

# LANDFIRE Biophysical Setting Model

**Biophysical Setting 7416160**

**Western North American Boreal Riparian  
Stringer Forest and Shrubland**

☐ This BPS is lumped with:

☐ This BPS is split into multiple models:

## General Information

**Contributors** (also see the Comments field)

**Date** 4/7/2008

|                                 |                           |                               |                             |
|---------------------------------|---------------------------|-------------------------------|-----------------------------|
| <b>Modeler 1</b> Nancy Fresco   | nancyfresco@hotmail.com   | <b>Reviewer</b> Marc Lee      | marc.lee@alaska.gov         |
| <b>Modeler 2</b> Colleen Ryan   | colleen_ryan@tnc.org      | <b>Reviewer</b> Tom Kurkowski | thomas.kurkowski@alaska.gov |
| <b>Modeler 3</b> Douglas Hanson | douglas.hanson@alaska.gov | <b>Reviewer</b> Tom Paragi    | tom.paragi@alaska.gov       |

### Vegetation Type

Wetlands/Riparian

### Map Zone

74

### Model Zone

### Dominant Species\*

PIGL POTR5  
BEPA SALIX  
PIMA ALNUS  
POBA2

### General Model Sources

☒ Literature  
☐ Local Data  
☒ Expert Estimate

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

### Geographic Range

This system occurs along streams throughout the boreal and sub-boreal regions of AK.

### Biophysical Site Description

The riparian forest and shrub stringer is found as a narrow band of vegetation along streams in low gradient and low volume drainages (NatureServe 2008). Although, seasonal overbank flooding may occur, it generally does not result in shifting channels or gravel bar formation (NatureServe 2008). The well-drained soils have moderately thick to thin organic horizons at the surface (indicative of infrequent flooding), are strongly acidic, lack permafrost and have deep water tables (Jorgenson et al. 1999).

### Vegetation Description

The mature phase of this system is dominated by *Picea glauca*, *Betula papyrifera* and *Picea mariana*. *Populus balsamifera* and *Populus tremuloides* are common early seral species on some sites. *Picea mariana* is more common and more likely to be dominant in the northern parts of this system's range. Common understory species include *Alnus tenuifolia*, *Rosa acicularis*, *Calamagrostis canadensis*, *Cornus canadensis*, *Equisetum arvense*, *Hylocomium splendens* and *Rhytidiadelphus triquetrus* (Jorgenson et al. 1999).

Immediately adjacent to the stream bank and in recently burned areas, tall shrubs including *Alnus tenuifolia*, *Salix. alaxensis*, *S. bebbiana* and *S. lasiandra* tend to dominate, with *Carex* spp. and *Calamagrostis canadensis* in the understory (NatureServe 2008, Jorgenson et al. 1999).

\*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

\*\*Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100-year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity

## **Disturbance Description**

Fire is the primary disturbance influencing this system. However, riparian forest and shrub stringers typically burn less frequently than adjacent vegetation types and tend to act as fire breaks.

Because of the linear nature of this system, fire frequencies are strongly influenced by surrounding vegetation types. In the sub-boreal region, surrounding vegetation is more likely to be white spruce and hardwood forest. In the northern boreal region, adjacent forest is more likely to be a black spruce type that burns more frequently. However, this system may also occur in tundra areas where there is a gap in the permafrost layer along the riparian corridor. The riparian stringer in this environment will have a very low fire frequency. As a result, fire frequencies are likely to be more variable in the boreal region compared with the sub-boreal region.

For this model, the overall mean fire return interval was estimated at about 170yrs, somewhat longer than the MFRI for the white spruce-hardwood systems and substantially longer than the black spruce types. This reflects the observation that fires from the surrounding forest types frequently burn into the riparian stringer types, but often do not burn across the river or stream. Patchy, mixed severity fire is thought to be more common in this type than in most other spruce-hardwood types.

Seasonal overbank flooding may occur, but it generally does not result in shifting channels or gravel bar formation (NatureServe 2008). As a result, flooding typically only acts as a disturbance in a narrow zone along the bank. This zone will typically remain in a self-replacing shrub stage. This disturbance is modeled as Option 1 in the VDDT model. Beaver activity may play a role in the dynamics of this system, but it is not included in the model due to the limited scale of these impacts.

## **Adjacency or Identification Concerns**

See the Disturbance Description for more information on adjacent types.

## **Native Uncharacteristic Conditions**

### **Scale Description**

Linear

### **Issues/Problems**

The main factor controlling the disturbance regime in this system is its ecological setting. Ideally, we would create a separate model for this system on sites where the adjacent systems are non-forested. If these sites cannot be distinguished, then it is probably not worth creating separate models for the boreal and sub-boreal regions, as the MFRI is probably similar for the two regions.

A reviewer noted that the age of transition from the shrub/sapling class to the forest class may vary widely depending on the tree species present. Hardwoods will begin to overtop the shrubs around age 15, but this stage will be very difficult to distinguish from the shrub stage using satellite imagery. Spruce-dominated stands may not transition from Class A to B for much longer, as it may take black spruce 30yrs to reach 3m in height.

Classes B and C may overlap in canopy composition. For the purposes of this model, it has been assumed that Class B will have >50% hardwoods in the canopy and Class C will have >50% spruce, but there will be exceptions to this rule in reality.

