10710

Sierra Nevada Alpine Dwarf-Shrubland

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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Vegetation Type

Shrubland

Map Zone

6

Geographic Range

This widespread ecological system occurs above upper timberline throughout the Sierra Nevada and Southern Cascades, including alpine areas of ranges in California and Oregon.

Biophysical Site Description

Elevations are above 2,800m. This system occurs in areas of level or concave glacial topography, with late-lying snow and sub-irrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist but well drained, strongly acidic, and often have substantial peat layers.

Vegetation Description

The system is commonly comprised of a mosaic of plant communities that include

*Arenaria kingii*, *Ericameria discoidea*, *Artemisia arbuscula*, *Phlox covillei*,

*Eriogonum incanum*, *Eriogonum ovalifolium*, *Eriogonum roseum*, *Polygonum shastense*, *Leptodactylon pungens*,and *Phyllodoce breweri*. Floristically, communities within this system have desert affinities rather than cordilleran affinities. Vegetation in these areas is controlled by the absence of persistent snow, wind desiccation, permafrost, and a short growing season.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ARKI | *Arenaria kingii* | King’s sandwort |
| ERDI14 | *Ericameria discoidea* | Whitestem goldenbush |
| ARAR8 | *Artemisia arbuscula* | Little sagebrush |
| PHCO12 | *Phlox covillei* | Coville’s phlox |
| ERIN9 | *Eriogonum incanum* | Frosted buckwheat |
| EROV | *Eriogonum ovalifolium* | Cushion buckwheat |
| ERRO6 | *Eriogonum roseum* | Wand buckwheat |
| POSH | *Polygonum shastense* | Shasta knotweed |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. Dry summers associated with major drought years (mean return interval, 100yrs) favor grasses over forbs, whereas wet summers cause a more diverse mixture of forbs and graminoids.

Avalanches on steeper slopes where soil accumulates can cause infrequent soil slips that expose bare ground.

Very small burns of a few square meters (replacement fire) caused by lightning strikes were included as a rare disturbance, although lighting storms are frequent at those elevations. The calculation of lightning strike frequency was not based on fire return intervals, but on the number of strikes (in this case, five) per 1,000 possible locations per year.

Native herbivores (Rocky Mountain bighorn sheep, mule deer, and elk) were common in the Alpine but probably did not greatly affect vegetation cover because animals move frequently as they reduce vegetation cover.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 227 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 227 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

This ecological system occurs sporadically in variable-size patches of the Alpine. Patch size varies from a few acres to 100ac in mountain basins. Stand-replacement fires may be caused by lightning strikes that do not spread due to the sparse cover of fine fuels and extensive barren areas acting as fire breaks.

Adjacency or Identification Concerns

Adjacent to and inter-mixed with Sierra Nevadan Dry Tundra.

Issues or Problems

Scarce information on this system.

Native Uncharacteristic Conditions

Comments

Reviewer modified the description to fit the Sierran geography.

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | B | B | B | B | B | B | B | B | B | B |
| Shrub | 0.5-1.0 | B | B | B | B | B | B | B | B | B | B |
| Shrub | 1.0-3.0 | B | B | B | B | B | B | B | B | B | B |
| Shrub | >3.0 | B | B | B | B | B | B | B | B | B | B |
| Tree | 0-5 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 13 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ARKI | Arenaria kingii | King’s sandwort | Upper |
| ERDI14 | Ericameria discoidea | Whitestem goldenbush | Upper |
| ARAR8 | Artemisia arbuscula | Little sagebrush | Upper |
| PHCO12 | Phlox covillei | Coville’s phlox | Upper |

Description

Very exposed (barren) state following a lightning strike. Soil (not rock) may dominate the area. Grasses are more common than forbs or shrubs.

Canopy closure originally input as 0-10%; however, due to mapping rules, it was changed to 0-20%.

*Maximum Tree Size Class*  
None

Class B 87 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ARKI | Arenaria kingii | King’s sandwort | Upper |
| ERDI14 | Ericameria discoidea | Whitestem goldenbush | Upper |
| ARAR8 | Artemisia arbuscula | Little sagebrush | Upper |
| PHCO12 | Phlox covillei | Coville’s phlox | Upper |

Description

Alpine community is dominated by semi-continuous layer of ericaceous shrubs. Plant cover may vary from 10% on exposed sites to as much as 50% on mesic and more protected sites. Infrequent replacement fire in the form of lightning strikes, severe summer droughts, and rare avalanches on steeper slopes with soil cause a transition.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Late1:CLS | 9 |
| Late1:CLS | 10 | Late1:CLS | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Optional 1 | Late1:CLS | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |

Optional Disturbances

Optional 1: Avalanches

References

Baker, W.L. 1980a. Alpine vegetation of the Sangre De Cristo Mountains, New Mexico: Gradient analysis and classification. Unpublished thesis. Chapel Hill, NC: University of North Carolina. 55 pp.

Bamberg, S.A. 1961. Plant ecology of alpine tundra area in Montana and adjacent Wyoming. Unpublished dissertation. Boulder, CO: University of Colorado. 163 pp.

Bamberg, S.A. and J. Major. 1968. Ecology of the vegetation and soils associated with calcareous parent materials in three alpine regions of Montana. Ecological Monographs 38(2): 127-167.

Cooper, S.V., P. Lesica and D. Page-Dumroese. 1997. Plant community classification for alpine vegetation on Beaverhead National Forest, Montana. Report INT-GTR-362. Ogden, UT: USDA Forest Service, Intermountain Research Station. 61 pp.

Komarkova, V. 1976. Alpine vegetation of the Indian Peaks Area, Front Range, Colorado Rocky Mountains. Unpublished dissertation. Boulder, CO: University of Colorado. 655 pp.

Komarkova, V. 1980. Classification and ordination in the Indian Peaks area, Colorado Rocky Mountains. Vegetation 42: 149-163.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

Schwan, H.E. and D.F. Costello. 1951. The Rocky Mountain alpine type: Range conditions, trends and land use (a preliminary report). Unpublished report prepared for USDA Forest Service, Rocky Mountain Region (R2), Denver, CO. 18 pp.

Thilenius, J.F. 1975. Alpine range management in the western United States-principles, practices, and problems: The status of our knowledge. USDA Forest Service Research Paper RM-157. Ft. Collins, CO: Rocky Mountain Forest and Range Experiment Station. 32 pp.

Willard, B.E. 1963. Phytosociology of the alpine tundra of Trail Ridge, Rocky Mountain National Park, Colorado. Unpublished dissertation. Boulder, CO: University of Colorado.