Ecological site R003XY010OR
Pumice Desert
40-60 PZ
(Depressional)

Last updated: 1/29/2025
Accessed: 08/21/2026

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.

Associated sites

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

Similar sites

R003XY011OR	**Ashy Alpine Desert 50-70 PZ**

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	1,680 – 1,980 m
Slope	0 – 10 %
Ponding depth	0 cm
Water table depth	150 cm
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)	50 days
Freeze-free period (average)	90 days
Precipitation total (average)	1,520 mm

Influencing water features

Accumulates snowment early in the year. Some poorly defined channels are modified by background wind ersoion 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	150 cm
Surface fragment cover <=3"	50 – 70 %
Surface fragment cover >3"	10 %
Available water capacity (0-101.6cm)	1.27 – 2.54 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified

Soil reaction (1:1 water) (0-101.6cm)	10
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

Conditions on the Ashy Pumice Desert ecological site are harsh. There is a very short growing season between snowment 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 recieves 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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant deep rooted perennials**			56-146	
	Brewer's sedge	CABR12	*Carex breweri*	22-78	–
	California needlegrass	ACOCC	*Achnatherum occidentale ssp. californicum*	34-67	–
2	**Sub-dominant deep rooted perennial**			11-45	
	Hall's sedge	CAHA2	*Carex halliana*	11-34	–
	squirreltail	ELEL5	*Elymus elymoides*	6-11	–
Forb					
7	**Dominant perennials**			39-135	
	marumleaf buckwheat	ERMA4	*Eriogonum marifolium*	22-67	–

	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	11-45	–
	Davis' knotweed	PODA	*Polygonum davisiae*	6-22	–
8	**Sub-dominant perennials**			11-34	
	hoary tansyaster	MACA2	*Machaeranthera canescens*	6-11	–
	Mt. Hood pussypaws	CIUM	*Cistanthe umbellata*	3-8	–
	cascade desertparsley	LOMA5	*Lomatium martindalei*	1-6	–
	Pacific lupine	LULE2	*Lupinus lepidus*	1-3	–
	ballhead sandwort	ARCO5	*Arenaria congesta*	1-3	–
	pioneer rockcress	ARPL	*Arabis platysperma*	1-3	–
	dwarf alpinegold	HUNA	*Hulsea nana*	1-2	–
	goosefoot violet	VIPU4	*Viola purpurea*	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 traffice 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

Aerts, R., 1999. Plant-Mediated Controls on Nutrient Cycling in Temperate Fens and Bogs. Ecology 80: from findarticles.com.

Dorr, J. ET. Al, 2000. Ecological Unit Inventory of the Winema National Forest Area, Portion of Klamath County, Oregon, Interim Report #2. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Winema National Forest, Klamath Falls, OR. 269p.

Franklin, J.F. and Dyrness, C.T., 1973. Natural Vegetation of Oregon and Washington. Oregon State University Press. 452p.

Horn, E. L., 2003. Monitoring Parkscapes Over Time - Plant Succession on the Pumice Desert, Crater Lake National Park, Oregon. Park Science 22

Johnson, D. ET. Al, 1995. Plants of the Western Boreal Forest and Aspen Parkland. Lone Pine Publishing and the Canadian Forest Service. 392p.

Klepadlo, S. and W. Campbell, eds., 1998. A Checklist of Vascular Plants of Crater Lake National Park. Crater Lake Natural History Association

Lynch, E.A., 1998. Origin of a Park-Forest Vegetation Mosaic in the Wind River Range, Wyoming. Ecology 79: from findarticles.com.

Raab, T.K., 1999. Soil Amino Acid Utilization Among Species of the Cyperaceae: Plant and Soil Processes. Ecology 80: from findarticles.com.

Radforth, N.W. and Brawner, C.O., 1977. Muskeg and the Northern Environment in Canada. University of Toronto Press. 399p.

Zika, P.F., 2003. A Crater Lake National Park Vascular Plant Checklist. Crater Lake Natural History Association, Crater Lake, OR. 92 p.

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	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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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):**

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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:**
