16230

Western North American Boreal Black Spruce-Tamarack Fen

Model Date: Report Date:

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
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|  |  |  |  |

Vegetation Type

Woody Wetland

Map Zones

70, 71, 72, 73, 74

Geographic Range

Biophysical Site Description

This Biophysical Setting (BpS) occurs in lowlands across boreal Alaska and includes treed fens and other organic-rich lowland black spruce-tamarack forests. Soils are poorly drained and often have a well-developed peat layer. Sites with at least 40 cm of peat are classified as fens.

Vegetation Description

The forest canopy is typically open to woodland and trees may be stunted. Common species include *Picea mariana, Larix laricina, Betula nana, Ledum groenlandicum, Ledum palustre* ssp*. decumbens, Empetrum nigrum, Vaccinium vitis-idaea, Vaccinium uliginosum, Chamaedaphne calyculata, Carex* spp., *Eriophorum angustifolium*, and *Sphagnum* spp. *Larix laricina* is considered a fen indicator in some regions.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| LALA | *Larix laricina* | Tamarack |
| EMNI | *Empetrum nigrum* | Crowberry |
| BENA | *Betula nana* | Dwarf birch |
| ERAN6 | *Eriophorum angustifolium* | Common Cottongrass |
| LEGR | *Ledum groenlandicum* | Labrador tea |
| VAUL | *Vaccinium uliginosum* | Bog blueberry |
| VAVI | *Vaccinium vitis-idaea* | Lingonberry |

Disturbance Description

There are two sources of natural disturbance: fire (without thermokarst collapse) and thermokarst collapse.

Mean fire return intervals for black spruce communities in Alaska generally range from 25 to 146 years from the 1700s to the 2000s (Fryer 2014), but it is unclear how well this applies to this particular BpS. As of 2013, there was generally more scientific literature on fire regimes of black spruce forest types than on other black spruce communities (e.g. black spruce-lichen, black spruce scrub, and black spruce bog types; Fryer 2014).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 199 | 75 |  |  |
| Moderate (Mixed) | 594 | 25 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 149 | 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

Adjacency or Identification Concerns

Issues or Problems

Native Uncharacteristic Conditions

Larch sawfly (*Pristiphora erichsonii*), an invasive defoliator, affected an estimated 600,000 to 700,000 acres of *Larix laricina* stands in Alaska from 1999 and 2004, killing 80% or more of the trees (Burnside 2013).

Comments

4/2022 – During the Boreal Forest BpS Review Work Session in February 2022 participants ranked the boreal forest BpS by relative fire frequency. It was estimated that this BpS would have a mean fire return interval (MFRI) less frequent than the other black spruce types, but more frequent than the non-black spruce forest types. The existing model already had a MFRI within these parameters, so no change was made.

2021 - This BpS description and it’s accompanying state-and-transition model were heavily revised as a result of changes to the Ecological Systems. Kori Blankenship created the state-and-transition model based on the Western North American Boreal Black Spruce Bog and Dwarf-Tree PeatlandBpS model (16210). All elements of the state-and-transition model need review. Are the states defined appropriately? Are major disturbances captured at the appropriate frequency? Does the proportion of states from the model results represent reference conditions?

This BpS model and description were drafted in 2021 by Pat Comer and Kori Blankenship based on the revised AK Ecological Systems classification.

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 | B | B | B | B | B | B | B | B | B | B |
| Tree | 5-10 | B | B | B | B | B | B | B | B | B | B |
| Tree | 10-25 | B | B | B | B | B | B | B | B | B | B |
| Tree | 25-50 | B | B | B | B | B | B | B | B | B | B |
| Tree | >50 | B | B | B | B | B | B | B | B | B | B |

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 44 Early Development 1 - All Structures

Structural Information

Tree Size Class: None

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| BENA | *Betula nana* | Dwarf birch | Upper |
| EMNI | *Empetrum nigrum* | Crowberry | Upper |
| LEGR | *Ledum groenlandicum* | Labrador tea | Upper |
| VACCI | *Vaccinium* spp. | Blueberry | Upper |

Description

Low Shrub. Permafrost is well developed in this class, making it subject to thermokarst processes. During dry periods fire can burn into the peat layer and kill the shrubs. Increased water levels as a result of thermokarst processes could kill the existing vegetation.

Class B 56 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** |
| LALA | *Larix laricina* | Tamarack | Upper |
| EMNI | *Empetrum nigrum* | Crowberry | Lower |
| BENA | *Betula nana* | Dwarf birch | Lower |
| LEGR | *Ledum groenlandicum* | Labrador tea | Lower |

Description

Tamarack-black spruce woodland. *Larix laricina* or *Larix laricina-Picea mariana* mix. Trees are generally stunted and pole sized although some achieve the medium (9-21") size class. The presence of *Larix laricina* is associated with higher soil pH. Severe replacement fire will kill the shrubs. A mixed fire will kill most of the trees and top-kill the shrubs. Permafrost is well developed in this class, making it subject to thermokarst processes. Increased water levels as a result of thermokarst processes could kill the existing vegetation.

***Model Parameters***

**Deterministic Transitions**

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Late1:ALL | 74 |
| 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** |
| Optional 1 | Early1:ALL | Early1:ALL | 0.0006 | 1667 | Yes | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.0050 | 200 | Yes | 0 |
| Mixed Fire | Late1:ALL | Early1:ALL | 0.0030 | 333 | Yes | 0 |
| Optional 1 | Late1:ALL | Early1:ALL | 0.0006 | 1667 | Yes | 0 |
| Replacement Fire | Late1:ALL | Early1:ALL | 0.0050 | 200 | Yes | 0 |

**Optional Disturbances**

Optional 1: increased water level (thermokarst processes)

***References***

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