LANDFIRE Biophysical Setting Model

Biophysical Setting 7416212 Western North American Boreal Black Spruce Dwarf-tree Peatland - Alaska Sub-boreal Complex

☑ *This BPS is lumped with: see below*

☐ *This BPS is split into multiple models: This system was created by merging two Ecological Systems: Western North American Boreal Black Spruce Dwarf-tree Peatland and Western North American Boreal Sedge-Dwarf-Shrub Bog*

General Information

Contributors (also see the Comments field **Date** 4/20/2008

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Vegetation Type

Wetlands/Riparian

Dominant Species*

VAOX	BENA
ANPO	EMNI
VAUL	CAREX
LEGR	SPHAG2

General Model Sources

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Map Zone

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Model Zone

- ☑ Alaska
- ☐ California
- ☐ Great Basin
- ☐ Great Lakes
- ☐ Northeast
- ☐ Northern Plains
- ☐ N-Cent.Rockies
- ☐ Pacific Northwest
- ☐ South Central
- ☐ Southeast
- ☐ S. Appalachians
- ☐ Southwest

Geographic Range

This system occurs in lowland areas throughout the sub-boreal region of AK.

Biophysical Site Description

This system includes hydrologically closed bogs, poor fens and organic-rich black spruce forests. Soils are poorly drained, acidic and nutrient-poor, often with a well-developed peat layer. Permafrost is generally absent.

Vegetation Description

Common species include Oxycoccus microcarpus, Andromeda polifolia, Vaccinium uliginosum, Ledum groenlandicum, Betula nana, Empetrum nigrum, Carex microglochin, C. rotundata, C. rariflora, C. lasiocarpa,C. limosa,C. livida, C. williamsii, Eriophorum brachyantherum, E. angustifolium and Drosera spp. Sphagnum spp. are usually abundant in the ground layer (NatureServe 2008).

Disturbance Description

Succession begins for this system in shallow ponds or low-lying wetlands that are hydrologically isolated, floodplain dynamics (oxbows) or thermokarst. An organic root mat typically develops and is either anchored to the mineral soil or floating on water such as a pond's edge. Over time, peat-forming mosses and sedges may fill in the basin. As the peat layer develops, low and dwarf shrubs become established. Dwarf trees may establish on the well-developed peat and also around the margin of the peatland. The

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primary disturbances in this system are changes in hydrology, which can move the system between successional classes or out of this system.

A common pathway into this system is via permafrost degradation, from the Western North American Boreal Lowland Wet Black Spruce Complex or another boreal permafrost system. Permafrost degradation leading to collapse scars and thaw ponds is a common in boreal Alaska, and studies from the Tanana Flats show areas of widespread degradation (Racine et al. 1998, Jorgenson et al. 2001a, Jorgenson et al. 2001b, Jorgenson et al. 2003). Thaw ponds form when ice rich permafrost degrades and collapses forming a basin. Aquatic plants rapidly colonize the pond. Over time, marsh plants and sphagnum moss invade, creating peatland conditions. If a collapse scar is isolated, succession follows a bog development model (this system), whereas in an open hydrologic setting, succession follows a fen development model (causing a transition out of this system to Alaska Sub-Boreal Fen Complex). Pond systems may become connected as adjacent permafrost thaws.

Succession to peatlands can also occur through paludification of previously forested landscapes. Restricted drainage from permafrost development (on inactive alluvial terraces, for example) can lead to the establishment of Sphagnum spp. or other peat forming mosses or sedges, and overtime, peatland plants dominate the site.

Adjacency or Identification Concerns

Compare with Alaska Sub-Boreal Fen Complex. Both of these non-permafrost systems may occur in the boreal region. The fen system will develop on sites with more open hydrology, while this system will develop on sites with isolated or closed hydrology. This system occurs on less than one percent of the boreal landscape.

Native Uncharacteristic Conditions

Scale Description

Large patch (small patch)

Issues/Problems

The rate of thermokarst processes appears to be accelerating rapidly, leading to widespread conversion of permafrost systems to this system and other non-permafrost wetland systems. Widespread ecosystem conversion has been documented in the Tanana Flats (Jorgenson et al. 2001b), among other areas. The altered rates of thermokarst processes make it difficult to create an equilibrium model for this system, since more land area has entered this system than exited it in recent decades.

Comments

Vegetation Classes

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Class A 10 %

Early Development 1 All Structures

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Indicator Species* and Canopy Position

CAAQ	Upper
ERRU2	Upper
ERAN6	Upper
SPHAG2	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	Herbaceous	Herbaceous
Height	Herbaceous	Herbaceous
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

0-49yrs

Subarctic Lowland Bog Meadow/Marsh/Poor Fen.

This early stage may exhibit a variety of herbaceous vegetation, from marsh to sedge meadow to sphagnum-dominated poor fen. Common species include sedges (Carex aquatilis, C. rariflora, C. limosa, C. utriculata, Eriophorum russeolum and E. angustifolium) and Sphagnum spp., sometimes with Calamagrostis canadensis, or Equisetum fluviatile.

This stage could be preceded by an open water or aquatic bed system (not included here because they are sparsely vegetated).

This class maintains itself in the absence of disturbance or follows an alternate succession pathway (probability = 0.01) to class B.

Class B 20 %

Mid Development 1 All Structures

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Indicator Species* and Canopy Position

VAOX	Middle
ANPO	Upper
VAUL	Upper
LEGR	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	Open Shrub (25-74% shrub cover)	Closed Shrub (> 75% shrub cover)
Height	Dwarf Shrub (< 20 cm)	Low Shrub (20 cm to 1.5 m)
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

1-299yrs

Sedge Dwarf Shrub Bog.

Common species include Vaccinium oxycoccus, V. uliginosum, Andromeda polifolia, Ledum groenlandicum, Betula nana, Empetrum nigrum, Carex microglochin, C. rotundata, C. rariflora, C. lasiocarpa, C. limosa,C. livida, C. williamsii, Eriophorum brachyantherum, E. angustifolium and Drosera spp. Sphagnum spp. are usually abundant in the ground layer.

Sucession to class C. Hydrological changes that cause a transition back to class A are modeled as Option 1 (probability = 0.001).

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Class C **70 %**

Late Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Indicator Species* and Canopy Position

PIMA Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Woodland (10-24% tree cover)	Open (25-59% tree cover)
Height	Dwarf Tree (< 3 m)	Tree (> 3 m)
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

300yrs+

Wet Black Spruce Forest/Forested Bog.

Common species include Picea mariana, Ledum groenlandicum, Betula nana, Empetrum nigrum, Vaccinium vitis-idaea, V. uliginosum, Chamaedaphne calyculata, Carex spp., Eriophorum angustifolium, and Sphagnum spp.

This class maintains itself in the absence of disturbance. Hydrological changes that cause a transition back to class A are modeled as Option 1 (probability = 0.001).

Class D **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Indicator Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover		
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Indicator Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover		
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Disturbances

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Fire Regime Group:** NA

Historical Fire Size (acres)

Avg 0
Min 0
Max 0

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement					
Mixed					
Surface					
All Fires					

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fir combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inver of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☐ Expert Estimate

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☑ Other (optional 1) increased water level
- ☐ Other (optional 2)

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