

# Ecological site R003XY012OR Ashy Alpine Meadow 50-70 PZ

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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 | <b>Ashy Alpine Desert 50-70 PZ</b><br>Occurs on inclusions and complexes within this site. |
| R003XY013OR | <b>Ashy Alpine Swale 50-70 PZ</b><br>Occurs on inclusions and complexes within this site.  |

## Similar sites

|             |                                    |
|-------------|------------------------------------|
| R003XY013OR | <b>Ashy Alpine Swale 50-70 PZ</b>  |
| R003XY011OR | <b>Ashy Alpine Desert 50-70 PZ</b> |

**Table 1. Dominant plant species**

|            |               |
|------------|---------------|
| Tree       | Not specified |
| Shrub      | Not specified |
| Herbaceous | Not specified |

## Physiographic features

The site occurs around the rim (but especially on the south, southwest, and southeast) and extends to areas around Union Peak and Crater Peak to the south. This site is associated with the Ashy Alpine Desert and Swale sites and is arrayed in a park-like setting surrounded by and interspersed with stringers of Mountain hemlock, Shasta Red Fir, and/or Lodgepole Pine.

**Table 2. Representative physiographic features**

|                    |   |
|--------------------|---|
| Landforms          | (1) Mountain slope<br>(2) Ash flow<br>(3) Ridge |
| Flooding frequency | None  |
| Ponding frequency  | None  |
| Elevation          | 1,676–2,286 m                                   |
| Slope              | 0–30%   |
| Ponding depth      | 0 cm  |
| Water table depth  | 152 cm  |
| Aspect             | S, SW, W  |

### **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 Ashy Alpine Meadow 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) | 1,524 mm |

### **Influencing water features**

Accumulates snowment 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**

These sites occur in alpine and sub-alpine meadows. The soils are very deep, excessively drained, very gravelly ashy loamy coarse sand over ashy sand and ashy coarse sand derived from ash, andesite, and pumice fragments.

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. Vegetation is critical for

protecting soils on this ecological site. Grass/grasslikes and shrubs offer the most protection. Unprotected soils are prone to wind and water erosion.

Type location Average Stability:

All samples taken = 3.4

Protected samples = 4.2

Unprotected samples = 2.4

Type location Average Stability by Vegetation Class:

No cover = 2.6

Grass/Grasslikes = 4.3

Forbs = 3.0

Shtubs = 4.5

Trees = N/A

**Table 4. Representative soil features**

|  |  |
|--|--|
| Surface texture  | (1) Gravelly sandy loam<br>(2) Ashy loamy sand |
| Family particle size                                     | (1) Sandy                                      |
| Drainage class   | Excessively drained                            |
| Permeability class                                       | Moderately rapid to rapid                      |
| Soil depth   | 152 cm   |
| Surface fragment cover <=3"                              | 3–10%  |
| Surface fragment cover >3"                               | 0%   |
| Available water capacity<br>(0-101.6cm)                  | 14.73–16.51 cm                                 |
| Calcium carbonate equivalent<br>(0-101.6cm)              | 0%   |
| Electrical conductivity<br>(0-101.6cm)                   | 10–20 mmhos/cm                                 |
| Sodium adsorption ratio<br>(0-101.6cm)                   | 0  |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 0–1%   |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0%   |

## Ecological dynamics

The Ashy Alpine Meadow ecological site is significant in its range of occurrence, size of openings in the forest ecosystem, species diversity, and relative productive capability. Reference areas for this site indicate fluctuation in relative amounts of graminoids and shrubs. Bloomer's Goldenweed dominates some sites and is sparse in others. Grazing pressure from native ungulates and other species, depth and duration of snowpack, encroachment pressure from adjacent forest sites, and growing season temperature and moisture conditions have probable effects on the differences in plant community composition.

