LANDFIRE Biophysical Setting Model

Biophysical Setting 7416130 Western North American Boreal Active Inland Dune

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field **Date** 6/4/2008

Modeler 1	Kori Blankenship	kblankenship@tnc.org	**Reviewer**
Modeler 2			**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type
Upland Savannah/Shrub Steppe

Map Zone
74

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

Dominant Species*

PIGL	EMPET
BENA	LEAR11
ALNUS	LUKU
VACCI	OXKO

General Model Sources
☐ Literature
☐ Local Data
☑ Expert Estimate

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. Some of the most noteworthy active areas are the Kobuk Dunes in western AK, 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 AK, 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. Three dominant habitat types occur within boreal active dune systems: grassy, dry mountainous and boreal forest (Parker 1998).

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,

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Alnus spp., Vaccinium spp. and Empetrum spp.

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.

Disturbance Description

The following information 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. With in 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; however, dunes now covered by forest and tundra may revert to active dunes after fire.

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).

Native Uncharacteristic Conditions

Scale Description

Small or large patch

Issues/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.

Comments

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.

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Vegetation Classes

Class A 65 %

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Indicator Species* and Canopy Position

LUKU	Upper
LEAR11	Upper
ALNUS	Upper
VACCI	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)	Tall Shrub (>1.5 m)
Tree Size Class	Seedling/Sapling <5"	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Zero years plus

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.

This class may persist in the absence of disturbance or follow an alternate succession pathway to class B (probability = 0.001). Sand deposition (probability = 0.5), represented by Option 1 in the model, can reset the age of this class.

Class B 35 %

Late Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Indicator Species* and Canopy Position

PIGL	Upper
ALNUS	Mid-Upper
BENA	Lower
VACCI	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Woodland (10-24% tree cover)	Closed (60-100% tree cover)
Height	Tree (> 3 m)	Tree (> 3 m)
Tree Size Class	Pole 5–9" (swd)/5–11" (hwd)	

☐ Upper layer lifeform differs from dominant lifeform.

Description

75-999yrs

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.

This class will persist in the absence of disturbance. Sand deposition (probability = 0.002), represented by Option 1 in the model, causes a transition to class A.

Class C 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.

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Description

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

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) Sand Deposition
- ☐ Other (optional 2)

References

Mann, D.H., P.A. Heiser, B.P. Finney. 2002. Holocene history of the Great Kobuk Sand Dunes, Northwestern Alaska. Quaternary Science Reviews 21(4): 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

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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.

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