16200

**Western North American Boreal Shrub-Sedge Bog and Acidic Fen**

BpS Model/Description Version: Nov. 2024

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Pat Comer | Pat\_Comer@natureserve.org |  |  |
|  |  |  |  |
|  |  |  |  |

Reviewer: Blaine T. Spellman

Vegetation Type

Woody Wetlands

Map Zones

68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78

Geographic Range

This Biophysical Setting (BpS) extends across lowlands of the western boreal and boreal transition regions of North America, including Alaska, with occurrences in inland British Columbia, and is not associated with permafrost processes. These wetlands are also found at higher temperate and boreal latitudes of Canada, extending south into the Pacific Maritime and Rocky Mountain divisions.

Biophysical Site Description

This BpS occurs in lowlands of the boreal and boreal transition regions of Alaska and includes low, shrub-dominated wetlands. Sites may be wetlands or hydrologically closed bogs and poor fens (systems with little or no groundwater inputs) with thick (>40 cm) peat deposits. However, peat depth is variable and can be less than 40 cm deep. Organic soils are acidic and nutrient-poor. Soils are saturated for at least a portion of the growing season, and permafrost is absent. It includes basin or blanket bogs.

Vegetation Description

Common species include *Vaccinium oxycoccos (= Oxycoccus microcarpos), Andromeda polifolia, Vaccinium uliginosum, Ledum palustre* ssp*. decumbens, Ledum groenlandicum, Betula nana, Rubus chamaemorus, Empetrum nigrum, Myrica gale, Comarum palustre, Salix fuscescens, Salix pulchra, Chamaedaphne calyculata*, *Calamagrostis canadensis, Carex aquatilis, Carex microglochin, Carex rotundata, Carex rariflora, Carex lasiocarpa, Carex limosa, Carex chordorrhiza, Carex livida, Carex pluriflora, Carex pauciflora, Carex stylosa, Carex membranacea, Eriophorum brachyantherum, Eriophorum angustifolium, Calla palustris*,and *Drosera* spp. (DeVelice et al. 1999, Jorgenson et al. 2003, Gracz et al. 2005). *Sphagnum* spp. are usually abundant in the ground layer. *Myrica gale* and *Chamaedaphne calyculata* indicate poor fen conditions.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| VAOX | *Vaccinium oxycoccos* | small cranberry |
| ANPO | *Andromeda polifolia* | bog rosemary |
| SALIX | *Salix spp.* | Willow |
| BENA | *Betula nana* | Dwarf birch |
| LEGR | *Ledum groenlandicum* | Bog labrador tea |
| MYGA | *Myrica gale* | Sweetgale |
| CAAQ | *Carex aquatilis* | Water sedge |
| SPHAG2 | *Sphagnum spp.* | Sphagnum |

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

Disturbance Description

In boreal wetlands the general successional trend is from marsh to fen to treed bog; however, succession is not necessarily directional, and environmental conditions, such as nutrient content and abundance of groundwater, may prevent fens from developing into bogs (Zoltai et al. 1988). Succession begins in shallow ponds or low-lying wetlands formed by processes such as glacial recession and floodplain dynamics (oxbows) or thermokarsts. An organic root mat typically develops and is either anchored to the mineral soil or floating on water such as a pond's edge. Over time, peat-forming mosses and sedges may fill in the basin. As the peat layer develops, low and/or dwarf-shrubs become established. Dwarf-trees may establish on the well-developed peat and also around the margin of the peatland. Many peatlands on the Kenai Lowland formed in kettles after remnant glacial ice melted. In this region there is a trend toward peatlands drying and ponds shrinking and filling in (Klein et al. 2005).

Permafrost degradation leading to collapse scars and thaw ponds is common in boreal Alaska, and studies from the Tanana Flats show areas of widespread degradation (Racine et al. 1998, Jorgenson et al. 2001a, 2001b, 2003). Thaw ponds form when ice-rich permafrost degrades and collapses forming a basin. Aquatic plants rapidly colonize the pond. Over time, marsh plants and sphagnum moss invade creating peatland conditions. This trend is leading to widespread ecosystem conversion in the Tanana Flats (Jorgenson et al. 2001b). If a collapse scar is isolated, succession follows a bog development model, whereas in an open hydrologic setting, succession follows a fen development model. Pond systems may become connected as adjacent permafrost thaws.