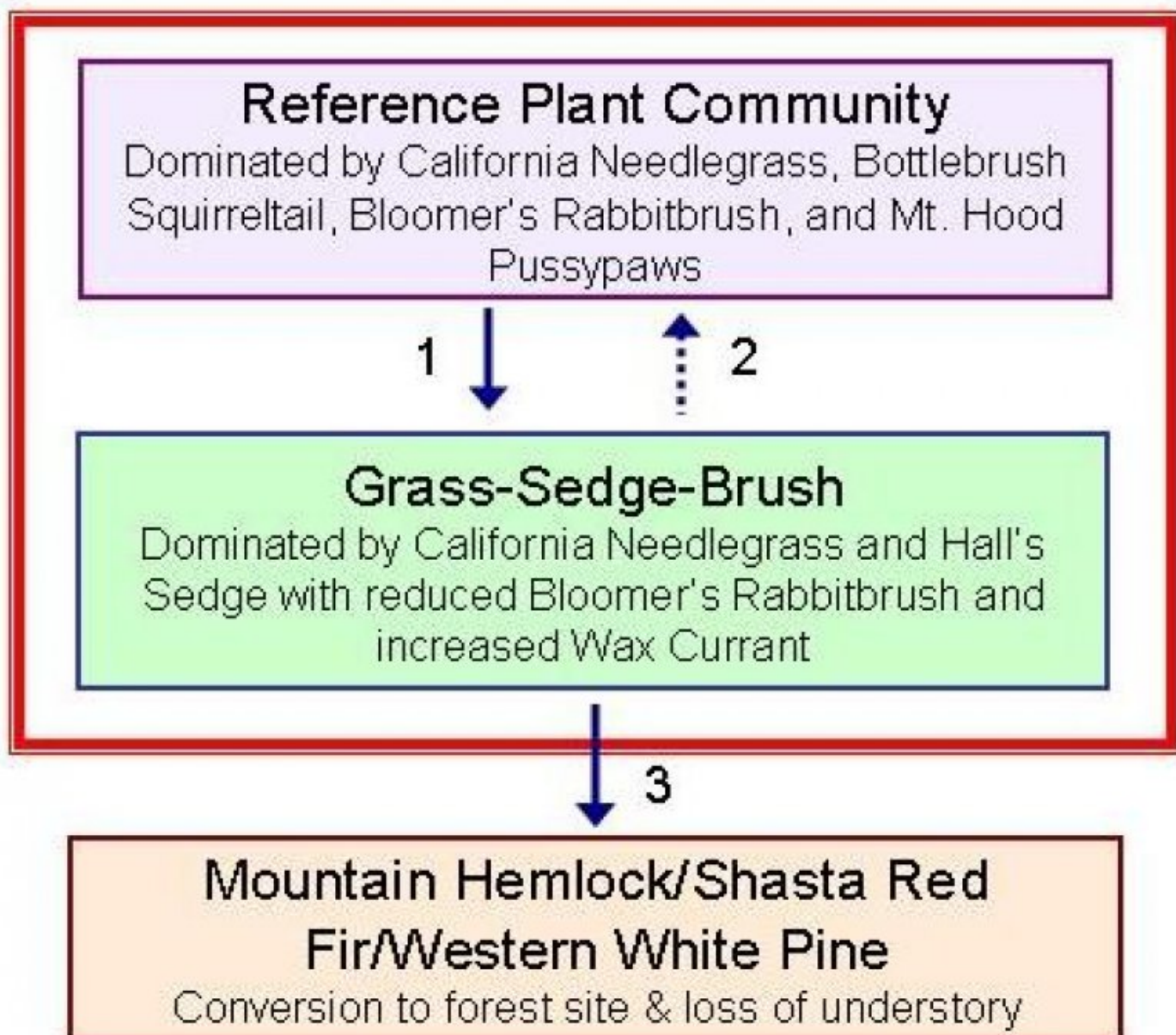
These park-like areas are surrounded by Mountain Hemlock (*Tsuga mertensiana*) and Whitebark Pine (*Pinus albicaulis*) forest sites at higher altitudes (> 6500 feet) and Mountain Hemlock (*Tsuga mertensiana*), Shasta Red Fir (*Abies x shastensis*), and Western White Pine (*Pinus monticola*) at lower elevations (5500 - 6500 feet). These sites are strongly correlated to soil types and are thought to be relatively permanent although plant community structure may have been different historically (Lynch, 1998).