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## Comments

The draft version of this model was created by Nacy Fresco and Colleen Ryan based in part on input from the experts who attended the LANDFIRE Anchorage (Dec. 07) modeling meeting. Extensive review by the Alaska Dept. of Natural Resources Div. of Forestry led to extensive changes to the model. As a result, lead reviewer Douglas Hanson was added as a modeler. The other Div. of Forestry reviewers, Marc Lee, Northern Region Forest Manager, and Tom Kurkowski, GIS specialist, were listed as reviewers. Will Putnam (wputman@tanachiefs.org) reviewed an early draft of this model.

## Vegetation Classes

### Class A 10 %

Early Development 1 All Structures

#### Upper Layer Lifeform

- ☐ Herbaceous  
☒ Shrub  
☐ Tree

#### Indicator Species\* and Canopy Position

SALIX Upper  
 ALNUS Upper  
 CAREX Lower  
 CACA4 Low-Mi

#### 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

0-15yrs

Shrub-sapling. This stage is dominated by shrubs but trees begin to sprout and saplings may be present. Around age 15yrs, the hardwood saplings will begin to overtop the shrubs, though the spruce saplings will still be in the understory.

Common shrub species include a variety of Salix spp. and Alnus tenuifolia. Herbs frequently include Calamagrostis canadensis, Equisetum arvense and Carex spp.

This class includes those areas immediately adjacent to the stream bank that are dominated by shrubs maintained by frequent flooding. These areas are unlikely to burn. The 0.1 annual probability of flooding in this class is meant to represent these areas.

Succession is to class B at age 15yrs. Replacement MFRI = 333yrs. Flooding (Option 1) probability = 0.1.

### Class B 40 %

Mid Development 1 All Structures

#### Upper Layer Lifeform

- ☐ Herbaceous  
☐ Shrub  
☒ Tree

#### Indicator Species\* and Canopy Position

BEPA Upper  
 PIGL Upper  
 PIMA Upper  
 ALNUS Middle

#### 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 | Pole 5-9" (swd)/5-11" (hwd)  |                             |

☐ Upper layer lifeform differs from dominant lifeform.

For mapping, the presence of hardwoods distinguishes Class B from Class C.

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### Description

16-119yrs

White spruce-hardwood mix. This is a mixed white spruce (black spruce) hardwood forest. Black spruce is more common and hardwoods are less common in the northern boreal region. Early in this age range, hardwoods will dominate the overstory. Spruce species typically will not overtop the shrub layer until age 30-50yrs. By the end of this age range, the canopy will typically be dominated by a mixture of birch and spruce.

Species composition is highly variable in this class, depending on landscape context, site characteristics, disturbance history and available seed sources. *Picea glauca*, *Betula papyrifera*, *Populus balsamifera*, *Alnus* spp. and *Salix* spp. typically dominate the overstory, though *Picea mariana* may be common, especially in the northern boreal region. The understory commonly includes *Rosa acicularis*, *Carex* spp. and *Calamagrostis canadensis*. Though species composition is highly variable, this class can be distinguished for mapping purposes by canopy composition (>50% hardwoods).

Succession is to class B at age 120yrs. Replacement MFRI = 500yrs. Mixed MFRI = 220yrs (system stays in class B).

### **Class C 50 %**

Late Development 1 All Structures

#### Upper Layer Lifeform

- ☐ Herbaceous  
☐ Shrub  
☒ Tree

#### Indicator Species\* and Canopy Position

PIGL Upper  
BEPA Upper  
POBA2 Upper  
PIMA Upper

#### 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.

This class may include some senescing hardwoods in the canopy, but the canopy should be at least 75% spruce.

### Description

120yrs+

Mature spruce forest. This class is typically dominated by mature spruce (>50% spruce in the canopy). More northern sites will have more black spruce, while more southern sites will be mostly white spruce. However, when these stands extend to the far north of the boreal region, such as the south slopes of the Brooks Range, white spruce will dominate over black spruce. Birch frequently persists in the canopy but typically will constitute <50% of the canopy.

Understory plants include *Alnus tenuifolia*, *Rosa acicularis*, *Cornus canadensis*, *Equisetum arvense*, *Hylocomium splendens* and *Rhytidiadelphus triquetrus* (Jorgenson et al. 1999).

This class persists in the absence of disturbance. Replacement MFRI = 400yrs. Mixed MFRI = 220yrs (system transitions to class B).

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**Class D** 0 %

[Not Used] [Not Used]

**Structure Data (for upper layer lifeform)**

**Upper Layer Lifeform**

- ☐ Herbaceous  
☐ Shrub  
☐ Tree

**Indicator Species\* and  
Canopy Position**

|                 | Min | Max |
|-----------------|-----|-----|
| Cover           |     |     |
| Height          |     |     |
| Tree Size Class |     |     |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

**Class E** 0 %

[Not Used] [Not Used]

**Structure Data (for upper layer lifeform)**

**Upper Layer Lifeform**

- ☐ Herbaceous  
☐ Shrub  
☐ Tree

**Indicator Species\* and  
Canopy Position**

|                 | Min | Max |
|-----------------|-----|-----|
| Cover           |     |     |
| Height          |     |     |
| Tree Size Class |     |     |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

**Disturbances**

**Fire Regime Group\*\*:** III

**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 | 434.8  |        |        | 0.0023      | 36                   |
| Mixed       | 243.9  |        |        | 0.0041      | 64                   |
| Surface     |        |        |        |             |                      |
| All Fires   | 156    |        |        | 0.00641     |                      |

**Fire Intervals (FI):**

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse 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.

**Additional Disturbances Modeled**

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

**References**

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NatureServe. 2008. International Ecological Classification Standard: Terrestrial Ecological Classifications.

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