**17140**

Alaska Arctic Large River Floodplain

BpS Model/Description Version: Nov. 2024

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| --- | --- | --- | --- |
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Reviewer: Lindsey Flagstad

Vegetation Type

Forest and Woodland

Map Zones

67, 68, 69, 72, 76

Geographic Range

This Biophysical Setting (BpS) is found in arctic AK and includes active (flooded frequently) and inactive (flooded infrequently) portions of the floodplains associated with two of AK's high-volume arctic rivers: the Yukon and Kuskokwim. Floodplains not associated with the Yukon or Kuskokwim are covered in the Alaska Arctic Floodplain BpS (BpS 1715).

Biophysical Site Description

This BpS includes large floodplains associated with the Yukon and Kuskokwim rivers. The flooding regime is characterized by large spring floods at break-up and the active flooding zone often can be several kilometers wide (Boggs et al. 2008). Permafrost is usually absent.

Vegetation Description

The primary existing vegetation types are mesic herbaceous, alder, tall-low willow, and balsam poplar (Boggs et al. 2008). Primary succession on floodplains begins when new alluvial surfaces are colonized by tree, shrub, and herbaceous species. Common woody species include *Populus balsamifera* ssp*. balsamifera, Alnus viridis* ssp*. sinuata, Alnus incana* ssp*. tenuifolia, Salix richarsondii,* and *Salix alaxensis.* Common early seral herbaceous species may include *Lupinus* *arcticus*, *Hedysarum* *alpinum*, *H. mackenzii*, and *Equisetum* *arvense*, *E. palustre*, *E. varigatum*. The next seral stage includes communities dominated by *Populus balsamifera* ssp*. balsamifera* and/or *Alnus viridis* ssp*. sinuata, Salix* spp., and bryophytes or uniform stands of *Salix* spp. such as *S. alaxensis*. The tall shrub component of the early successional stages diminishes rapidly because of decreased light from the dense tree overstory, and high levels of herbivory by moose or snowshoe hares may accelerate succession (Butler et al. 2007).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| POBAB2 | *Populus balsamifera ssp. balsamifera* | Balsam poplar |
| ALVIS | *Alnus viridis ssp. sinuata* | Sitka alder |
| ALINT | *Alnus incana ssp. tenuifolia* | Thinleaf alder |
| SARI4 | *Salix richardsonii* | Richardson's willow |
| SAAL | *Salix alaxensis* | Feltleaf willow |
| HEAL | *Hedysarum alpinum* | Alpine sweetvetch |
| LUAR2 | *Lupinus arcticus* | Arctic lupine |
| EQAR | *Equisetum arvense* | Field horsetail |

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

Disturbance Description

Flooding can be caused by snow melt, precipitation, ice jams, and glacial runoff. Frequent flooding and channel migration create a pattern of gravel bars and early successional stages across the valley bottom. Sediment deposition raises the surface of the floodplain over time. As the terrace becomes farther removed from the channel, flooding becomes less frequent. Water availability on terraces plays a major role in community structure and composition. Water inputs are from overbank flow (flooding), ground water, and precipitation. Deposits with high permeability become progressively drier as they are vertically and horizontally removed from the active channels. Ice scour causes regeneration of willow carrs.

Oxbows and other wet depressions commonly form on the floodplains and develop into wetlands. Fire, if it occurs, would be extremely rare and is not included in the model.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement |  |  |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires |  |  |  |  |

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

Patches are linear along river courses but are found in a mosaic with floodplain wetlands.

Adjacency or Identification Concerns

This type is mosaiced with the wetland systems which are modeled separately.

Issues or Problems

Frequency of major flood events on the larger rivers seems to be lower compared with the middle 20th Century, as evident from the age of *Salix alaxensis* cohorts on higher terraces. With the advent of climate change and changing weather patterns, historical ice scouring/jamming and flooding events are no longer common. The decline in floods that deposit a silt cap for willow and poplar regeneration and in ice scouring that rejuvenates willows could have a major impact on reducing the amount of available winter forage for moose, an important game species in Interior Alaska.

The modeled flood intervals, alternate succession probability and the results for the percent of the landscape in each class are best guesses.

Native Uncharacteristic Conditions

Comments

A reviewer suggested that the early seral state should have a larger relative proportion than other floodplain BpS, but no guidance on how to change the model was provided. The results of the current model indicate that about 5% of this BpS may have been in an early seral state on average over long time periods. In contrast the Alaska Arctic Floodplain (BpS 1715), which represents smaller rivers in the Arctic region, estimates 20% in the early seral state.

