16091

Alaska Sub-boreal Mesic Subalpine Alder Shrubland - Avalanche Slopes

BpS Model/Description Version: Nov. 2024

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
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| None | None | None | None |
| None | None | None | None |

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Vegetation Type

Shrubland

Map Zones

68, 69, 70, 71, 72, 73, 74, 75, 76

Model Splits or Lumps

This Biophysical Setting (BpS) is split from Alaska Sub-boreal Mesic Subalpine Alder Shrubland (1609) to represent the dynamics of avalanche slopes.

Geographic Range

This system is found on steep and upper mountain slopes in the Sub-boreal region and less frequently in the boreal region of AK.

Biophysical Site Description

Avalanche slopes occur where mountain slopes are steep enough to produce frequent snow slides preventing forest development. Upper avalanche slopes typically have a slope angle of at least 70% but the lower slopes and run-out zones may be much less steep. It occurs less commonly throughout the northern boreal region to the southern slopes of the Brooks Range. Soils are shallow, stony, and well-drained, underlain by colluvium, glacial till, and residuum.

Vegetation Description

The dominant shrub species is typically *Alnus viridis* ssp. *sinuate*, but other shrubs including *Sambucus racemosa, Salix* spp. and *Spirea stevenii* may be common. Herbaceous patches are often dominated by *Calamagrostis canadensis* and *Chamerion angustifolium*; other common herbs include *Athyrium filix-femina, Dryopteris expansa* and *Veratrum viride* (Viereck et al. 1992). Tree seedlings and saplings may be common on some slopes but do not emerge as an overstory due to frequent snow avalanches. In boreal Alaska, low-shrub tundra is more common in the gaps between alder patches.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ALVIS | *Alnus viridis ssp. sinuata* | Sitka alder |
| SARA2 | *Sambucus racemosa* | Red elderberry |
| SALIX | *Salix spp.* | Willow |
| CACA4 | *Calamagrostis canadensis* | Bluejoint |
| CHAN9 | *Chamerion angustifolium* | Fireweed |
| ATFI | *Athyrium filix-femina* | Common ladyfern |
| DREX2 | *Dryopteris expansa* | Spreading woodfern |

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

Disturbance Description

Avalanche slopes can extend from the alpine into the montane and lower toe slopes; this model, however, applies only to avalanche slopes occurring below treeline. Snow avalanche is the dominant disturbance, but rocks, soil, and debris can also be transported in the slide. This system represents a topoedaphic climax (Viereck et al. 1992). *Alnus viridis* ssp*. sinuata* has a growth form that tolerates avalanche disturbance and can maintain dominance on the site. Frequent snow slides generally prevent tree seedlings and saplings from reaching the upper canopy. On sites with a less frequent avalanche cycle, trees may temporarily dominate the overstory. This system may be extending further into the alpine in recent decades.

Fire is minimal and is expressed only around the edges of this type as fires are introduced from neighboring types. Avalanche slopes may act as a firebreak except during severe weather (Innes 2015). Sitka alder is generally top-killed by fire but can resprout from the root crown and seeds can germinate in soil exposed by fire (Uchytil 1989).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 788 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 788 | 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

Small to large patch

Adjacency or Identification Concerns

This system is similar in species composition to Alaska Sub-Boreal Mesic Subalpine Alder Shrubland, but it occurs below the subalpine zone and tree growth is limited by avalanche frequency rather than elevation as in the subalpine system. Adjacent forest systems may include Alaska Sub-boreal Mountain Hemlock-White Spruce Forest, Alaska Sub-boreal Mountain Hemlock Forest or Alaska Sub-boreal White Spruce-Hardwood Forest.

Though avalanche slopes can occur from alpine to lower slopes, this model excludes the avalanche slopes above treeline—these would be included in other systems according to vegetation type: Alaska Sub-Boreal Mesic Subalpine Alder Shrubland, Western North American Boreal Alpine Dwarf-Shrubland, Alaska Sub-boreal and Maritime Alpine Mesic Herbaceous Meadow, etc.

Issues or Problems

In 2015 an extensive search was done by Fire Effects Information System staff to locate information for a synthesis on [fire regimes of Alaskan alder and willow shrublands](https://www.fs.fed.us/database/feis/fire_regimes/AK_alder_shrub/all.html#LimitationsOfInformation) (Innes 2015). At that time, the scientific literature about fire regimes in Alaskan alder and willow shrublands was scarce. Descriptions of fire ignition, season, pattern, and size specific to alder and willow shrublands were not found in the literature. The fire return interval (FRI) was estimated to be the same as the Alaska Sub-Boreal Mesic Subalpine Alder Shrubland BpS.

Native Uncharacteristic Conditions

Comments

10/2021

- This description was updated by NatureServe staff and Kori Blankenship based on the updated Ecological Systems classification for Alaska. Edits focused on adjusting the Geographic Range, Biophysical Site Descriptions, and Vegetation Description sections.

In 2021 Kori Blankenship eliminated the use of mixed fire in the state-and-transition simulation model fire because Sitka alder, the dominant species, is top killed by fire (Uchytil 1989). Blankenship increased the frequency of replacement fire to maintain the overall All Fire mean fire return interval (MFRI).

During LANDIFRE National this model did not receive review specifically for z76. This model was developed by Kori Blankenship using the class age ranges from the Persistent Shrub North PNVG model (Murphy and Witten 2006) and a similar FRI to the Alaska Sub-Boreal Mesic Subalpine Alder Shrubland BpS.

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 | B | B | B | B | B | B | B | B | B | B |
| Tree | 5-10 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | B | B | 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 69 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| CACA4 | *Calamagrostis canadensis* | Bluejoint | Upper |
| CHAN9 | *Chamerion angustifolium* | Fireweed | Upper |
| ATFI | *Athyrium filix-femina* | Common ladyfern | Upper |
| DREX2 | *Dryopteris expansa* | Spreading woodfern | Upper |

Description

Forbs, shrubs, and deciduous trees resprout immediately following disturbance, but herbaceous vegetation dominates in early succession. Herbaceous patches are often dominated by *Calamagrostis canadensis* and *Chamerion angustifolium*; other common herbs include *Athyrium filix-femina, Dryopteris expansa,* and *Veratrum viride* (Viereck et al. 1992).

*Maximum Tree Size Class*  
Seedling/Sapling <5"

Class B 31 Late Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ALVIS | *Alnus viridis* ssp*. sinuata* | Sitka alder | Upper |
| SALIX | *Salix* spp. | Willow | Upper |
| SARA2 | *Sambucus racemosa* | Red elderberry | Upper |
| SPST3 | *Spiraea stevenii* | Beauverd spirea | Upper |

Description

Shrubs can become established at the edges or the bottom of the chutes. The dominant shrub species is typically *Alnus viridis* ssp*. sinuata*, but other shrubs including *Sambucus racemosa*, *Salix* spp., and *Spiraea stevenii* may be common. Tree seedlings and saplings may be common on some slopes but typically do not emerge as an overstory due to frequent snow avalanche. On sites where avalanche activity is less frequent trees can occasionally emerge temporarily in the overstory.

*Maximum Tree Size Class*  
Pole 5–9" (swd)/5–11" (hwd)

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Late1:ALL | 4 |
| Late1:ALL | 5 | Late1:ALL | 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** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.0013 | 769 | Yes | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.25 | 4 | Yes | 0 |
| Replacement Fire | Late1:ALL | Early1:ALL | 0.0013 | 769 | Yes | 0 |
| Optional 1 | Late1:ALL | Early1:ALL | 0.25 | 4 | Yes | 0 |

Optional Disturbances

Optional 1: Avalanche

References

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