Historic fire frequencies probably mirrored those of the adjacent forest sites. A fire could be sustained on these sites

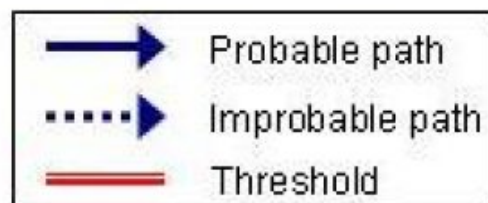
only in a few high growth years. Adjacent forest sites would be moved back, increasing the size of the openings and encouraging more herbaceous growth.

Boundaries between forest and rangeland are generally abrupt and rarely are there rapid, significant intrusions of tree species into the sites (encroachment occurs over decades). There has historically been a large amount of time between catastrophic fires at these elevations (400-800 years for Mountain Hemlock and 70-130 years for Red Fir). Local Indian tribes, who used the area frequently in the summers, may have set fires to freshen vegetation to attract more big game to the area.

## **State and transition model**



**R003XY012OR: ASHY  
 ALPINE MEADOW 50-70 PZ**



1. Lack of fire, low spring moisture, encroachment of forest (increased sheltering)
2. Fire, low snow pack (winter drying), decreased sheltering of adjacent forest
3. Long-term lack of fire (climate change?)

## Reference Plant Community - Herbaceous

### Community 1.1

#### Reference Plant Community - Herbaceous

The Ashy Alpine Meadow site is the most widespread of the alpine sites. This site is a relatively productive grassy meadow site dominated by Western Needlegrass (*Achnatherum occidentale* ssp. *californicum*) Hall's Sedge (*Carex halliana*), Bottlebrush Squirreltail (*Elymus elymoides* ssp. *elymoides*), and the shrubby Bloomer's Goldenweed (*Ericameria bloomeri*) which has brilliant yellow flowers in July and August. Fire is an important modifier of this plant community but frequencies are long (400-800 years) where the sites are surrounded by Mountain Hemlock/Whitebark Pine forest communities. Mature Mountain Hemlock stands that succumb to fire are replaced by Lodgepole Pines for up to 200 years. Where mature Mountain Hemlock has been replaced, encroachment of woody species into the site is a possibility (shrubs and trees). This site provides important summer forage for large ungulates and rodents (and hence raptors). 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. Moderate plant cover is reflected in the large amount of smaller canopy gaps. Plant density is low, however; basal gaps are mostly larger than 6 feet. Type Location Canopy Gaps (%): 1.0-2.0 ft. = 26.4 2.1-3.0 ft. = 10.1 3.1-6.0 ft. = 5.8 > 6.0 ft. = 4.2 Type Location Basal Gaps (%): 1.0-2.0 ft. = 2.2 2.1-3.0 ft. = 5.4 3.1-6.0 ft. = 8.9 > 6.0 ft. = 63.9

Table 5. Annual production by plant type

| Plant Type      | Low<br>(Kg/Hectare) | Representative Value<br>(Kg/Hectare) | High<br>(Kg/Hectare) |
|-----------------|---------------------|--------------------------------------|----------------------|
| Grass/Grasslike | 224                 | 448                                  | 673                  |
| Forb            | 112                 | 224                                  | 336                  |
| Shrub/Vine      | 56                  | 112                                  | 168                  |
| <b>Total</b>    | <b>392</b>          | <b>784</b>                           | <b>1177</b>          |

Table 6. Ground cover

|                                   |        |
|-----------------------------------|--------|
| Tree foliar cover                 | 0-1%   |
| Shrub/vine/liana foliar cover     | 5-10%  |
| Grass/grasslike foliar cover      | 5-10%  |
| Forb foliar cover                 | 10-20% |
| Non-vascular plants               | 0%     |
| Biological crusts                 | 0%     |
| Litter                            | 20-40% |
| Surface fragments >0.25" and <=3" | 10-20% |
| Surface fragments >3"             | 1-5%   |
| Bedrock                           | 0%     |
| Water                             | 0%     |
| Bare ground                       | 50-60% |

