16160

Western North American Boreal Riparian Stringer Forest and Shrubland

BpS Model/Description Version: Nov. 2024

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| --- | --- | --- | --- |
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Reviewer: Ilana Abrahamson, Beth Schulz, Blaine Spellman

Vegetation Type

Forest and Woodland

Map Zones

70, 71, 72, 73, 74, 75, 76, 77, 78, 80

Geographic Range

This Biophysical Setting (BpS) occurs along streams throughout the boreal and sub-boreal regions of AK.

Biophysical Site Description

This BpS 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 thin to moderately thick organic horizons at the surface (indicative of infrequent flooding), are strongly acidic, lack permafrost, and have deep water tables (Jorgenson et al. 1999). Drainageways/small order streams on steep gradients in the mountains tends to have gravelly substrates while water bodies occurring on low sloping areas (like in rolling boreal hills or plains) tend to be silty.

The steeper gradient-gravelly drainages with dry soils tend to be *Alnus* dominant (Cryorthents). The steeper-gradient-gravelly drainages with wet soils tend to be *Salix pulchra-Vacinnium*-sedge dominant (Cryaquents). The low-gradient silty drainages tend to be *Picea glauca* dominant on drier soils, and on Aquorthels (moist permafrost soils), *Picea mariana*-dominatedcommunities (Spellman pers. comm. 2022).

Vegetation Description

The mature phase of this system is dominated by *Picea glauca, Betula neoalaskana,* and *Picea mariana*. *Populus balsamifera (P. balsamifera* ssp. *trichocarpa* in sub boreal) 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).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIGL | *Picea glauca* | White spruce |
| BEPA | *Betula neoalaskana* | Alaska paper birch |
| PIMA | *Picea mariana* | Black spruce |
| POBA2 | *Populus balsamifera* | Balsam poplar |
| POTR5 | *Populus tremuloides* | Quaking aspen |
| SALIX | *Salix spp.* | Willow |
| ALNUS | *Alnus spp.* | Alder |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

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. 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.

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 dominant 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. Patchy, mixed severity fire is thought to be more common in this type than in most other spruce-hardwood types.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 694 | 43 |  |  |
| Moderate (Mixed) | 529 | 57 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 300 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Linear

Adjacency or Identification Concerns

See the Disturbance Description for more information on adjacent types.

Issues or Problems

The main factor controlling the disturbance regime in this BpS 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 fire return interval (FRI) 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.

Native Uncharacteristic Conditions

Comments

8/2022 - Kori Blankenship adjusted the modeled mean fire return interval (MFRI) from 156 to 303 years based on the relative fire frequency rankings developed for boreal forest BpS during the Boreal Forest BpS Review Work Session in February 2022. The change in fire frequency changed the succession class proportions from 9, 41, 50 to 5, 27, 68 in classes A-C respectively.

Reviewer Ilana Abrahamson noted that she found no published fire history studies on this BpS in a 2014 literature review.

During LANDFIRE National, this model was created for the AK boreal region and did not receive review for the arctic region. The draft version of this model was created by Nancy 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.

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | >3.0 | A | A | A | A | A | A | A | A | A | A |
| Tree | 0-5 | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf |
| Tree | 5-10 | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf |
| Tree | 10-25 | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf |
| Tree | 25-50 | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf |
| Tree | >50 | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf | B brdlf |
| Tree | 0-5 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | 5-10 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | 10-25 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | 25-50 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | >50 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | 0-5 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |
| Tree | 5-10 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |
| Tree | 10-25 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |
| Tree | 25-50 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |
| Tree | >50 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 5 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SALIX | *Salix* spp. | Willow | Upper |
| ALNUS | *Alnus* spp. | Alder | Upper |
| CAREX | *Carex* spp. | Sedge | Lower |
| CACA4 | *Calamagrostis canadensis* | Bluejoint | Low-Mid |

Description

Shrub-sapling. This stage is dominated by shrubs, but trees begin to sprout, and saplings may be present. Around age 15, 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. Flooding in this class is meant to represent these areas.

*Maximum Tree Size Class*  
Seedling/Sapling <5"

Class B 26 Mid Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| BEPA | *Betula neoalaskana* | Alaska paper birch | Upper |
| PIGL | *Picea glauca* | White spruce | Upper |
| PIMA | *Picea mariana* | Black spruce | Upper |
| ALNUS | *Alnus* spp. | Alder | Middle |

Description

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 30-50. 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 neoalaskana, Populus balsamifera, P. balsamifera* ssp. *trichocarpa*, *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).

*Maximum Tree Size Class*  
Pole 5–9" (swd)/5–11" (hwd)

Class C 69 Late Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIGL | *Picea glauca* | White spruce | Upper |
| BEPA | *Betula neoalaskana* | Alaska paper birch | Upper |
| POBA2 | *Populus balsamifera* | Balsam poplar | Upper |
| PIMA | *Picea mariana* | Black spruce | Upper |

Description

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).

*Maximum Tree Size Class*  
Med. 9–20" (swd)/11–20" (hwd)

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:ALL | 15 |
| Mid1:ALL | 16 | Late1:ALL | 119 |
| Late1:ALL | 120 | Late1:ALL | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.1 | 10 | Yes | 0 |
| Mixed Fire | Mid1:ALL | Mid1:ALL | 0.002 | 500 | No | 0 |
| Replacement Fire | Mid1:ALL | Early1:ALL | 0.0014 | 714 | Yes | 0 |
| Mixed Fire | Late1:ALL | Mid1:ALL | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Late1:ALL | Early1:ALL | 0.0014 | 714 | Yes | 0 |

Optional Disturbances

Optional 1: Flooding

References

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