LANDFIRE Biophysical Setting Model

Biophysical Setting 7316440 Alaskan Pacific Maritime Sitka Spruce Forest

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

General Information

Contributors (also see the Comments field **Date** 11/5/2008

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Vegetation Type
Forest and Woodland

Map Zone
73

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

Dominant Species*

PISI	ALVIS
OPHO	RUSP
VAOV	HYSP70
SARA2	RHLO70

General Model Sources
- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Geographic Range
This system is found from south of Blying Sound on the Kenai Peninsula to Shuyak and Afognak Islands and the northern tip of Kodiak Island from Viekoda Bay southeast to Narrow Cape. It is also present in a narrow coastal band (likely one to several km wide) on the west side of Cook Inlet including portions of Katmai and Lake Clark National Parks. The northern extent of Sitka spruce is near the Johnson River.

Biophysical Site Description
This BpS occurs in an area where the boreal and maritime regions of AK overlap. Sitka spruce occurs on rolling bedrock hills and valleys where there is a strong maritime influence and warm, wet coastal storms occur. Soils tend to be well-drained, deep and well-developed (except in areas where spruce is invading meadows and shrublands).

The biophysical environment of the Kodiak Archipelago is unique in that vegetation communities on these islands are still responding to the retreat of Pleistocene glaciers and ash deposition from the 1912 Katmai eruption (Fleming and Spencer 2007). Fleming and Spencer (2007, p. 5) note that: "Sitka spruce forest is actively moving south along the island of Kodiak, perhaps as much as a mile/century [the source of this claim is unknown (personal communication, Page Spencer)]. This succession replaces alder, salmon and elderberry and forb meadows with dense spruce forest. Preferred wildlife habitats with grasses, sedges and forbs and prolific berry crops are being replaced with dense conifers."

Vegetation Description
Picea sitchensis is the dominant tree species and is stunted in some areas (especially on Shuyak and Afognak Islands). Oplopanax horridus and mosses are common in the understory of open stands (Fleming and Spencer 2007). Closed stands tend to have a very sparse understory that may include Oplopanax horridus, Vaccinium ovalifolium, Sambucus racemosa, Alnus crispa ssp. sinuata, Rubus spectabilis and

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feather mosses (e.g. Hylocomium splendens and Rhytidiadelphus loreus) (Fleming and Spencer 2007). Calamagrostis canadensis and Menyanthes trifoliata are also present in some forest openings. In Lake Clark National Park near the northern extent of this BpS, a broader range of species is present including Picea glauca which may hybridize with Picea sitchensis. In this area, the characteristic moss understory found in the Kodiak Archipelago is absent.

Disturbance Description

Primary succession of Picea sitchensis forest in the Kodiak Archipelago begins with rich forb meadows. Overtime, Alnus crispa ssp. sinuata invades, fills in and Sambucus racemosa and Rubus spectabilis are added to the species mix. Eventually Picea sitchensis will start to invade. The timing of the transition to Picea sitchensis appears to be a function of the timing of the Pleistocene glacial retreat, seed source and seed advancement. As the Picea sitchensis trees become denser, the first generation closed Picea sitchensis forest develops with Vaccinium ovalifolium, Oplopanax horridus and feather mosses in the understory. After about 150-300yrs the trees start to senesce, small scale blow down occurs and a multi-age stand develops. In the forest gaps left after tree death or blowdown a rich shrub layer with Alnus crispa ssp. sinuata, Oplopanax horridus and Calamagrostis canadensis competes with the young Picea sitchensis trees. Over long time scales, these forests become more open. In areas with beaver activity, ponds can form that when drained turn into muskegs which dry and can again support Picea sitchensis trees.

In the Katmai area Picea sitchensis advancement appears to be slower than on Kodiak (personal communication, Page Spencer). It is unclear how well the Kodiak successional sequence applies to Picea sitchensis forest on the south end of the Kenai Peninsula which appears to be better developed and is the likely seed source for Picea sitchensis invading the Kodiak Archipelago.

Small scale wind events are the main disturbance affecting this system (larger areas of blowdown are possible after logging). Bark beetle attacks have been recorded but their effects are minor and a few human caused fires have been reported. Gap-phase dynamics drive the successional processes. As older trees senesce or are windthrown gaps are created for younger trees to exploit and a multi-age stand develops.

Adjacency or Identification Concerns

Open Sitka spruce forests are often intermixed with alder and forb meadows (Fleming and Spencer 2007).

Native Uncharacteristic Conditions

Logging on Kodiak Island and on the Kenai Peninsula south of Seldovia has created more early successional forests than would exist otherwise.

Scale Description

Matrix

Issues/Problems

This BpS is represented by a one-box model for several reasons:

1) Although Sitka spruce sites represent a unique biophysical environment with unique successional dynamics it is difficult to model them using the LANDFIRE methodology which assumes that overtime an equilibrium condition will be reached and that the percent of the landscape in each seral stage varies within a certain range (i.e. the natural or historic range of variability). These modeling assumptions do not apply to areas where spruce is actively invading.

2) In dense spruce forest where secondary succession characterized by gap dynamics has begun, the

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disturbance is occurring on a fine scale as individual or small groups of trees die or are windthrown. The small forest openings created by these dynamics are likely not mappable using the LANDFIRE methodology and therefore seral stages can not be defined for me (for the LANDFIRE project seral stages must be mappable).

3) It is unclear how well the dynamics described in the Disturbance Description for the Kodiak Archipelago apply to the Kenai and west Cook Inlet parts of the distribution of this BpS.

Comments

This model description is largely based on work in the Kodiak Archipelago (Fleming and Spencer 2007) and conversations with Page Spencer.

Vegetation Classes

Class A 100%

Mid Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Indicator Species* and Canopy Position

PISI	Upper
OPHO	Lower
VAOV	Lower
SARA2	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Woodland (10-24% tree cover)	Closed (60-100% tree cover)
Height	Dwarf Tree (< 3 m)	Tree (> 3 m)
Tree Size Class	Med. 9–20" (swd)/11–20" (hwd)	

☑ Upper layer lifeform differs from dominant lifeform.

Shrubs may dominate the early seral stages of this BpS.

Description

Zero years plus

This class represents the Sitka Spruce Forest BpS. See the vegetation description for common species.

No disturbances were modeled.

Class B 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

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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.

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

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

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.

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Additional Disturbances Modeled

☐Insects/Disease ☐Native Grazing ☐Other (optional 1)
☐Wind/Weather/Stress ☐Competition ☐Other (optional 2)

References

Boggs et al. in preparation. Kenai Fjords User's Guide.

Fleming, M.D. and P. Spencer. 2007. Kodiak Archipelago land cover classification users guide. SAIC at USGS Alaska Science Center, Anchorage, AK. 77 pp.

Viereck et al. 1992. The Alaska vegetation classification. Pacific Northwest Research Station, USDA Forest Service, Portland, OR. Gen. Tech. Rep. PNW-GTR286. 278 pp.

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