Table 7. Canopy structure (% cover)

| Height Above Ground (M) | Tree | Shrub/Vine | Grass/<br>Grasslike | Forb |
|-------------------------|------|------------|---------------------|------|
| <0.15                   | –    | 1-2%       | 1-2%                | 1-6% |
| >0.15 <= 0.3            | –    | 1-2%       | 1-2%                | 1-6% |
| >0.3 <= 0.6             | –    | 0-1%       | 1-2%                | –    |
| >0.6 <= 1.4             | –    | –          | 0-1%                | –    |
| >1.4 <= 4               | –    | –          | –                   | –    |
| >4 <= 12                | –    | –          | –                   | –    |
| >12 <= 24               | –    | –          | –                   | –    |
| >24 <= 37               | –    | –          | –                   | –    |
| >37                     | –    | –          | –                   | –    |

Figure 5. Plant community growth curve (percent production by month).  
OR1253, A3 Ashy Alpine Meadow. 012 for both reference plant communities.

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0   | 0   | 0   | 0   | 5   | 25  | 40  | 25  | 5   | 0   | 0   | 0   |

## State 2 Reference Plant Community - Herbaceous/Shrubby

### Community 2.1 Reference Plant Community - Herbaceous/Shrubby

This plant community occurs in either of three situations: 1) smaller openings in the forest sites that provide increased sheltering and modify the impact of snow pack melt-off in the early summer, and 2) lower elevations ranging from 5500 to 6500 feet surrounded by Shasta Red Fir/Western White Pine forests, and 3) sites adjacent to Lodgepole Pine forest (fire-induced stand replacement of Mountain Hemlock). Fire frequencies reflect the adjacent forest sites (70-130 years for Shasta Red Fir and < 20 years for Lodgepole Pine). The site is characterized by increased production of California Needlegrass, Hall's Sedge (most dominant) and Long-stolon sedge. There is a decrease in the amount of Brewer's Rabbitbrush and the addition of Wax Currant. Restoring natural fire frequencies will remove woody competition, increase the size of the openings, and return the plant community to a more herbaceous aspect. With removal of natural fire from the ecosystem, this site is prone to conversion to forest (Mountain Hemlock, Shasta Red Fir, and Western White Pine) with a consequent loss of the grass/grasslike and shrub functional groups. Canopy and basal gaps are similar to reference plant community #1.

Table 8. Annual production by plant type

| Plant Type      | Low<br>(Kg/Hectare) | Representative Value<br>(Kg/Hectare) | High<br>(Kg/Hectare) |
|-----------------|---------------------|--------------------------------------|----------------------|
| Grass/Grasslike | 841                 | 1121                                 | 1401                 |
| Forb            | 168                 | 224                                  | 280                  |
| Shrub/Vine      | 112                 | 168                                  | 224                  |
| <b>Total</b>    | <b>1121</b>         | <b>1513</b>                          | <b>1905</b>          |

Table 9. Ground cover

|                               |        |
|-------------------------------|--------|
| Tree foliar cover             | 1-2%   |
| Shrub/vine/liana foliar cover | 10-20% |
| Grass/grasslike foliar cover  | 7-15%  |
| Forb foliar cover             | 5-10%  |
| Non-vascular plants           | 0%     |

|                                   |        |
|-----------------------------------|--------|
| Biological crusts                 | 1-2%   |
| Litter                            | 20-40% |
| Surface fragments >0.25" and <=3" | 10-20% |
| Surface fragments >3"             | 1-5%   |
| Bedrock                           | 0-2%   |
| Water                             | 0%     |
| Bare ground                       | 45-55% |

