic regime characterized by wide day and nighttime temperatures.

Table 3. Representative climatic features

Frost-free period (average)	45 days
Freeze-free period (average)	90 days
Precipitation total (average)	60 in

Influencing water features

Accumulates snowmelt early in the year. Some poorly defined channels are modified by background wind erosion later in the season. The snowpack can linger in some concave protected areas, delaying the advent of the growing season and adding soil water later in the season.

Soil features

Cleetwood soil, Depressional Phase. These soils are very deep, excessively drained very gravelly ashy loamy coarse sands over ashy sand.

Increases in stability of both surface and subsurface samples reflect increased soil erosion resistance and resilience. Surface stability is correlated with current erosion resistance, while subsurface stability is correlated with resistance following soil disturbance. Sites with average values of 5.5 or above generally are very resistant to erosion, particularly if there is little bare ground and there are few large gaps. Maximum possible soil stability values may be less than 6 for very coarse sandy soils. High values usually reflect good hydrologic function. This is because stable soils are less likely to disperse and clog soil pores during rainstorms. High stability values also are strongly correlated with soil biotic integrity. Soil organisms make the “glue” that holds soil particles together. In most ecosystems, soil stability values decline first in areas without cover (Veg = NC). In more highly degraded systems, Veg = Canopy values also decline.

The following soil aggregate stability results are typical of the reference plant community. Aggregate stability is higher for samples taken under cover compared to unprotected samples. Grass/grasslike cover seems to result in better aggregate stability than forb cover.

Type location Average Stability:

All samples taken = 1.1

Protected samples = 1.7

Unprotected samples = 1.0

Type location Average Stability by Vegetation Class:

No cover = 1.0

Grass/Grasslikes = 2.0

Forbs = 1.0

Shtubs = 1.0

Trees = N/A

Table 4. Representative soil features

Surface texture	(1) Very gravelly loamy coarse sand (2) Ashy
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Very rapid to rapid
Soil depth	60 in
Surface fragment cover <=3"	50–70%
Surface fragment cover >3"	5–10%
Available water capacity (0-40in)	0.5–1 in
Calcium carbonate equivalent (0-40in)	1%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6–7
Subsurface fragment volume <=3" (Depth not specified)	1%
Subsurface fragment volume >3" (Depth not specified)	1%

Ecological dynamics

Conditions on the Ashy Pumice Desert ecological site are harsh. There is a very short growing season between snowmelt and late summer hard freezes. Only a few species of plants can complete their life cycles and thrive. Wind erosion is a major influence on the site. The ashy/coarse soil materials move readily across the expanses of the site, affecting individual plants. Only those plants that can withstand the shifting soil materials can survive on the site. There is usually adequate plant available water in the soils throughout the summer but it moves below the rooting zone of the small statured plant community later in the season. The site has the ability to accumulate moisture like summer fallowed grain fields.

