

LANDFIRE Biophysical Setting Model

Biophysical Setting 7016160

**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

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

Vegetation Type

Wetlands/Riparian

Map Zone

70

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 30 years 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.

*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.

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@tananachiefs.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 (> 3m)
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.

*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

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 (> 3m)
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).

*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

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

Additional Disturbances Modeled

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

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.

References

Foot, M. Joan. 1983. Classification, description, and dynamics of plant communities after fire in the Taiga of Interior Alaska. Res. Pap. PNW-307. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 108 pp.

Jorgenson, M.T., J.E. Roth, M.K. Reynolds, M.D. Smith, W. Lentz, A.L. Zusi-Cobb and C.H. Racine. 1999. An ecological land survey for Fort Wainwright, Alaska. U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. CRREL TR-99-9. 92 pp.

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

*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

Draft Ecological Systems Description for Alaska Boreal and Sub-boreal Regions.

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

*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