**Table 10. Canopy structure (% cover)**

| Height Above Ground (M) | Tree | Shrub/Vine | Grass/<br>Grasslike | Forb  |
|-------------------------|------|------------|---------------------|-------|
| <0.15                   | –    | 1-3%       | 3-6%                | 3-6%  |
| >0.15 <= 0.3            | –    | 2-4%       | 3-3%                | 5-10% |
| >0.3 <= 0.6             | –    | 1-3%       | 1-2%                | 3-6%  |
| >0.6 <= 1.4             | –    | 1-2%       | 1-2%                | –     |
| >1.4 <= 4               | –    | –          | –                   | –     |
| >4 <= 12                | –    | –          | –                   | –     |
| >12 <= 24               | –    | –          | –                   | –     |
| >24 <= 37               | –    | –          | –                   | –     |
| >37                     | –    | –          | –                   | –     |

**Figure 7. Plant community growth curve (percent production by month).  
OR1253, A3 Ashy Alpine Meadow. 012 for both reference plant communities.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0   | 0   | 0   | 0   | 5   | 25  | 40  | 25  | 5   | 0   | 0   | 0   |

## Additional community tables

**Table 11. Community 1.1 plant community composition**



| Group                  | Common Name  | Symbol | Scientific Name   | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|------------------------|--|--------|---|--------------------------------|------------------|
| <b>Grass/Grasslike</b> |  |        |   |                                |                  |
| 1                      | <b>Dominant deep-rooted Perennial Grasses and Sedges</b> |        |   | 224–673                        |                  |
|                        | California needlegrass                                   | ACOCC  | <i>Achnatherum occidentale</i> ssp. <i>californicum</i> | 112–336                        | –                |
|                        | Hall's sedge   | CAHA2  | <i>Carex halliana</i>                                   | 56–224                         | –                |
|                        | squirreltail   | ELELE  | <i>Elymus elymoides</i> ssp. <i>elymoides</i>           | 56–168                         | –                |
| <b>Forb</b>            |  |        |   |                                |                  |
| 2                      | <b>Perennial Forbs</b>                                   |        |   | 112–336                        |                  |
|                        | Pacific lupine   | LULE2  | <i>Lupinus lepidus</i>                                  | 28–84                          | –                |
|                        | spreading phlox  | PHDI3  | <i>Phlox diffusa</i>                                    | 28–84                          | –                |
|                        | Davis' knotweed  | PODA   | <i>Polygonum davisiae</i>                               | 28–84                          | –                |
|                        | sagebrush violet   | VIVA   | <i>Viola vallicola</i>                                  | 28–84                          | –                |
|                        | Mt. Hood pussypaws                                       | CIUM   | <i>Cistanthe umbellata</i>                              | 28–84                          | –                |
|                        | marumleaf buckwheat                                      | ERMA4  | <i>Eriogonum marifolium</i>                             | 28–84                          | –                |
|                        | Shasta buckwheat   | ERPY2  | <i>Eriogonum pyrolifolium</i>                           | 6–17                           | –                |
|                        | cobwebby Indian paintbrush                               | CAAR11 | <i>Castilleja arachnoidea</i>                           | 6–17                           | –                |
| <b>Shrub/Vine</b>      |  |        |   |                                |                  |
| 3                      | <b>Shrubs</b>  |        |   | 56–168                         |                  |
|                        | rabbitbush   | ERBL2  | <i>Ericameria bloomeri</i>                              | 56–168                         | –                |