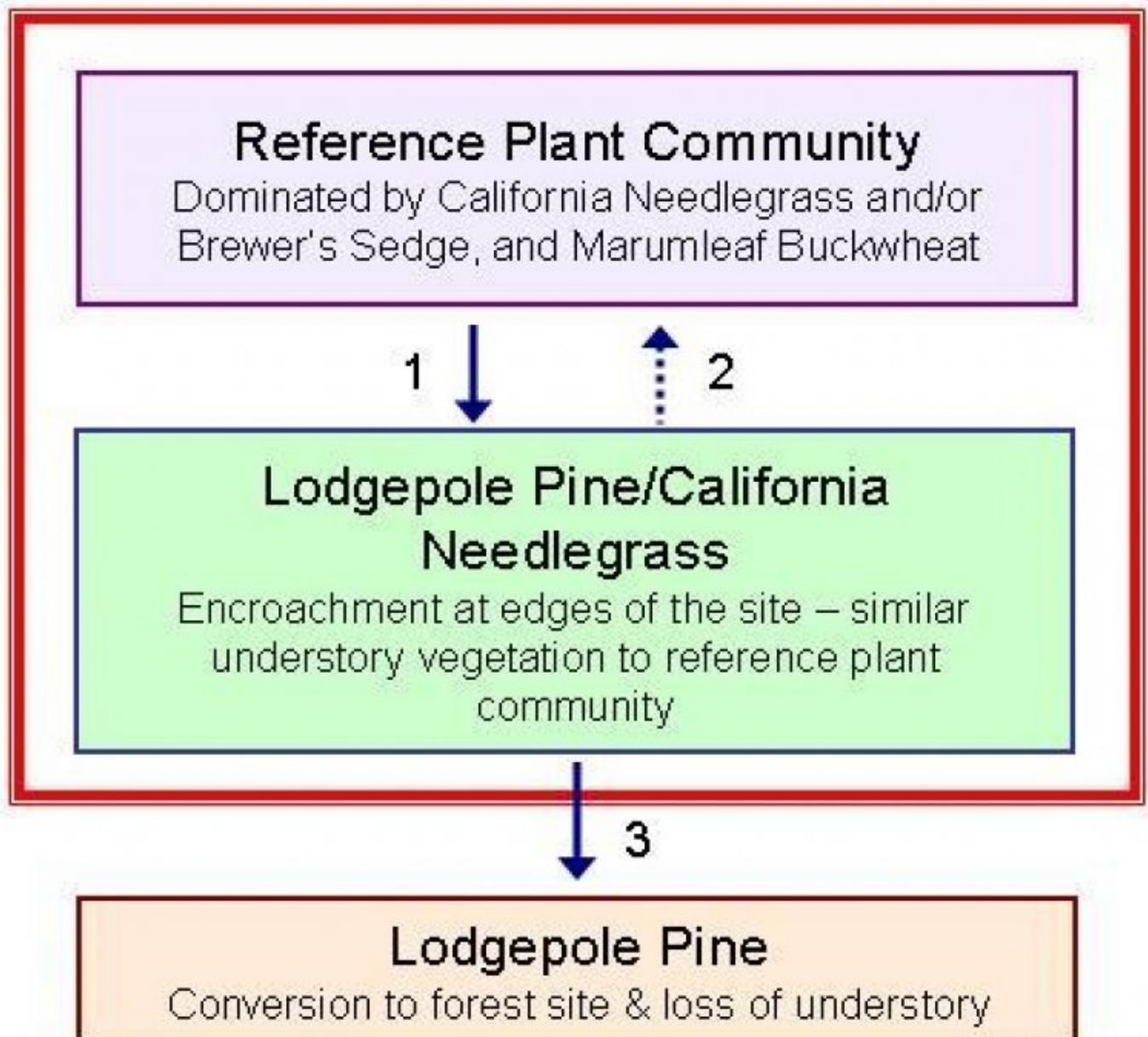
There are a few species of forbs and grass/grasslike plants on the site. The relative amounts of these species vary across the site with aspect and snowpack. There may be patches of grasses, sedges, and forbs or mostly forbs with a few grass plants in a mosaic pattern across the site.

The site receives grazing pressure from Elk, Mule Deer, insects, and rodents. The sedges and grasses are lightly grazed. It is likely that the site vegetation developed under some grazing pressure and that the grazing disturbance plays a role in the long-term stability of the plant community.

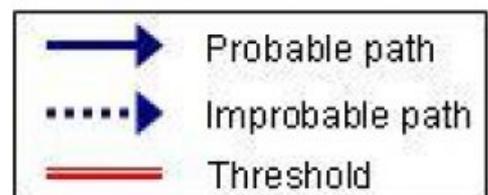
Lodgepole Pine can invade the site over time (usually several decades) resulting in a slightly modified plant community that is essentially the reference plant community with a sparse overstory of multi-stemmed Lodgepole Pines. Areas encroached by the pines can eventually be converted to forest sites (crossing a biotic and abiotic threshold) with the continued absence of fire (fire frequency in Lodgepole stands is < 20 years).

Disturbances such as grazing and recreational use would decrease the amount of grasses, sedges, and the more sensitive forbs. Bare ground would increase.

State and transition model



**R003XY010OR: PUMICE
DESERT 40-60 PZ
(Depressional)**



1. Lack of fire, low spring moisture
2. Fire, low snow pack (winter drying), rodent population cycles (aeration & mixing of soils)
3. Long-term lack of fire (climate change?)