This model was modified by Colleen Ryan, Kori Blankenship, and Keith Boggs from the Boreal Large River Floodplain model by Robert Lambrecht and Kori Blankenship. On the advice of experts who attended the LANDFIRE Arctic workshop in Fairbanks (Apr. 08), the spruce classes and fire disturbances from the boreal region model were removed, but the model was otherwise not substantially changed. Some edits were made to the description to make it applicable to arctic Alaska.

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 | B | B | B | B | B | B | B | B | B | B |
| Shrub | >3.0 | B | B | B | B | B | B | B | B | B | B |
| Tree | 0-5 | C | C | C | C | C | C | C | C | C | C |
| Tree | 5-10 | C | C | C | C | C | C | C | C | C | C |
| Tree | 10-25 | C | C | C | C | C | C | C | C | C | C |
| Tree | 25-50 | C | C | C | C | C | C | C | C | C | C |
| Tree | >50 | C | C | C | C | C | C | C | C | C | C |

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 6 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| EQAR | *Equisetum arvense* | Field horsetail | Upper |
| SAAL | *Salix alaxensis* | Feltleaf willow | Upper |

Description

Post disturbance regeneration. This class can include gravel bar, herbs, shrub regeneration, and seedlings. Silt is deposited on the inside of river meanders following flood events, although it can occur on higher terraces. Flooding deposits seeds which germinate and take root. *Equisetum* spp. and *Salix* spp. colonize in the first year. Within five years *Salix* spp., *Alnus* spp., and balsam poplar seedlings may be abundant. Plant cover is 1-20% in the first year. Shrub cover increases up to 40% by the fifth year, with a diverse herbaceous layer underneath. *Lupinus* spp. and *Hedysarum* spp. are common herbaceous species in this stage.

*Maximum Tree Size Class*  
Seedling <4.5ft

Class B 15 Mid Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SAAL | *Salix alaxensis* | Feltleaf willow | Upper |
| ALINT | *Alnus incana ssp. tenuifolia* | Thinleaf alder | Upper |
| POBAB2 | *Populus balsamifera* ssp*. balsamifera* | Balsam poplar | Upper |

Description

Tall shrubs (*Salix* spp., *Alnus* spp., *Populus balsamifera*) and saplings with a closed canopy (>60%). Saplings may consist of *Salix alaxensis* (dominant) or balsam poplar. Saplings overtop shrubs at 15-40 years. In colder areas, poplar and birch (Class C) do not occur and this class may persist.

An alternate succession pathway represents areas where poplar and birch do not occur.

*Maximum Tree Size Class*  
Sapling >4.5ft; <5"DBH

Class C 79 Late Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POBAB2 | *Populus balsamifera* ssp*. balsamifera* | Balsam poplar | Upper |
| BENE4 | *Betula neoalaskana* | Resin birch | Lower |
| SAAL | *Salix alaxensis* | Feltleaf willow | Lower |
| ALINT | *Alnus incana ssp. tenuifolia* | Thinleaf alder | Lower |

Description

Balsam poplar and white spruce are the dominant overstory species. Shade-tolerant shrub species persist in the understory. As the stand ages, individual trees are lost to wind, disease, or rot. Shrub cover commonly increases as the overstory canopy declines. Stands tend to be closed but can be open depending on site conditions. Permafrost build up can lead to wetland development, but that is beyond the scope of this model.

*Maximum Tree Size Class*  
Medium 9-21"DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:ALL | 4 |
| Mid1:ALL | 5 | Late1:ALL | 19 |
| Late1:ALL | 20 | 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** |
| Optional 1 | Early1:ALL | Early1:ALL | 0.05 | 20 | Yes | 0 |
| Alternative Succession | Mid1:ALL | Mid1:ALL | 0.01 | 100 | No | 0 |
| Optional 1 | Mid1:ALL | Early1:ALL | 0.03 | 33 | Yes | 0 |
| Optional 1 | Late1:ALL | Early1:ALL | 0.01 | 100 | Yes | 0 |

Optional Disturbances

Optional 1: Flooding/Ice scour

References

Boggs et al. 2008. International Ecological Classification Standard: Terrestrial Ecological Classifications. Draft Ecological Systems Description for the Alaska Arctic Region.

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