Table 12. Community 2.1 plant community composition

| Group                  | Common Name                          | Symbol | Scientific Name   | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|------------------------|--------------------------------------|--------|---|--------------------------------|------------------|
| <b>Grass/Grasslike</b> |                                      |        |   |                                |                  |
| 1                      | <b>Deep-rooted Perennial Grasses</b> |        |   | 841–1401                       |                  |
|                        | California needlegrass               | ACOCC  | <i>Achnatherum occidentale</i> ssp. <i>californicum</i> | 280–560                        | –                |
|                        | long-stolon sedge                    | CAIN9  | <i>Carex inops</i>                                      | 280–560                        | –                |
|                        | Hall's sedge                         | CAHA2  | <i>Carex halliana</i>                                   | 224–448                        | –                |
|                        | squirreltail                         | ELELE  | <i>Elymus elymoides</i> ssp. <i>elymoides</i>           | 84–112                         | –                |
|                        | spike trisetum                       | TRSP2  | <i>Trisetum spicatum</i>                                | 56–84                          | –                |
|                        | California brome                     | BRCA5  | <i>Bromus carinatus</i>                                 | 56–84                          | –                |
| <b>Forb</b>            |                                      |        |   |                                |                  |
| 2                      | <b>Perennial Forbs</b>               |        |   | 224–280                        |                  |
|                        | Pacific lupine                       | LULE2  | <i>Lupinus lepidus</i>                                  | 56–84                          | –                |
|                        | hoary tansyaster                     | MACA2  | <i>Machaeranthera canescens</i>                         | 28–56                          | –                |
|                        | marumleaf buckwheat                  | ERMA4  | <i>Eriogonum marifolium</i>                             | 22–34                          | –                |
|                        | Shasta buckwheat                     | ERPY2  | <i>Eriogonum pyrolifolium</i>                           | 22–34                          | –                |
|                        | sulphur-flower buckwheat             | ERUM   | <i>Eriogonum umbellatum</i>                             | 22–34                          | –                |
|                        | scarlet gilia                        | IPAG   | <i>Ipomopsis aggregata</i>                              | 17–34                          | –                |
|                        | spreading phlox                      | PHDI3  | <i>Phlox diffusa</i>                                    | 11–22                          | –                |
|                        | Davis' knotweed                      | PODA   | <i>Polygonum davisiae</i>                               | 11–22                          | –                |
|                        | sagebrush violet                     | VIVA   | <i>Viola vallicola</i>                                  | 11–22                          | –                |
|                        | pioneer rockcress                    | ARPL   | <i>Arabis platysperma</i>                               | 6–17                           | –                |
|                        | Mt. Hood pussypaws                   | CIUM   | <i>Cistanthe umbellata</i>                              | 6–17                           | –                |
|                        | chaparral willowherb                 | EPMI   | <i>Epilobium minutum</i>                                | 6–17                           | –                |
| <b>Shrub/Vine</b>      |                                      |        |   |                                |                  |
| 3                      | <b>Shrubs</b>                        |        |   | 168–224                        |                  |
|                        | rabbitbush                           | ERBL2  | <i>Ericameria bloomeri</i>                              | 84–112                         | –                |
|                        | wax currant                          | RICE   | <i>Ribes cereum</i>                                     | 84–112                         | –                |

## Animal community

Wildlife extensively use range and forest areas for food and cover. The survey area has excellent forage resources for summer and fall grazing. The alpine meadows surrounding the rim and Union peak are dominated by Western Needlegrass (*Achnatherum occidentale* ssp. *californicum*) with Hall's Sedge (*Carex halliana*) and Brewer's Sedge (*Carex Breweri*) subdominant. In some places Bottlebrush Squirreltail (*Elymus elymoides* ssp. *elymoides*) is present also. These species all have nutritive value for grazing ungulates from green-up in June and July through September and early October. Deep snow cover and very cold temperatures in the winter and spring make grazing these sites impractical. These alpine meadows and swells have excellent interspersed forested sites providing hiding and thermal cover as well as transportation corridors for wildlife.

## Recreational uses

Significant aesthetic beauty. Park-like setting is desirable for camping, hiking, and other outdoor pursuits.

## Wood products

None

## Type locality

|                                |  |
|--------------------------------|--|
| Location 1: Klamath County, OR |  |
| Township/Range/Section         | T31S R6E S13   |
| UTM zone                       | N  |
| UTM northing                   | 576287.000   |
| UTM easting                    | 4748598.00   |
| General legal description      | Center of section 13 between rim road and Greyback road, about 1/2 mile below rim road.<br>Headwaters of Watson creek. |

## Other references

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## Contributors

J P Repp  
Jeffrey P. Repp

## 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:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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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:

---

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:**
-