16130

Western North American Boreal Active Inland Dune

Model Date: 06/04/08 Report Date: 9/11/15

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Kori Blankenship | kblankenship@tnc.org | None | None |
| None | None | None | None |
| None | None | None | None |

Reviewer: Robin Innes

Vegetation Type

Upland Savannah/Shrub Steppe

Map Zones

71, 74

Geographic Range

This type occurs in the boreal region as isolated features in western AK and western Canada. It does not occur in southeast AK or Cook Inlet. Areas with active transport are relatively uncommon (Wolfe et al. 2011), but some of the most noteworthy active areas are the Carcross Dunes in southern Yukon and the Lake Athabasca Dunes in northern Saskatchewan.

Biophysical Site Description

The following information was taken from the draft Boreal Ecological Systems description (NatureServe 2008):

Active inland dunes occur in boreal Alaska 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. Some of the most noteworthy active areas are the Kobuk Dunes in western Alaska, the Carcross Dunes in southern Yukon, and the Lake Athabasca Dunes in northern Saskatchewan. 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.

Vegetation Description

Active dunes support a unique assemblage of plant species, but plant cover is typically sparse and discontinuous. Three dominant habitat types occur within boreal active dune systems: grassy, dry mountainous and boreal forest (Parker 1998). Common species may include Picea glauca, Betula nana, Alnus ssp., Vaccinium ssp. and Empetrum ssp.

Dunes of the Kobuk Valley feature four plant species listed as imperiled in Alaska: Lupinus kuschei, Oxytropis kobukensis, Aster yukonensis and Corispermum ochotense var. alaskanum. Leymus arenarius, usually restricted to a narrow strip along the coast is also common on the Kobuk Dunes. Several Beringian endemics and species which are widely disjunct from their known distributions have also been documented (Parker and Mann, 2000). Carex sabulosa, a sedge know from only four other sites in North America can be found in Yukon Territory in dune systems near Carcross and Kusawa Lake; however, it does not occur in the Kobuk Dunes.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIGL | Picea glauca | White spruce |
| BENA | Betula nana | Dwarf birch |
| ALNUS | Alnus | Alder |
| VACCI | Vaccinium | Blueberry |
| EMPET | Empetrum | Crowberry |
| LEAR11 | Leymus arenarius | Sand ryegrass |
| LUKU | Lupinus kuschei | Yukon lupine |
| OXKO | Oxytropis kobukensis | Kobuk locoweed |

Disturbance Description

The following paragraph was taken from the draft Boreal Ecological Systems description (NatureServe 2008):

The main disturbance process is the transport and deposition of sand. In western AK, 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 and successional stages occur. Interdune slacks may feature wetland habitats while xeric conditions prevail on active deposition surfaces. Along the dune margins, varying stages of boreal forest succession 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** | **Min FI** | **Max FI** | **Percent of All Fires** |
| Replacement |  |  |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| **All Fires** |  |  |  |  |

Scale Description

Small or large patch

Non-Fire Disturbances

Other 1: Sand Deposition

Adjacency or Identification Concerns

This BpS expanded and contracted throughout the late Holocene in response to variations in climate, moisture, storm and fire frequency (Parker and Mann 2000). Given the remote location of these dunes, minor climatic variations are more likely to affect this BpS than human activity in the future (Parker and Mann 2000).

Issues or Problems

This BpS should be modeled with a barren sand dune stage to represent the dynamics of active transport and deposition on the dunes, but this is not included in the model because LANDFIRE does not map barren seral stages.

The modeler was not familiar with this system and no review of the model was obtained. The Vegetation Description should likely include more information on the herbaceous species but the modeler was unable to find more information about this. Class A may need to be split to create separate herbaceous and shrub classes but this was not done due to lack of information on class age ranges, successional dynamics and species composition. This model needs to be refined and all quantitative information it contains reassessed by a knowledgeable expert.

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 based on the draft Boreal Ecological Systems description (NatureServe 2008) and in consultation with Tina Boucher. Carolyn Parker is a suggested reviewer for this type.

**Model Parameters**

*Using Track Changes in Word you may suggest changes to any of the parameters indicated in the following tables. If you wish to see how those changes impact model results, go to the “Simulation Model Review Instructions” section on* <http://www.landfirereview.org/models.html>*. If you do not wish to edit and run the actual model, the TNC LANDFIRE will do so and if requested provide the reviewer with the results.*

**Deterministic Transitions**

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Early1:ALL | 999 |
| Late1:ALL | 75 | 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** |
| Optional1 | Early1:ALL | Early1:ALL | 0.5000 | 2 | No | 0 |
| AltSuccession | Early1:ALL | Late1:ALL | 0.0010 | 1,000 | Yes | 0 |
| Optional1 | Late1:ALL | Early1:ALL | 0.0020 | 500 | Yes | 0 |

Succession Classes

Class A 65 Early Development 1 - All Structures

Structural Information

Tree Size Class: Seedling/Sapling <5"

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| LUKU | Lupinus kuschei | Yukon lupine | Upper |
| LEAR11 | Leymus arenarius | Sand ryegrass | Upper |
| ALNUS | Alnus | Alder | Upper |
| VACCI | Vaccinium | Blueberry | Upper |

Description

Herbaceous vegetation dominates this stage which persists as an open canopy over a small area of the active dune. As areas of the dune stabilize, shrub species may invade.

Class B 35 Late Development 1 - All Structures

Structural Information

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

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIGL | Picea glauca | White spruce | Upper |
| ALNUS | Alnus | Alder | Mid-Upper |
| BENA | Betula nana | Dwarf birch | Lower |
| VACCI | Vaccinium | Blueberry | Lower |

Description

Boreal Forest Stage. With long term dune stabilization boreal forest can develop. Common species include Picea galuca, Alnus spp., Betula nana, Vaccinium spp. and Empetrum spp.

References

Innes, Robin J. 2013. Fire regimes of Alaskan coastal herbaceous communities and active inland dunes. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/fire\_regimes/AK\_coastal/all.html [2016, May 20].

Mann, D.H., P.A. Heiser and B.P. Finney. 2002. Holocene history of the Great Kobuk Sand Dunes, Northwestern Alaska. Quaternary Science Reviews, Volume 21, Number 4, February 2002. 23: 709-731.

NatureServe. 2008. International Ecological Classification Standard: Terrestrial Ecological Classifications. Draft Ecological Systems Description for Alaska Boreal and Sub-boreal Regions.

Parker, C.L. 1998. Plant Assemblages and Floristic Mysteries at the Great Kobuk Sand Dunes, Kobuk Valley National Park. Beringia Days 1998. National Park Service, Alaska Region, Anchorage, Alaksa. http://www.nps.gov/akso/beringia/berinotesjan99(2).htm.

Parker and Mann, 2000. Arctic Science 2000 - Crossing Borders: Science and Community Whitehorse, Yukon, Canada, Sept 21-24 2000. American Association for the Advancement of Science & Yukon Science Institute. Abstract available at http://www.taiga.net/arctic2000/abstracts/parker.html.

Wolfe, Stephen; Bond, Jeffrey; Lamothe, Michel. 2011. Dune stabilization in central and southern Yukon in relation to early Holocene environmental change, northwestern North America. Quaternary Science Reviews. 30(3-4): 324-334.