Succession to peatlands can also occur through paludification of previously forested landscapes. Restricted drainage from permafrost development (on inactive alluvial terraces, for example) can lead to the establishment of *Sphagnum* spp. or other peat-forming mosses or sedges, and overtime, peatland plants dominate the site.

Fire Frequency Results

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

Scale Description

Large patch (small patch)

Adjacency or Identification Concerns

Issues or Problems

Native Uncharacteristic Conditions

Comments

In 2021 Pat Comer drafted this description based on NatureServe’s updated Ecological Systems classification for AK. This concept was not described or modeled by LANDFIRE prior to 2021. Kori Blankenship created a simple one-box model to represent the BpS dynamics.

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 | A | A | A | A | A | A | A | A | A | A |
| Tree | 5-10 | A | A | A | A | A | A | A | A | A | A |
| Tree | 10-25 | A | A | A | A | A | A | A | A | A | A |
| Tree | 25-50 | A | A | A | A | A | A | A | A | A | A |
| Tree | >50 | A | A | A | A | A | A | A | A | A | A |

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 100 Mid Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| VAOX | *Vaccinium oxycoccos* | small cranberry | Upper |
| ANPO | *Andromeda polifolia* | bog rosemary | Upper |
| SALIX | *Salix* spp. | Willow | Upper |
| BENA | *Betula nana* | Dwarf birch | Upper |

Description

This class represents the Shrub-Sedge Bog and Acidic Fencommunity. This class persists indefinitely under appropriate hydrological conditions.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Mid1:ALL | 0 | Mid1: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** |

References

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, C. Nordman, M. Pyne, M. Reid, M. Russo, K. Schulz, K. Snow, J. Teague, and R. White. 2003-present. Ecological systems of the United States: A working classification of U.S. terrestrial systems. NatureServe, Arlington, VA.

DeVelice, R.L., 1999. *Plant community types of the Chugach National Forest: southcentral Alaska*. US Department of Agriculture, Forest Service, Chugach National Forest, Alaska Region.

Foote, 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.

Gracz, M., Noyes, K, North, P., Tande, G. 2005 Wetland Mapping and Classification of the Kenai Lowland, Alaska. http://www.kenaiwetlands.net/

Jorgenson, M. T., J. E. Roth, M. D. Smith, S. Schlentner, W. Lentz, and E. R. Pullman. 2001. An ecological land survey for Fort Greely, Alaska. U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. ERDC/CRREL TR-01-04. 85 pp.

Jorgenson, M. T., J. E. Roth, M. Raynolds, M. D. Smith, W. Lentz, A. 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. U.S. Army Cold Regions Research Engineering Laboratory, Hanover, NH CRREL Report 99-9. 83 pp.

Jorgenson, M. T., J. E. Roth, M. D. Smith, S. Schlentner, W. Lentz, and E. R. Pullman. 2001. An ecological land survey for Fort Greely, Alaska. U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. ERDC/CRREL TR-01-04. 85 pp.

Jorgenson, M.T., Racine, C.H., Walters, J.C. and Osterkamp, T.E., 2001. Permafrost degradation and ecological changes associated with a warmingclimate in central Alaska. *Climatic change*, *48*(4), pp.551-579.

Klein, E., Berg, E.E. and Dial, R., 2005. Wetland drying and succession across the Kenai Peninsula Lowlands, south-central Alaska. *Canadian Journal of Forest Research*, *35*(8), pp.1931-1941.

Post, R. A. 1996. Functional profile of black spruce wetlands in Alaska. US EPA, Alaska Operations Office, Seattle, WA. EPA/910/R-96/006. 170pp.

Racine, C.H., Jorgenson, M.T. and Walters, J.C., 1998, June. Thermokarst vegetation in lowland birch forests on the Tanana Flats, interior Alaska, USA. In *Proceedings of the Seventh International Conference on Permafrost* (Vol. 57, pp. 927-933). Québec: Université Laval.

Zoltai, S.C., Taylor, S., Jeglum, J.K., Mills, G.F. and Johnson, J.D., 1988. Wetlands of boreal Canada. *Wetlands of Canada, Ecological Land Classification Series*, *24*, pp.97-154.