Community 1.1 Sparsely Vegetated

The site is characterized by very sparse vegetative cover and large (65%+) cover of rock fragments and bare ground (25%). The plant community varies from areas of grasses, grasslikes, and forbs to areas of mostly forbs with a few grass plants. There are drastic differences in nighttime and daytime soil temperatures (reaching over 100 degrees F in the summer) that limits plant establishment. Pocket gophers also have had a role in mixing soils and grazing on plant roots. The Lodgepole Pine forest that surrounds the area is slowly pioneering the edges of the site. Wind erosion moves soils to the pine fringe and increased shading may ameliorate the diurnal swings in soil temperatures. No fire frequency is known for this site. Since there is little vegetation or litter, it is doubtful that fire has played an important part in the formation of this plant community. Wind erosion, snow pack, cold temperatures (including summer freezes), grazing, and a very brief growing season have influenced the desert character of this site. Community dominants include Western Needlegrass, Brewer's Sedge, Halls sedge, Marumleaf Buckwheat, and Davis (Newberry) Knotweed. Increases in the proportion of canopy gaps are related to increased risk of wind erosion and invasive "weed" species establishment. For example, wind velocities in most areas of the western United States are capable of moving disturbed soil in 20-in gaps in grasslands. Disturbed soil in gaps 3-6 ft in diameter is nearly as susceptible to erosion as that with no vegetation. Minimum gap size required to cause wind erosion increases with vegetation height. Increases in the proportion of the line covered by large basal gaps reflect increased susceptibility to water erosion and runoff. Plant bases slow water movement down slopes. As basal gaps increase, there are fewer obstacles to water flow, so runoff and erosion increase. Increases in large basal gaps have a greater effect where rock and litter cover are low, because they are the only obstacles to water flow and erosion. The following canopy and basal gaps are typical of the reference plant community. The paucity of vegetation results in a large percentage of canopy gaps. Plant bases are widely spaced and resulting basal gaps are overwhelmingly large. Type Location Canopy Gaps (%): 1.0-2.0 ft. = 21.7 2.1-3.0 ft. = 17.2 3.1-6.0 ft. = 20.9 > 6.0 ft. = 8.6 Type Location Basal Gaps (%): 1.0-2.0 ft. = 1.3 2.1-3.0 ft. = 4.1 3.1-6.0 ft. = 6.7 > 6.0 ft. = 56.5

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Forb	40	110	180
Grass/Grasslike	30	85	130
Total	70	195	310

Table 6. Ground cover

Tree foliar cover	0-1%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-10%
Surface fragments >0.25" and <=3"	25-35%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	50-70%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	2-5%	3-6%
>0.5 <= 1	–	–	0-1%	3-6%
>1 <= 2	–	–	–	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 5. Plant community growth curve (percent production by month).
OR1251, A3 Pumice Desert HCPC. 010.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	15	30	35	15	5	0	0	0

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	Dominant deep rooted perennials			50–130	
	Brewer's sedge	CABR12	<i>Carex breweri</i>	20–70	–
	California needlegrass	ACOCC	<i>Achnatherum occidentale ssp. californicum</i>	30–60	–
2	Sub-dominant deep rooted perennial			10–40	
	Hall's sedge	CAHA2	<i>Carex halliana</i>	10–30	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	5–10	–
Forb					
7	Dominant perennials			35–120	
	marumleaf buckwheat	ERMA4	<i>Eriogonum marifolium</i>	20–60	–
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	10–40	–
	Davis' knotweed	PODA	<i>Polygonum davisiae</i>	5–20	–
8	Sub-dominant perennials			10–30	
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	5–10	–
	Mt. Hood pussypaws	CIUM	<i>Cistanthe umbellata</i>	3–7	–
	cascade desertparsley	LOMA5	<i>Lomatium martindalei</i>	1–5	–
	Pacific lupine	LULE2	<i>Lupinus lepidus</i>	1–3	–
	ballhead sandwort	ARCO5	<i>Arenaria congesta</i>	1–3	–
	pioneer rockcress	ARPL	<i>Arabis platysperma</i>	1–3	–
	dwarf alpinegold	HUNA	<i>Hulsea nana</i>	1–2	–
	goosefoot violet	VIPU4	<i>Viola purpurea</i>	1–2	–

Animal community

The area is used by Elk, Mule Deer, Pocket Gophers, and various birds. There is limited food and shelter on the site.

Recreational uses

Limited - some hiking and plant and animal observation occurs within 1/4 mile of the park highway. Site is unsuitable for camping or hiking trails - heavy traffic can permanently alter the site.

Wood products

None

Type locality

Location 1: Klamath County, OR	
Township/Range/Section	T29S R6E S28
UTM zone	N
UTM northing	571121
UTM easting	4764623
General legal description	About 1 mile west north west of Pumice Desert parking area on park road.

Other references

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Contributors

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Approval

Kirt Walstad, 1/29/2025

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	01/29/2025
Approved by	Kirt Walstad
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:**
-