17130

North American Arctic Active Inland Dune

BpS Model/Description Version: Nov. 2024 9/11/15

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| None | None | None | None |

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Vegetation Type

Shrubland

Map Zones

67, 68, 72, 76

Geographic Range

This Biophysical Setting (BpS) is a minor but widespread system across the Alaskan arctic and boreal forest regions. They occur from the Bristol Bay lowlands in southwestern AK to the North Slope on the Arctic Ocean. They also occur in the Alaskan boreal region as isolated features. Some of the most noteworthy active areas in the Arctic are the Kobuk Dunes in northwestern AK and the Alaskan Arctic Coastal Plain dune field on the Alaskan North Slope.

Biophysical Site Description

The following information was taken from the draft Arctic and Boreal Ecological Systems descriptions with minor modifications (Boggs et al. 2008, Boucher et al. 2008):

Active inland dunes occur as remnants of a larger system of dunes and sand sheets that developed under the climatic conditions of the late Pleistocene. Strong storm winds carried glacio-fluvial silts and sands across vast areas of northwestern North America. Most of these sand deposits have been stabilized by forest and tundra vegetation, but areas of active transport and deposition still exist. Dunes are also common where rivers have cut through sand sheets, and new dunes are still forming along rivers with high sediment loads and outwash deposits. These active dunes share many floristic elements and geomorphic processes (Parker and Mann, 2000). The main disturbance process is the transport and deposition of sand. Common landforms include transverse and longitudinal dunes, sand sheets, desert pavements, blowouts, and interdune slacks. The dunes or blowouts are dry to mesic sand deposits, and the slacks may be wet silts and sands.

Vegetation Description

Active dunes support a unique assemblage of plant species, but plant cover is typically sparse and discontinuous. Three dominant map classes occur within arctic active dune systems: tall willows, mesic herbaceous, and wet sedge. Low- and tall-willow communities are dominated by *Salix glauca, Salix alaxensis, Salix richardsonii* (= *Salix lanata*), and *Salix niphoclada* (= *Salix brachycarpa* ssp*. niphoclada*), along with *Bromus inermis var. pumpellianus* (= *Bromus pumpellianus*) (Parker 1998). The mesic herbaceous class includes *Leymus mollis, Bromus inermis var. pumpellianus* and *Chamerion latifolium* (= *Epilobium latifolium*) (Peterson and Billings 1978; Komarkova and Webber 1980). Additional herbaceous species include *Carex obtusata, Carex lachenalii, Festuca rubra, Festuca brachyphylla, Astragalus alpinus,* and others. Ponds and wet depressions may occur in the slacks and support the wet herbaceous class dominated by *Carex aquatilis* and *Arctophila fulva* (Boggs et al. 2008).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| SAGL | *Salix glauca* | Grayleaf willow |
| SAAL | *Salix alaxensis* | Feltleaf willow |
| SANI10 | *Salix niphoclada* | Barrenground willow |
| SARI4 | *Salix richardsonii* | Richardson's willow |
| BRINP | *Bromus inermis ssp. pumpellianus* | Pumpelly's brome |
| LEMO8 | *Leymus mollis* | American dunegrass |
| CHLA13 | *Chamerion latifolium* | Dwarf fireweed |
| CAOB4 | *Carex obtusata* | Obtuse sedge |

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

Disturbance Description

The following paragraph was taken from the draft Arctic and Boreal Ecological Systems descriptions with minor modifications (Boggs et al 2008; Boucher et al. 2008):

The main disturbance process is the transport and deposition of sand. The location and formation of dunes depend primarily on the availability of sand and wind direction. In western Alaska, the prevailing sand transport direction is from southeast to northwest. Vegetation on the downwind side of the dune is gradually being buried in sand, while on the windward side vegetation is reestablishing. Within the dune complex, a wide variety of moisture regimes occur. Interdune slacks may feature wetland habitats while xeric conditions prevail on active deposition surfaces. Tundra or boreal forest vegetation has stabilized most of these sand deposits, but small blowouts and areas of active transport and deposition still exist.

Fire is not a major disturbance on active dunes. In June of 2013 an extensive search was done by Fire Effects Information System staff to locate information on fire regimes of active inland dunes (Innes 2013) with few results. Dunes now covered by forest or tundra will have the fire regime characteristics of their dominant plant communities but may revert to active dunes after fire.

Fire Frequency

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

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 or large patch.

Adjacency or Identification Concerns

**Issues or Problems**

Native Uncharacteristic Conditions

Comments

More information on active inland dunes can be found in the Fire Effects Information System Synthesis: [fire regimes in Alaskan coastal herbaceous communities and active inland dunes](https://www.fs.fed.us/database/feis/fire_regimes/AK_coastal/all.html) (Innes 2013).

This model was developed by Kori Blankenship with input from Keith Boggs based on the draft Arctic and Boreal Ecological Systems descriptions (Boggs et al. 2008, Boucher et al. 2008). Carolyn Parker is a suggested reviewer for this type.

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 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | >3.0 | A | A | A | A | A | A | A | A | A | A |
| Tree | 0-5 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | A | A | 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 100 Mid Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SALIX | *Salix* spp. | Willow | Upper |
| BRINP | *Bromus inermis* ssp*. pumpellianus* | Pumpelly's brome | Upper |
| LEMO8 | *Leymus mollis* | American dunegrass | Upper |
| CHLA13 | *Chamerion latifolium* | Dwarf fireweed | Upper |

Description

This class represents the Active Inland Dune system which can be dominated by bare ground, tall willows, mesic herbaceous, or wet sedge types. *Leymus Mollis* is most common along the coast and in the Kobuk Sand Dunes.

There are many possible successional trajectories for stabilized dunes, which are outside the scope of this model. The Kobuk Sand Dunes in the Arctic may be succeeding to boreal forest, which is the surrounding vegetation, while others are succeeding to tundra vegetation as seen along the Meade River area on the North Slope of Alaska.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Mid1:ALL | 0 | Mid1: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** |

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